Need for Location Decisions

- Location as a Marketing Strategy (to expand market)
  - Additions to existing systems
    - Banks, fast food chains, supermarkets, etc.
- Increased Cost of Doing Business in current location
  - Taxes, labor market, weather
- Growth in demand is unsatisfiable with expansion
- Depletion of Resources
  - E.g. mining, land erosion, oil, fish, timber, …

Nature of Location Decisions

- Strategic Importance
  - Involving Long term commitment/costs
  - Impact on investments, revenues, and operations
  - Impact on Supply chains
- Objectives
  - Profit potential / Increased customer service
  - No single location may be better than others
  - Identify several locations from which to choose
- Options
  - Expand existing facilities
  - Add new facilities
  - Move
  - Do Nothing

Making Location Decisions

- Decide on the important criteria
  - Increase revenue or service, decrease costs, …
- Identify the important factors
  - Proximity to supply or customers, labor costs, …
- Develop location alternatives
- Evaluate the alternatives
- Make selection

Location Decision Factors

Regional Factors

Community Considerations

Multiple Plant Strategies

Site-related Factors
The Transportation Model

Regional Factors
- Location of raw materials
- Location of markets
- Labor factors
- Climate and taxes

Community Considerations
- Quality of life
- Services
- Attitudes
- Taxes
- Environmental regulations
- Utilities
- Developer support

Site Related Factors
- Land availability/appropriateness
- Transportation costs to customer
- Environmental
- Legal

Multiple Plant Strategies
- Product plant strategy
  - Products in different location
- Market area plant strategy
  - Close to customer(s)
- Process plant strategy
  - Processes in different locations

Comparison of Service and Manufacturing Considerations

<table>
<thead>
<tr>
<th>Manufacturing/Distribution</th>
<th>Service/Retail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost Focus</td>
<td>Revenue focus</td>
</tr>
<tr>
<td>Transportation modes/costs</td>
<td>Demographics: age, income, etc.</td>
</tr>
<tr>
<td>Energy availability, costs</td>
<td>Population/drawing area</td>
</tr>
<tr>
<td>Labor cost/availability/skills</td>
<td>Competition</td>
</tr>
<tr>
<td>Building/leasing costs</td>
<td>Traffic volume/patterns</td>
</tr>
<tr>
<td></td>
<td>Customer access/parking</td>
</tr>
</tbody>
</table>

Trends in Locations
- Foreign producers locating in U.S.
  - “Made in USA”
  - Currency fluctuations
- Just-in-time manufacturing techniques
- Microfactories
- Information Technology
Evaluating Locations

- Cost-Profit-Volume Analysis
  - For each location:
    - Determine fixed and variable costs
    - Plot total costs
    - Remember \( TC = F + Q(R - v) \)
  - Determine lowest total costs for variable outputs

Location Cost-Volume Analysis

- Assumptions
  - Fixed costs are constant
  - Variable costs are linear
  - Output can be closely estimated
  - Only one product involved

Example 1: Cost-Volume Analysis

Fixed and variable costs for four potential locations

<table>
<thead>
<tr>
<th>Location</th>
<th>Fixed Cost</th>
<th>Variable Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>$250,000</td>
<td>$11 (10,000)</td>
</tr>
<tr>
<td>B</td>
<td>$100,000</td>
<td>$30 (10,000)</td>
</tr>
<tr>
<td>C</td>
<td>$150,000</td>
<td>$20 (10,000)</td>
</tr>
<tr>
<td>D</td>
<td>$200,000</td>
<td>$35 (10,000)</td>
</tr>
</tbody>
</table>

Example 1: Solution

<table>
<thead>
<tr>
<th></th>
<th>Fixed Costs</th>
<th>Variable Costs</th>
<th>Total Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>$250,000</td>
<td>$11(10,000)</td>
<td>$360,000</td>
</tr>
<tr>
<td>B</td>
<td>$100,000</td>
<td>$30(10,000)</td>
<td>$400,000</td>
</tr>
<tr>
<td>C</td>
<td>$150,000</td>
<td>$20(10,000)</td>
<td>$350,000</td>
</tr>
<tr>
<td>D</td>
<td>$200,000</td>
<td>$35(10,000)</td>
<td>$550,000</td>
</tr>
</tbody>
</table>

Example 1: Solution

- Transportation Model
  - Decision based on movement costs of raw materials or finished goods (linear programming approach)
- Factor Rating
  - Decision based on quantitative and qualitative inputs (weighted averages) (pg. 366 in text)
- Center of Gravity Method
  - Location of Supply node is based on minimum distribution costs

Annual Output (000)

Remember we are minimizing costs (not maximizing profit).

Pick 2 easy, reasonable production quantities, Q, e.g. 0 and 20,000, then plug these two values into each location alternative and graph.
The Transportation Model:

Used to Evaluate Locations of Supply Nodes & to Minimize Total Distribution Costs

**Requirements for Transportation Model**

- List of Supply origins and each one’s capacity
- List of Demand destinations and each one’s demand
- Unit cost of shipping from a Supply (origin) node to a Demand (destination) node

**The Transportation Problem**

What is lowest cost distribution of supply to demand?

**A Transportation Table**

<table>
<thead>
<tr>
<th>Factory</th>
<th>Warehouse A</th>
<th>Warehouse B</th>
<th>Warehouse C</th>
<th>Warehouse D</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4</td>
<td>7</td>
<td>7</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>12</td>
<td>2</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>3</td>
<td>8</td>
<td>10</td>
<td>16</td>
<td>5</td>
</tr>
<tr>
<td>Demand</td>
<td>80</td>
<td>30</td>
<td>120</td>
<td>160</td>
</tr>
</tbody>
</table>

Factory 1 can supply 100 units per period

Cost from Factory to Warehouse:

- 180
- 200
- 150

Total supply capacity per period: 450

Total demand per period: 450

Warehouse B demands 90 units per period

Excel Template for up to 5x5 Transportation Problem