Lesson 11 – Location Planning & Analysis

involves the need for location decisions, factors that affect them, and guidelines for evaluating location alternatives.

Many factors affect location decisions:
- Marketing strategy (e.g., need to expand into other markets)
- Growth
- Depletion of demand (e.g., lack of customers)
- Cost of doing business (e.g., customer requirements)
- Competitive advantage
- Lower operating costs
- New products/services

Importance:
- Long term commitment - mistakes can be costly
- Investment requirements
- Costs
- Proximity to customer

Objectives:
- Profit potential

Options:
- Expand existing facility
- New facility in another location
- Move to another existing facility
- Do nothing
The general procedure for making location decisions involves:

1. Establishing criteria for evaluating alternatives
2. Identifying important factors
3. Developing location alternatives
   - Identify general region
   - Identify community alternatives
   - Identify site alternatives among community choices
4. Evaluating alternatives and making selection

Location Considerations

- Proximity to suppliers
- Proximity to markets
- Speed (time based competition)
- Perishable
- Transportation costs
- Labor Factors
  - Availability of work force
  - Wages for the area and worker compensation laws
  - Worker attitudes toward unions
  - Quality of workforce (skills)
- Other Factors
  - Taxes
  - Production costs (e.g. Clothing, electronics)
  - Climate Foreign location
  - Sentiment (e.g. Buying Japanese cars made in USA)
  - Currency Fluctuations
  - Trade Agreements

Community & Site Considerations

- Quality of life (e.g. schools, entertainment, religion, shopping, etc.)
- Environmental regulations
- Services (e.g. Medical, fire, police)
- Utilities availability and cost
- Development support (e.g. bonds, tax abatement, low-cost loans)
- Infrastructure (e.g. roads, airports, shipping port)
- Land availability and costs
**Multiple Plant Manufacturing Strategies**

**Product plant strategy** - assign different products to different plants which can generate higher volume and result in cost savings.

**Market area plant strategy** - plants are designed to service geographic needs (e.g. west coast, southeast) and may have higher costs than in a "product strategy".

**Process plant strategy** - different plants concentrate on different aspects of a process (e.g. one automotive plants concentrate on engines while another concentrates on brakes).

**Service & Retail Locations**

The primary concern is accessibility and volume of customer traffic where adequate facilities are available for customer convenience and safety (e.g. parking, restaurants, etc.).

**Trends In Location Selection**

Multi-national corporations have been created by companies seeking:
- Lower cost labor (e.g. apparel, electronics, shoes)
- Closer to customer (e.g. Toyota, BMW)
- Elimination of trade tariffs
- Avoiding trade quotas

Just-in-Time manufacturing - proximity to customers for better communication, coordinated planning, quicker deliveries (e.g. Target Corporation, "speed is life")

Technology is beginning to have an effect on location decisions (e.g. information, video communication).
**Trends In Location Selection**

- **Foreign Government**
  - Policies on ownership of production facilities
  - Local content requirements
  - Import restrictions
  - Currency restrictions
  - Environmental restrictions
  - Local product standards
  - Stability

- **Cultural differences**

- **Customer preferences**

- **Labor**
  - Level of training
  - Work practices
  - Regulations limiting number of foreign employees
  - Language differences

- **Resources** (e.g., Materials, energy, water, phone, transportation)

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**Global Hot Spots**

East Asia. The Pacific Basin, including Japan, South Korea, China, Taiwan, and Singapore has become the fastest growing and foremost trading region in the world.

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**Global Hot Spots**

**North American Free Trade Agreement (NAFTA)** makes trade easier between Canada, Mexico, and the United States. Other Latin American countries may follow suit.

- **U.S. Sunbelt.** The sunbelt is attracting many firms normally entrenched in the industrial heartland of the United States owing to lower labor costs, less unionism, and a more attractive climate.

- **Mexico.** Thousands of plants have been built by firms across the world in the maquiladoras on Mexico's northern border.
Europe. The European Union (EU) encompasses 15 member nations and special arrangements with most other European states.

Former Communist Countries. The population of 410 million promises huge market opportunities and attractive possibilities for joint ventures.

Methodology
- Determine the fixed and variable costs
- Plot the total-cost lines on the same graph
- Determine which location will have the lowest total cost for the expected level of output
- Determine which location will have the lowest cost

Assumes
- Fixed costs are constant for the range of output
- Variable costs are linear for the range of output
- The required level of output can be closely estimated
- Only one product is involved
Lesson 11 – Location Planning & Analysis

Total Cost – Example

Example 1: The fixed and variable plant costs for four potential plant locations are shown below. Use the formula below to calculate and graphically display the “total cost” for Locations A, B, C, D for units 0 to 14,000 in increments of 1,500. Answer the following questions.

Total Cost = FC + VC * Q
VC = variable cost per unit
Q = quantity to be produced
FC = Fixed cost

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

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Which alternative has the least cost over what range?

B: Volume < 5,000
C: 5,000 < Volume < 11,111.11
A: Volume > 11,111.11
D: is never lowest

What is the cost at the point of indifference between alternatives B and C?

$250,000

What is the cost for each alternative if the volume is 8,000 units?

A: $338,000
B: $340,000
C: $310,000
D: $480,000
11 - 22

What is the profit for each alternative if the volume is 8,000 units and the revenue/unit is $50? Notice when revenue/unit is entered, we have a profit graph rather than a costs graph.

A: $62,000
B: $60,000
C: $90,000
D: -$80,000

11 - 23

Transportation cost of raw materials or finished goods often plays an important role in the location decision. We calculate transportation costs in terms of units of output for evaluating location alternatives.

11 - 24

Evaluating Alternatives – Delphi Method

Another method that can be used is the Analytic Delphi Method. The process is a general approach to evaluating location alternatives using quantitative and qualitative data based on a strategic evaluation.

The procedure involves:
- Forming two Delphi panels
- Identifying threats and opportunities
- Determining direction and strategic goals of the organization
- Developing alternatives
- Prioritizing alternatives

The Multiple Alternative Template can also be used to analyze multiple alternatives where we want to consider transportation costs as an additional cost.
Another method that can be used is the **subjective factor weighting**, which is a general approach to evaluating location alternatives using quantitative and qualitative data.

The following procedure is used to produce a factor weighting:

1. Determine which factors are relevant (e.g., location of market, water supply, parking facilities, revenue potential)
2. Assign a weight to each factor that indicates its relative importance compared with all the other factors.
3. Decide on a common scale for all factors (e.g., 0 to 100)
4. Score each location alternative
5. Multiply the factor weight by the score for each factor and sum the results for each location alternative
6. Choose the alternative with the highest composite score

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**Example 2:** A photo processing company intends to open a new branch store. The table below contains information on two potential locations: Loc A and Loc B. Which alternative is best?

<table>
<thead>
<tr>
<th>Factor Description</th>
<th>Weight</th>
<th>Loc A</th>
<th>Loc B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proximity to existing store</td>
<td>0.10</td>
<td>100</td>
<td>60</td>
</tr>
<tr>
<td>Traffic Volume</td>
<td>0.05</td>
<td>80</td>
<td>80</td>
</tr>
<tr>
<td>Rental Costs</td>
<td>0.40</td>
<td>90</td>
<td>90</td>
</tr>
<tr>
<td>Size</td>
<td>0.30</td>
<td>90</td>
<td>92</td>
</tr>
<tr>
<td>Layout</td>
<td>0.20</td>
<td>40</td>
<td>70</td>
</tr>
<tr>
<td>Operating Costs</td>
<td>0.15</td>
<td>80</td>
<td>90</td>
</tr>
</tbody>
</table>
Location Analysis (Subjective Weighting)

Loc B has the best overall subjective weighting.

The center of gravity method evaluates the selection of a location alternative for a distribution center which ships to different destinations based on the minimum distribution cost. It treats distribution costs as a linear function of the distance and quantity shipped. The solution involves a map locating the x and y coordinates for each destination alternative and the coordinates of the solution location for the distribution center is given by the formula:

\[
(x, y) = \left( \frac{\sum x_i Q_i}{\sum Q_i}, \frac{\sum y_i Q_i}{\sum Q_i} \right)
\]

where

- \(x_i\) = x coordinate of destination i
- \(y_i\) = y coordinate of destination i
- \(Q_i\) = quantity to be shipped to destination i

Evaluating Alternatives – Center Of Gravity

Example 3: Determine the “center of gravity” solution for the coordinates of the distribution center which ships to the destinations D1, D2, D3 and D4.

<table>
<thead>
<tr>
<th>Location Name</th>
<th>X</th>
<th>Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>D1</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>D2</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>D3</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>D4</td>
<td>8</td>
<td>5</td>
</tr>
</tbody>
</table>

Center Of Gravity - Example

Example 3: Determine the “center of gravity” solution for the coordinates of the distribution center which ships to the destinations D1, D2, D3 and D4.
Consider the shipments to each destination location as shown. We now have the weighted solution.
Lesson 11 – Location Planning & Analysis

Homework
Read and understand all material in the chapter.
Discussion and Review Questions
Recreate and understand all classroom examples
Exercises on chapter web page