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Operations Management

Location Strategies

Chapter 8
Outline

- GLOBAL COMPANY PROFILE: FEDERAL EXPRESS
- THE STRATEGIC IMPORTANCE OF LOCATION
- FACTORS THAT AFFECT LOCATION DECISIONS
  - Labor Productivity
  - Exchange Rates and Currency Risks
  - Costs
  - Attitudes
  - Proximity to Markets
  - Proximity to Suppliers
  - Proximity to Competitors (Clustering)
Outline - Continued

◆ METHODS OF EVALUATING LOCATION ALTERNATIVES
  ◆ The Factor-Rating Method
  ◆ Locational Break-Even Analysis
  ◆ Center-of-Gravity Method
  ◆ The Transportation Method

◆ SERVICE LOCATION STRATEGY
  ◆ How Hotel Chains Select Sites
  ◆ The Telemarketing Industry
  ◆ Geographic Information Systems
Learning Objectives

When you complete this chapter, you should be able to:

Identify or Define:
- Objective of location strategy
- International location issues
- Clustering
- Geographic Information Systems

Describe or explain:
- Three methods of solving the location problem
  - Factor-rating method
  - Locational breakeven analysis
  - Center-of-gravity method
- Describe the factors affecting location decisions
Federal Express

- Stresses “hub” concept
- Advantages:
  - Enables service to more locations with fewer aircraft
  - Enables matching of aircraft flights with package loads
  - Reduces mishandling and delay in transit because there is total control of packages from pickup to delivery
Objective of Location Strategy

Maximize the benefit of location to the firm
Industrial Location Decisions

- **Cost** focus
  - Revenue varies little between locations

- Location is a major cost factor
  - Affects shipping & production costs (e.g., labor)
  - Costs vary greatly between locations
Service Location Decisions

- **Revenue focus**
  - Costs vary little between market areas

- **Location is a major revenue factor**
  - Affects amount of customer contact
  - Affects volume of business
In General - Location Decisions

- Long-term decisions
- Difficult to reverse
- Affect fixed & variable costs
  - Transportation cost
    - As much as 25% of product price
  - Other costs: Taxes, wages, rent etc.

Objective: Maximize benefit of location to firm
Location Decision Sequence

1. Country
2. Region/Community
3. Site

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Factors That Affect Location Decisions

Country Decision

1. Political risks, government rules, attitudes, incentives
2. Cultural and economic issues
3. Location of markets
4. Labor availability, attitudes, productivity, costs
5. Availability of supplies, communications, energy
6. Exchange rates and currency risk

Region/Community Decision

1. Corporate desires
2. Attractiveness of region (culture, taxes, climate, etc.)
3. Labor availability, costs, attitudes toward unions
4. Cost and availability of utilities
5. Environmental regulations of state and town
6. Government incentives
7. Proximity to raw materials and customers
8. Land/construction costs

Site Decision

1. Site size and cost
2. Air, rail, highway, waterway systems
3. Zoning restrictions
4. Nearness of services/supplies needed
5. Environmental impact issues
Factors Affecting Country

- Government rules, attitudes, political risk, incentives
- Culture & economy
- Market location
- Labor availability, attitudes, productivity, and cost
- Availability of supplies, communications, energy
- Exchange rates and currency risks
Region Location Decisions

- Corporate desires
- Attractiveness of region (culture, taxes, climate, etc.)
- Labor, availability, costs, attitudes towards unions
- Costs and availability of utilities
- Environmental regulations of state and town
- Government incentives
- Proximity to raw materials & customers
- Land/construction costs
Factors Affecting Site

- Site size and cost
- Air, rail, highway, and waterway systems
- Zoning restrictions
- Nearness of services/supplies needed
- Environmental impact issues
Location Decision Example

BMW decided to build its first major manufacturing plant outside Germany in Spartanburg, South Carolina.
Country Decision Factors

◆ Market location
  ♦ U.S. is world’s largest luxury car market
  ♦ Growing (baby boomers)

◆ Labor
  ♦ Lower manufacturing labor costs
    ♦ $17/hr. (U.S.) vs. $27 (Germany)
  ♦ Higher labor productivity
    ♦ 11 holidays (U.S.) vs. 31 (Germany)

◆ Other
  ♦ Lower shipping cost ($2,500/car less)
  ♦ New plant & equipment would increase productivity (lower cost/car $2,000-3000)
Region/Community Decision Factors

- **Labor**
  - Lower wages in South Carolina (SC)

- **Government incentives**
  - $135 million in state & local tax breaks
  - Free-trade zone from airport to plant
    - No duties on imported components or on exported cars
## CSF in Location Analysis

### Critical Success Factors

<table>
<thead>
<tr>
<th>Critical Success Factors</th>
<th>Country 1</th>
<th>Country 2</th>
<th>Country 3</th>
<th>Country 4</th>
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<tbody>
<tr>
<td>Country</td>
<td></td>
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<tr>
<td>Technology</td>
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<td>Rate of technology change</td>
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<td>Innovations in process design</td>
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<td>Level of education</td>
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<td>Number of skilled workers</td>
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<td>3</td>
<td>4</td>
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<td>Political and Legal Aspects</td>
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<td>Stability of government</td>
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<td>2</td>
<td>5</td>
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<tr>
<td>Product liability laws</td>
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<td>3</td>
<td>3</td>
<td>5</td>
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<tr>
<td>Export restrictions</td>
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### CSF in Location Analysis - Continued

<table>
<thead>
<tr>
<th>Critical Success Factors</th>
<th>Country 1</th>
<th>Country 2</th>
<th>Country 3</th>
<th>Country 4</th>
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<tbody>
<tr>
<td>Social and Cultural Aspects</td>
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<td>Similarity in language</td>
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<td>Work ethic</td>
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<td>Economic factors</td>
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<td>Tax rates</td>
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<td>Inflation</td>
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<td>5</td>
<td>5</td>
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<tr>
<td>Availability of raw materials</td>
<td>2</td>
<td>4</td>
<td>3</td>
<td>5</td>
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<tr>
<td>Interest rates</td>
<td>3</td>
<td>4</td>
<td>2</td>
<td>5</td>
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</tbody>
</table>

| Total Rating Points      | 50        | 43        | 35        | 48        |
# Global Competitiveness of Countries

<table>
<thead>
<tr>
<th>Country</th>
<th>2001 Ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finland</td>
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</tr>
<tr>
<td>United States</td>
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<tr>
<td>Netherlands</td>
<td>3</td>
</tr>
<tr>
<td>Germany</td>
<td>4</td>
</tr>
<tr>
<td>Canada</td>
<td>11</td>
</tr>
<tr>
<td>Japan</td>
<td>15</td>
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<tr>
<td>Brazil</td>
<td>35</td>
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<tr>
<td>Russia</td>
<td>58</td>
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<tr>
<td>Ecuador</td>
<td>72</td>
</tr>
<tr>
<td>Bangladesh</td>
<td>73</td>
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<tr>
<td>Honduras</td>
<td>74</td>
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<tr>
<td>Bolivia</td>
<td>75</td>
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## Ranking Corruption

A score of 10 represents corruption free

<table>
<thead>
<tr>
<th>Rank</th>
<th>Score</th>
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<tbody>
<tr>
<td>1</td>
<td>Finland 9.9</td>
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<tr>
<td>2</td>
<td>Denmark 9.5</td>
</tr>
<tr>
<td>3</td>
<td>New Zealand 9.4</td>
</tr>
<tr>
<td>4</td>
<td>Singapore 9.2</td>
</tr>
<tr>
<td>16</td>
<td>Israel &amp; U.S.A (Tied) 7.6</td>
</tr>
<tr>
<td>21</td>
<td>Japan 7.1</td>
</tr>
<tr>
<td>57</td>
<td>China 3.5</td>
</tr>
<tr>
<td>79</td>
<td>Russia 2.3</td>
</tr>
<tr>
<td>90</td>
<td>Nigeria 1.0</td>
</tr>
<tr>
<td>91</td>
<td>Bangladesh 0.4</td>
</tr>
</tbody>
</table>

A score of 10 represents corruption free.
Organizations That Need To Be Close to Markets

- Government agencies
  - Police & fire departments
  - Post Office
- Retail Sales and Service
  - Fast food restaurants, supermarkets, gas stations
  - Drug stores, shopping malls
  - Bakeries
- Services
  - Doctors, lawyers, accountants, barbers
  - Banks, auto repair, motels
Location Evaluation Methods

- Factor-rating method
- Locational break-even analysis
- Center of gravity method
- Transportation model
Factor-Rating Method

- Most widely used location technique
- Useful for service & industrial locations
- Rates locations using factors
  - Tangible (quantitative) factors
    - Example: Short-run & long-run costs
  - Intangible (qualitative) factors
    - Example: Education quality, labor skills
Factors Affecting Location Selection

- Labor costs (including wages, unionization, productivity)
- Labor availability (including attitudes, age, distribution, and skills)
- Proximity to raw materials and suppliers
- Proximity to markets
- Government fiscal policies (including incentives, taxes, unemployment compensation)
Factors Affecting Location Selection - Continued

- Environmental regulations
- Utilities (including gas, electric, water, and their costs)
- Site costs (including land, expansion, parking, drainage)
- Transportation availability (including rail, air, water, and interstate roads)
Factors Affecting Location Selection - Continued

- Quality-of-life issues in the community (including all levels of education, cost of living, health care, sports, cultural activities, transportation, housing, entertainment, religious facilities)
- Foreign exchange including rates and stability
- Quality of government (including stability, honesty, attitudes toward new business - whether overseas or local)
Steps in Factor Rating Method

- List relevant factors
- Assign importance weight to each factor (such as 0 – 1)
- Develop scale for each factor (such as 1 – 100)
- Score each location using factor scale
- Multiply scores by weights for each factor & total
- Select location with maximum total score
Locational Break-Even Analysis

- Method of cost-volume analysis used for industrial locations
- Steps
  - Determine fixed & variable costs for each location
  - Plot total cost for each location (Cost on vertical axis, Annual Volume on horizontal axis)
  - Select location with lowest total cost for expected production volume
    - Must be above break-even
Locational Break-Even Analysis Example

You’re an analyst for AC Delco. You’re considering a new manufacturing plant in Akron, Bowling Green, or Chicago. Fixed costs per year are $30k, $60k, & $110k respectively. Variable costs per case are $75, $45, & $25 respectively. The price per case is $120. What is the best location for an expected volume of 2,000 cases per year?
Locational Break-Even Crossover Chart

![Chart showing the annual cost for different volumes for locations like Akron, Bowling Green, and Chicago. The chart illustrates the crossover points where costs are minimized for each location.]
Center of Gravity Method

- Finds location of single distribution center serving several destinations
- Used primarily for services
- Considers
  - Location of existing destinations
    - Example: Markets, retailers etc.
  - Volume to be shipped
  - Shipping distance (or cost)
    - Shipping cost/unit/mile is constant
Center of Gravity Method Steps

- Place existing locations on a coordinate grid
  - Grid has arbitrary origin & scale
  - Maintains relative distances
- Calculate X & Y coordinates for ‘center of gravity’
  - Gives location of distribution center
  - Minimizes transportation cost
Center of Gravity Method Equations

X Coordinate

\[ C_x = \frac{\sum d_{ix} W_i}{\sum W_i} \]

- \( d_{ix} \) = x coordinate of location \( i \)
- \( W_i \) = Volume of goods moved to or from location \( i \)

Y Coordinate

\[ C_y = \frac{\sum d_{iy} W_i}{\sum W_i} \]

- \( d_{iy} \) = y coordinate of location \( i \)
Coordinate Locations of Four Quain's Department Stores and the Center of Gravity

- Chicago (30, 120)
- Pittsburgh (90, 110)
- Atlanta (60, 40)
- New York (130, 130)

Center of gravity (66.7, 93.3)
Transportation Model

- Finds amount to be shipped from several sources to several destinations
- Used primarily for industrial locations
- Type of linear programming model
  - Objective: Minimize total production & shipping costs
  - Constraints
    - Production capacity at source (factory)
    - Demand requirement at destination
Components of Volume and Revenue for a Service Firm

1. Purchasing power of customer drawing area
2. Service and image compatibility with demographics of the customer drawing area
3. Competition in the area
4. Quality of the competition
5. Uniqueness of the firm’s and competitor’s locations
6. Physical qualities of facilities and neighboring businesses
7. Operating policies of the firm
8. Quality of management
# Location Strategies – Service vs. Industrial

<table>
<thead>
<tr>
<th>Service/Retail/Professional</th>
<th>Goods-Producing Location</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Revenue Focus</strong></td>
<td><strong>Cost Focus</strong></td>
</tr>
<tr>
<td>- Volume/revenue</td>
<td>- <strong>Tangible costs</strong></td>
</tr>
<tr>
<td>- Drawing area, purchasing power</td>
<td>- Transportation cost of raw materials</td>
</tr>
<tr>
<td>- Competition; advertising/pricing</td>
<td>- Shipment cost of finished goods</td>
</tr>
<tr>
<td>- Physical quality</td>
<td>- Energy and utility cost; labor; raw material; taxes, etc.</td>
</tr>
<tr>
<td>- Parking/access; security/ lighting; appearance/image</td>
<td></td>
</tr>
</tbody>
</table>
## Location Strategies – Service vs. Industrial

### Service/Retail/Professional Techniques
- Regression models to determine importance of various factors
- Factor-rating method
- Traffic counts
- Demographic analysis of drawing area
- Purchasing power analysis of drawing area
- Center of gravity method
- Geographic information systems

### Goods Producing Location Techniques
- Linear Programming (Transportation method)
- Factor-rating method
- Locational breakeven analysis
- Crossover charts
## Location Strategies – Service vs. Industrial

<table>
<thead>
<tr>
<th>Service/Retail/Professional</th>
<th>Goods-Producing Location</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Assumptions</strong></td>
<td><strong>Assumptions</strong></td>
</tr>
<tr>
<td>□ Location is a major determinate of revenue</td>
<td>□ Location is a major determinate of cost</td>
</tr>
<tr>
<td>□ High customer-contact issues are critical</td>
<td>□ Most major costs can be identified explicitly for each site</td>
</tr>
<tr>
<td>□ Costs are relatively constant for a given area; therefore, the revenue function is critical</td>
<td>□ Low customer contact allows focus on identifiable costs</td>
</tr>
<tr>
<td></td>
<td>□ Intangible costs can be evaluated</td>
</tr>
</tbody>
</table>
Major Methods of Solving Location Problems

- Weighted methods which:
  - Assign weights and points to various factors
  - Determine tangible costs
  - Investigate intangible costs

- Center of Gravity Method
  - Find best distribution center location

- Location breakeven methods
  - Special case of breakeven analysis

- Transportation method
  - A specialized linear programming method
Telemarketing and Internet Industries

- Require neither face-to-face contact with customers (or employees) nor movement of material
- Presents a whole new perspective on the location problem
Geographic Information Systems

- New tool to help in location analysis
- Enables combination of many parameters
Final Thought

The ideal location for many companies in the future will be a floating factory ship that will go from port to port, from country to country – wherever cost per unit is lowest.