Meet our Panelists

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- 25 Years of Specialized Experience in Supply Chain Strategy, Business Strategy, Logistics Operations and Facility Design/Optimization
- 100+ Projects Completed
- 60+ Industry Presentations
- 50+ Articles Published
## Agenda

<table>
<thead>
<tr>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distribution Network Strategy Overview</td>
</tr>
<tr>
<td>10 Tips for Optimizing a Distribution Network</td>
</tr>
<tr>
<td>Presentation Summary</td>
</tr>
</tbody>
</table>
10 Tips for Optimizing a Distribution Network
Distribution Strategy Impacts All Supply Chain Participants

Distribution strategy defines how we move goods to market. Regardless of company size or industry, every company participating in the global supply chain has some form of distribution strategy.

The question is how cost-effective, service-oriented and flexible is the strategy?
Distribution Network Optimization
The Great Balancing Act

Operating Expenses & Working Capital

- Inventory Assets
- Capital Investments
- Production Expenses
- Warehouse & Transportation Expense

Service Level

- Order Turnaround Time & Delivery Frequency
- Quality of Service
- Stocking Strategy & Inventory Availability
Service Level Versus Cost

- Distribution Network Optimization enables an intimate understanding of the trade-offs between the optimal network for operating expenses versus customer service level (turnaround time)
Drivers to Optimize a Distribution Network

- Merger or acquisition
- Business growth/downsizing
- Competitive pressure to reduce expense through near-shoring or off-shoring
- Increase efficiency by reducing logistics operating expenses

- Pressure to reduce working capital tied up in inventory assets and/or infrastructure
- Changes in customer service level requirements
- New market opportunities
- Changes in supply or customer base
- Increases in fuel / transportation costs
Typical Questions That Need to Be Answered

**Supplier Sourcing / Procurement**
- Which countries / suppliers / sites do we source from?
- Which distribution channels should we source through?
- How can we lower our net landed cost of goods?
- How much inventory should we be holding?
- What products should we insource versus outsource?

**Manufacturing**
- When and why should we use contract manufacturing?
- Which products should be produced at which plants?
- Where should our plants be located globally and domestically?
- Should our plants be in the same locations as our distribution sites?
- How do we balance production versus inventory?

**Distribution**
- How many distribution centers do we need? Where should they be?
- What markets should our facilities serve to optimize service levels?
- What should our stocking strategy be?
- How can we optimize global and domestic distribution costs?
- How do we reduce working capital in our distribution infrastructure?

**Transportation**
- For which suppliers should we manage & integrate inbound freight?
- Which transportation modes & partners should we use for each site and lane?
- How can we consolidate and optimize our freight?
- For a given set of shipments, what are the best routes?
- What strategies can we use to minimize carbon footprint?
Tips for Optimizing a Distribution Network
Tip 1: Customers

- Know your demand volumes by customer point
- Customer Master File
- Gather 1 Year of history for detailed customer demand / orders / shipments
- Gather 1 year of history for outbound transportation activity, spend, & days in transit by mode / carrier / lane

Quick Facts
2010 U.S. Population: 309 M
3.5 M Sq. Miles of Land
70% of the U.S. population lives East of the Mississippi
Data Aggregation

- The key to success for a complex network optimization may be to aggregate large complex datasets in a meaningful way without loss of integrity.

- E.g. Often times, customer demand data is aggregated to approx. 900 (3-digit) zip codes to reduce the size of the order dataset.
Tip 2: Suppliers

- Know your Supplier Points and Points of Entry
- Vendor Master File
- Gather 1 yr of history of detailed purchase orders / inter-facility transfers
- Gather 1 yr of history of paid inbound transportation / transfer activity & spend by mode / carrier / lane

### Major North American Gateways for Air, Land, Maritime

#### 5 Largest NA Ports of Entry

<table>
<thead>
<tr>
<th>Port of Entry</th>
<th>2009 TEUs (000)</th>
<th>2006 TEUs (000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Los Angeles</td>
<td>6,748</td>
<td>8,470</td>
</tr>
<tr>
<td>Long Beach</td>
<td>5,067</td>
<td>6,710</td>
</tr>
<tr>
<td>New York/New Jersey</td>
<td>4,561</td>
<td>5,093</td>
</tr>
<tr>
<td>Savannah</td>
<td>2,356</td>
<td>2,160</td>
</tr>
<tr>
<td>Vancouver</td>
<td>2,152</td>
<td>2,208</td>
</tr>
</tbody>
</table>

Top 5 NA Ports have experienced a 15% reduction in container traffic (TEU’s - Equivalent 20’ Containers) over from 2006 - 2009
Tip 3: Products

- Know your products and inventory assets
- Gather item master file data
- Gather 1 Yr of movement and inventory history by SKU by distribution location
- Important to have cube / weight data by SKU when evaluating alternate stocking strategies (e.g. Fast/Slow Networks) and impact on facility sizing requirements

*Information on product history (variety, movement, inventory) is critical to developing the capital investment requirements into distribution centers which is a key input into the 10-year cash flow pro forma for alternate scenarios*
Tip 4: Financials

- Know your money
- Gather 1 Yr of logistics-related financial spending by distribution location
- Important to have solid understanding of working capital invested (inventory, buildings, equip., etc.); obligations (lease, 3PL, etc.) and sacred cows/constraints

Too many distribution network strategy studies end up on the shelf. Why? Because inadequate attention to the financials has resulted in a lack of confidence by the financial officers. This is why we emphasize work be done down to the general ledger level of detail.
Tip 5: Process Overview

4-Phased Project Methodology To Be Adapted to the Specifics of Each Project

**Phases Overview**

- **Phase 1: Business Assessment & Data Collection**
  - Data Gathering
  - Model Baseline Scenario “As Is”

- **Phase 2: Model Alternative Scenarios**
  - Model Baseline Scenario “As Is”
  - Phase 3: Strategy Formulation
  - Phase 4: Transition Planning & Implementation

**Activities**

- **Phase 1: Business Assessment & Data Collection**
  - Project Kick-Off
  - Define Project Scope, Deliverables, Schedule, Resources, Team
  - Develop Data Gathering Requirements
  - Assessment of Data Availability and Accuracy
  - Define Service Level Goals

- **Phase 2: Model Alternative Scenarios**
  - Define Main Scenarios to Evaluate
  - Simulate Transportation In/Out & Service Levels by Scenario
  - Simulate Inventory Assets by Scenario
  - Determine Operating Expenses, Capital Expenditures & One-Time Expenses by Scenario
  - Develop Financial Model by Scenario

- **Phase 3: Strategy Formulation**
  - Define and Evaluate Hybrid Scenarios to Evaluate in More Detail
  - Identify Final Optimized Distribution Network
  - Address IT, Tax, Incentives, Legal, Infrastructure Issues
  - Risk Analysis and Qualitative Issues
  - Carbon Footprint

- **Phase 4: Transition Planning & Implementation**
  - Develop Transition and Implementation Road Map Plan
  - Identify Resources, Timeline, Funds, Structure, Constraints, Partners, Stakeholders, Communication Strategy

**Key Phases**

- **Phase 1: Business Assessment & Data Collection**
  - Phase 2: Model Alternative Scenarios
  - Phase 3: Strategy Formulation
  - Phase 4: Transition Planning & Implementation

**Technical Details**

- **Model Baseline Scenario “As Is”**
  - Construct & Simulate Baseline Scenario
  - Calibrate Baseline Model to Actual Spending
  - Build Econometric Financial Model
  - Develop Infrastructure Assumptions & Constraints

- **Model Alternative Scenarios**
  - Develop Main Scenarios to Evaluate
  - Simulate Transportation In/Out & Service Levels by Scenario
  - Simulate Inventory Assets by Scenario
  - Determine Operating Expenses, Capital Expenditures & One-Time Expenses by Scenario
  - Develop Financial Model by Scenario

- **Transition Planning & Implementation**
  - Develop Transition and Implementation Road Map Plan
  - Identify Resources, Timeline, Funds, Structure, Constraints, Partners, Stakeholders, Communication Strategy

**Visual Elements**

- Maps depicting transportation networks
- Graphs and charts representing data analysis and scenario simulation

**Supplementary Notes**

- Supply Chain Management
- Virtual Events 2011
Tip 6: Tools
There Are Multiple Software Applications / Tools Available

ISCO (Insight Supply Chain Optimizer)

Logility / Optiant

ILOG LogicNet Plus XE

i2

Supply Chain Strategist

CAST Network Modeling

Supply Chain Guru

Barloworld Optimus

CAPS Logistics/TransPro/RoutePro

CZARLite / RateWare

ToolsGroup
Network Optimization Tools

Pros and Cons

**Pros**
- Highly suited for companies with complex global or domestic networks that need continuous re-optimizing
- Once a model is established and validated, tools can efficiently measure impact on many unconstrained and constrained scenarios
- Good to measure trade-offs between service levels and costs

**Cons**
- Much of the work still needs to be done outside the tool
- High up-front time investment in technical skills to push data into the model
- “Black Box” Syndrome
  - Use of linear cost input variables do not always provide accurate reflection of costs – difficult to substantiate results to Finance
- Often ends up as shelf-ware due to complexity
The biggest challenge is almost always the ability to obtain accurate quality data for the Baseline Scenario’s inbound and outbound paid transportation activity and costs.
Tip 8 : Deliverables

- Typical network modeling strategy output provides high-level cost figures for each scenario mapped against the baseline.

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Baseline</th>
<th>3 DCs Replenishment</th>
<th>ATL Replenishment</th>
<th>China Consolidation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approximate Size</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cleveland DC</td>
<td>287,009</td>
<td>196,910</td>
<td>308,395</td>
<td></td>
</tr>
<tr>
<td>Cleveland Replen</td>
<td>164,601</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Related Activities</td>
<td>70,000</td>
<td>70,000</td>
<td>70,000</td>
<td></td>
</tr>
<tr>
<td>Atlanta DC</td>
<td>155,438</td>
<td>186,808</td>
<td>327,712</td>
<td></td>
</tr>
<tr>
<td>ATL Replen</td>
<td>0</td>
<td>348,434</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Las Vegas</td>
<td>131,363</td>
<td>136,356</td>
<td>229,275</td>
<td></td>
</tr>
</tbody>
</table>

| Facilities Cost   |          |                      |                   |                     |
| DC Fixed          | $6,848,202 | $9,496,857           | $8,593,694        |                     |
| DC Variable       | $7,760,304 | $7,317,869           | $6,919,504        |                     |
| Outside Fixed     | $1,426,297 | 0                    | $396,104          |                     |
| Outside Variable  | $887,488  | 0                    | $148,229          |                     |

| Transportation Cost |          |                      |                   |                     |
| Ocean              | $9,114,000 | $8,941,000           | $9,013,000        |                     |
| Transfer           | $656,000   | $910,000             | $150,000          |                     |
| Customer           | $10,919,000 | $10,930,000         | $10,930,000       |                     |

**Total Cost**

- **Baseline**: $37,611,291
- **3 DCs Replenishment**: $36,415,696
- **China Consolidation**: $35,606,158
## Tip 8: Deliverables

### 10-Year After Tax Cash Flow

#### Cash Flow Summary

**Scenario 5**

<table>
<thead>
<tr>
<th>Financial Summary</th>
<th>Cash Flow Impact by Year</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2012</td>
</tr>
<tr>
<td>Incremental Revenue / Reduced COGS</td>
<td>$ -</td>
</tr>
<tr>
<td>Outbound Transportation Expense Savings</td>
<td>$ -</td>
</tr>
<tr>
<td>Warehouse Operating Expense Savings</td>
<td>$ -</td>
</tr>
<tr>
<td>Depreciation</td>
<td>$ -</td>
</tr>
<tr>
<td>Amortization</td>
<td>$ -</td>
</tr>
<tr>
<td>Asset write-off</td>
<td>$ -</td>
</tr>
<tr>
<td>Initial one-time expense / gain</td>
<td>$ (750,628)</td>
</tr>
<tr>
<td><strong>EBIT Impact</strong></td>
<td>$ (750,628)</td>
</tr>
<tr>
<td>EBIT Impact</td>
<td>$ (750,628)</td>
</tr>
<tr>
<td>Adjust for Non-Cash Items</td>
<td>$ -</td>
</tr>
<tr>
<td>Depreciation</td>
<td>$ -</td>
</tr>
<tr>
<td>Amortization</td>
<td>$ -</td>
</tr>
<tr>
<td>Asset Write-off</td>
<td>$ -</td>
</tr>
<tr>
<td><strong>Total Non-Cash Items</strong></td>
<td>$ -</td>
</tr>
<tr>
<td>Income Tax</td>
<td>$ 291,994</td>
</tr>
<tr>
<td>Net Cash Flow Impact</td>
<td>$ (458,634)</td>
</tr>
<tr>
<td>Inventory Reduction</td>
<td>$ -</td>
</tr>
<tr>
<td>Capital Investment</td>
<td>$ -</td>
</tr>
<tr>
<td>Gain from Sale of Building (Sale $ - Writeoff $)</td>
<td>$ -</td>
</tr>
<tr>
<td><strong>Total Cash Flow Impact</strong></td>
<td>$ (458,634)</td>
</tr>
</tbody>
</table>

**Note that much of the work still needs to be done outside the results provided by the tool.**
Tip 9: Transportation Geography

**1 DC Network**

- **Columbus OH** can access 47% of the U.S. Market within a 500 mile radius – best single location for market accessibility
- **UPS Worldport** is in Louisville, KY and ships ~1.5 M packages/day
- **FedEx World Hub** is in Memphis, TN and ships ~3.3 M packages/day
- **Best Case 47% < 500 Miles**
- **Average 2.3 days lead time**

### Most Common Locations for a Single National DC

<table>
<thead>
<tr>
<th>Location</th>
<th>% of U.S. Population Within 500 Miles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Columbus, OH</td>
<td>47%</td>
</tr>
<tr>
<td>Louisville, KY (UPS Worldport)</td>
<td>39%</td>
</tr>
<tr>
<td>Memphis, TN (FedEx World Hub)</td>
<td>31%</td>
</tr>
</tbody>
</table>
Transportation Geography Cont’d

2 DC Network

- LA Inland Empire (25%)
  - Alternate locations include Bakersfield, etc.

- New Jersey – Near Port (75%)
  - Alternate locations include towns West of Allentown to move away from organized labor

- This is a very common network for companies that import heavily from overseas

- Best Case 45% < 500 Miles

- Average 1.5 Days Lead Time

### Most Common Locations for a 2-DC Network

<table>
<thead>
<tr>
<th>Location</th>
<th>% of U.S. Population Within 500 Miles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Los Angeles</td>
<td>15%</td>
</tr>
<tr>
<td>New Jersey Near Port</td>
<td>30%</td>
</tr>
</tbody>
</table>
Transportation Geography Cont’d

3 DC Network
- LA Inland Empire
- New Jersey – Near Port
- Greater Chicago
  - E.g. West of the city e.g. Naperville, Aurora
- Best Case 73% < 500 Miles
- Average 1.3 Days Lead Time

Most Common Locations for a 3-DC Network
<table>
<thead>
<tr>
<th>Location</th>
<th>% of U.S. Population Within 500 Miles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Los Angeles</td>
<td>15%</td>
</tr>
<tr>
<td>New Jersey Near Port</td>
<td>30%</td>
</tr>
<tr>
<td>Chicago</td>
<td>28%</td>
</tr>
</tbody>
</table>
Transportation Geography Cont’d

4 DC Network
- LA Inland Empire
- New Jersey – Near Port
- Greater Chicago
- Greater Atlanta
- Best Case 85% < 500 Miles
- Average 1.2 Days Lead Time

Most Common Locations for a 4-DC Network

<table>
<thead>
<tr>
<th>Location</th>
<th>% of U.S. Population Within 500 Miles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Los Angeles</td>
<td>15%</td>
</tr>
<tr>
<td>New Jersey Near Port</td>
<td>30%</td>
</tr>
<tr>
<td>Chicago</td>
<td>28%</td>
</tr>
<tr>
<td>Atlanta</td>
<td>27%</td>
</tr>
</tbody>
</table>
Transportation Geography Cont’d

5 DC Network
- LA Inland Empire
- New Jersey – Near Port
- Greater Chicago
- Greater Atlanta
- Dallas/Fort Worth
- Best Case 90% < 500 Miles
- Average 1.1 Days Lead Time

Most Common Locations for a 5-DC Network

<table>
<thead>
<tr>
<th>Location</th>
<th>% of U.S. Population Within 500 Miles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Los Angeles</td>
<td>15%</td>
</tr>
<tr>
<td>New Jersey Near Port</td>
<td>30%</td>
</tr>
<tr>
<td>Chicago</td>
<td>28%</td>
</tr>
<tr>
<td>Atlanta</td>
<td>27%</td>
</tr>
<tr>
<td>Dallas/Fort Worth</td>
<td>15%</td>
</tr>
</tbody>
</table>
Transportation Geography Cont’d

6 DC Network
- LA Inland Empire
- New Jersey – Near Port
- Greater Chicago
- Greater Atlanta
- Dallas/Fort Worth
- Tacoma
- Best Case 92% < 500 Miles
- Average 1.1 Days Lead Time

Most Common Locations for a 5-DC Network

<table>
<thead>
<tr>
<th>Location</th>
<th>% of U.S. Population Within 500 Miles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Los Angeles</td>
<td>15%</td>
</tr>
<tr>
<td>New Jersey Near Port</td>
<td>30%</td>
</tr>
<tr>
<td>Chicago</td>
<td>28%</td>
</tr>
<tr>
<td>Atlanta</td>
<td>27%</td>
</tr>
<tr>
<td>Dallas/Fort Worth</td>
<td>15%</td>
</tr>
<tr>
<td>Tacoma</td>
<td>4%</td>
</tr>
</tbody>
</table>
Transportation Geography Cont’d

12 DC Network
- Newark
- Washington DC
- Atlanta
- Lakeland, FL
- Cleveland
- Chicago
- Kansas City
- Dallas
- Denver
- Tacoma
- Oakland
- Los Angeles

- ~95+% of the country receives 24 hour order cycle time
Transportation Geography Cont’d

20 DC Network
- Boston
- Newark
- Washington DC
- Charlotte
- Atlanta
- Lakeland, FL
- Cleveland
- Cincinnati
- Chicago
- St Louis
- New Orleans
- Minneapolis
- Kansas City
- Dallas
- Houston
- Denver
- Phoenix
- Tacoma
- Oakland
- Los Angeles

- 97+% of the country receives 24 hour order cycle time
Tip 10 : Looking Ahead

Transportation Costs Will Rise Significantly Causing Distribution Networks to Gradually Expand Closer to Market to Reduce Miles

- The expectation is that over the road transportation costs will rise by 10% to 15% over the next couple of years
- Expected shortage of 300,000 drivers
- Trucking equipment replacement costs rising by as much as 30% due to environmental equipment and technologies being added
- Fuel cost volatility
U.S. Freight Index 2007-2011

Chart depicts the U.S. Freight Index Projection if rates go up by 15% over the next 2 years.
Key Takeaways

In summary, *distribution network optimization* . . .

- Can provide an order of magnitude increase in service levels or profit margins
- Is a structured process that should not be short changed – it really helps to have experienced internal and external resources involved
- Requires an extensive effort to gather, cleanse, analyze and aggregate customer, supplier, inventory, and transportation data
- Will be increasingly important over the next couple of years as transportation costs increase
Credits

• Several of the map plates in this presentation were provided from an excellent book with full permission from the authors.
  – Available at http://people.hofstra.edu/geotrans
Participants Questions

*Having observed this material, what questions do you have?*

- People
- Process
- Tools
- Deliverables
- The Future
Please join us now in the Networking Lounge for a LIVE Q&A Chat!

Frank Quinn, Editorial Director
Supply Chain Management Review

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