ISM 125/225, LECTURE #18 (3/4/10)

Agenda:

1. Transportation
   - General considerations
   - Transportation Network Options
   - Transportation Network Design

2. Safety Inventory: Aggregation

Comments

- HW #6 is due on Friday, by 4 PM, in the drop-box outside E2, Room 561

- HW #7 (covering the above two topics) is on the class website

- See Instructor for Project Review next week
Transportation

INTEL  \rightarrow  DELL  \rightarrow  Customer

"chips"

Inbound Transportation \rightarrow Outbound Transportation

SHIPPER  CARRIER (e.g. UPS)

"BUILD-TO-ORDER"

General Considerations in designing a transportation network:
1. What is the function (purpose, role) of transportation [efficient? responsive?]
   e.g. WALMART needs an efficient transportation system to lower overall costs

2. Decision Making
   - The objective of the CARRIER (e.g. UPS) is to design the transportation network infrastructure (trucks, ships, routes, ...) (e.g. DELL)
   - The objective of the shipper is to minimize the total transportation cost
3. Modes of transportation
   - Air, Ship (water), Rail, Truck
   - Package (FedEx, UPS), ...

4. Transportation Network Design
   - Modes (air, ...)
   - Options (see below)
   - Aggregation: space, time, products
   - Routing

2. TRANSPORTATION NETWORK OPTIONS

(i) Direct shipping
   Networks

(ii) Direct shipping with Milk runs

[Diagram showing network with nodes A, B, C, 1, 2, 3, and connecting arrows indicating flow between suppliers, retail stores, and retailers]
(iii) Shipping via a Central Distribution Center (DC)

(iv) Shipping using DC + milk runs

A → DC → Retail stores
B → DC → Retail stores
C → DC → Retail stores

e.g. WALMART (cross-decking)

Please read Chapter on Transportation (Third Edition, Chapter 13)

See Table 13.2 (SCM, 3rd Edition) for the Pros & Cons of the above options
TRANSPORTATION NETWORK DESIGN

Problem: Design the transportation network connecting suppliers to end-customers, with the objective of minimizing total cost.

Process (Five-Step):

Step 1: Q: Which mode of transportation should I choose?
A: Choose the mode of transportation (air, water, land) that minimizes total cost.

\[
\text{Total cost} = \text{Transportation cost} + \text{(Inventory holding costs + cycle, safety)}
\]

Create a table of options (see next page) → →
<table>
<thead>
<tr>
<th>Mode</th>
<th>Lot Size</th>
<th>Transportation Costs</th>
<th>Cycle Inventory Costs</th>
<th>Safety Inventory Costs</th>
<th>In-Transit Inventory Costs</th>
<th>Total Inventory Costs</th>
<th>Total Cost (3+7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mode 1 (Air)</td>
<td>Small Lot</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mode 2 (Truck)</td>
<td>Medium Lot</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mode 3 (Truck)</td>
<td>Large Lot</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Comments:

A: Total Inventory cost = columns (4) + (5) + (6)

B: Total Cost = columns (3) + (7)

Pick the option that minimizes total cost.

(See the "Eastern Electric/Golden" example in Chapter 13 (Third Edition) of the text.)
Step 2: Q: Should inventory be aggregated spatially?

A: Yes: explore options for spatial aggregation.

Inbound transportation costs are reduced by aggregation.

Create a table of options.