Learning Objectives

- Explain the different between competitive clustering and saturation marketing.
- Explain the impact of the Internet on location decisions.
- Describe how a geographic information system is used in service location decisions.
- Differentiate between a Euclidian and metropolitan metric approach to measuring travel distance.
- Locate a single facility using the cross-median approach.
- Use the Huff retail location model to estimate revenue and market share for a potential site.
- Locate multiple facilities using the set covering model.
Introduction

- From marketing perspective service location focuses on attracting customers to a site because of convenience (fast food restaurant on a high traffic street) or physical attributes (resort on a beautiful beach).

- Location also effects the service delivery design and has an impact on employees.
Strategic Location Dimensions

- **Competitive positioning**: refers to methods by which the firm can establish itself relative to its competitors. Prime location can be a barrier to entry.

- **Demand management**: is the ability to control the quality, quantity and timing of demand. E.g., a hotel can control demand by locating near a diverse set of market generators that supply a steady demand regardless of the economic condition.
Flexibility of a location is a measure of the degree to which the service can react to changing economic situations.

plan for future economic changes and portfolio effect e.g., locating sites in a number of states could reduce the overall risk of a financial crises resulting from regional economic downturns.
**Focus**: can be developed by offering the same narrowly defined service at many locations. Many multisided service firms develop a standard (or formula) facility that can be duplicated at many locations. While this approach makes expansion easier, sites that are located in close proximity could siphon business from each other.
Strategic Location Considerations

- **Competitive Clustering**: is a reaction to observed consumer behavior when they are choosing among competitors. When shopping for items such as automobiles, customers like to make comparisons, and for convenience, seek out the area of town where many dealers are concentrated.

- **Saturation Marketing**: The idea is to group outlets of the same firm tightly in urban and other high traffic areas (e.g. Au Bon Pain, Ice Cream Vendors)
Strategic Location Considerations-2

- **Marketing Intermediaries**: Service channels of distribution have involved that use separate organizational entities as intermediaries between the producer and the customer. (e.g. Credit Cards, HMO)

- **Substitute Communication for Travel**: an appealing alternative to moving people from one place to another is the use of telecommunications. (e.g. telecommuting, e-Commerce)
Impact of the Internet on Service Location
A web site has become the virtual location of pure e-commerce firms. The concept of “e-distance”, the barrier created by internal and external navigation, arises from the desire to attract customers to a web site.
(e.g. Amazon.com, eBay, FedEx)

Separation of Front from Back Office: (e.g., Dry cleaning, ATM, shoe repair)
# Strategic Location Considerations

<table>
<thead>
<tr>
<th></th>
<th>Front Office</th>
<th>Back Office</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>External Customer</strong></td>
<td>Is travel out to customer or customer travel to site?</td>
<td>Is service performed on person or property?</td>
</tr>
<tr>
<td>(consumer)</td>
<td>Can electronic media substitute for physical travel?</td>
<td>Is co-location necessary?</td>
</tr>
<tr>
<td></td>
<td>Is location a barrier to entry?</td>
<td>How is communication accomplished?</td>
</tr>
<tr>
<td><strong>Internal Customer</strong></td>
<td>Availability of labor?</td>
<td>Are economies of scale possible?</td>
</tr>
<tr>
<td>(employee)</td>
<td>Are self-service kiosks an alternative?</td>
<td>Can employees work from home?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Is offshoring an option?</td>
</tr>
</tbody>
</table>
Site Selection Considerations

1. **Access:**
   - Convenient to freeway exit and entrance ramps
   - Served by public transportation

2. **Visibility:**
   - Set back from street
   - Surrounding clutter
   - Sign placement

3. **Traffic:**
   - Traffic volume on street that may indicate potential impulse buying
   - Traffic congestion that could be a hindrance (e.g., fire stations)

4. **Parking:**
   - Adequate off-street parking

5. **Expansion:**
   - Room for expansion

6. **Environment:**
   - Immediate surroundings should complement the service

7. **Competition:**
   - Location of competitors

8. **Government:**
   - Zoning restrictions
   - Taxes
The management of the motel, a national chain of hotels commissioned a study to determine the direction of its expansion efforts. It wanted to know which factors determined a profitable hotel location and, thus would allow management to screen available real estate for new hotel sites. Investigators collected data on many factors at existing locations, such as traffic count, number of competitive rooms nearby, visibility of signs, local airport traffic, types of neighboring businesses, and distance to the central business district. In all 35 factors, or independent variables, were considered.
Regression Model for Motel Location

- **Competitive Factors:** Room rate, hotels within one mile, competitive room rate
- **Demand Generators:** College, Hospital beds within one mile, Annual tourists
- **Area Demographics:** Family income, residential population
- **Market Awareness:** State population per inn, Distance to nearest inn
- **Physical Attributes:** Sign visibility, Distance to downtown, Accessibility
Regression Model for Motel Location (La Quinta Motor Inns)

- The Inn’s operating margin, obtained by adding depreciation and interest expenses to the profit and then dividing by the total revenue, was chosen as the most reliable measure, or dependent variable Y, on which to base a forecast.

- A statistical analysis of the data for all the variables in Table 10.3 allowed the investigators to identify four critical factors STATE, PRICE, INCOME, and COLLEGE to be used in forecast model.

\[ Y = 39 + (-5.41) \text{STATE} + (5.86) \text{PRICE} + (-3.09) \text{INCOME} + (1.75) \text{COLLEGE} \]
Many factors enter into the decision to locate a service facility. Fig. 10.2 classifies location issues that will be used to guide our discussion.

The broad categories are:

1. geographic representation,
2. number of facilities
3. Optimization criteria.
Classifications of Service Facility Location issues-Fig. 10.2

Service Facility location

- Geographic representation
  - Network
  - Plane
    - Metropolitan metric
    - Euclidian metric

- Number of facilities
  - Public sector
  - Private sector
    - many
      - Service capacity
      - Level of service
      - Area served

- Optimization criteria
  - one

**Geographic Representation**

*Location on a Plane*

- **Origin** $i$: $Y_i$, $X_i$
- **Destination** $j$: $Y_j$, $X_j$

**Euclidean Distance**

$$d_{ij} = \left[ (x_i - x_j)^2 + (y_i - y_j)^2 \right]^{1/2}$$

**Metropolitan Distance**

$$d_{ij} = |x_i - x_j| + |y_i - y_j|$$
Effect of Optimization Criteria

1. **Maximize Utilization:** maximize the total number of visits to the centers
   (City C: elderly find distance a barrier)

2. **Minimize Distance per Capita:** minimize the average distance per capita to the closest center
   (City B: centrally located)

3. **Minimize Distance per Visit:** minimize the average per-visit travel distance to the nearest center.
   (City A: many frequent users)
Single Facility Location Using Cross Median Approach

![Graph showing facility locations with weights W1, W2, W3, and W4.]

- Location 1: (W1=7)
- Location 2: (W2=1)
- Location 3: (W3=3)
- Location 4: (W4=5)
Single Facility Location Using Cross Median Approach

Solution is line segment $y=2$, $x=2,3$
Huff Retail Location Model

First, a gravity analogy is used to estimate attractiveness of store j for customers in area i.

\[ A_{ij} = \text{Attraction to store j for customers in area i} \]
\[ S_j = \text{Size of the store (e.g. square feet)} \]
\[ T_{ij} = \text{Travel time from area i to store j} \]
\[ \lambda = \text{Parameter reflecting propensity to travel} \]

\[ A_{ij} = \frac{S_j}{T_{ij}^\lambda} \]
Second, to account for competitors we calculate the probability that customers from area i will visit a particular store j.

\[ P_{ij} = \frac{A_{ij}}{\sum_{j=1}^{n} A_{ij}} \]
Third, annual customer expenditures for item k at store j can now be calculated.

\[ P_{ij} = \text{Probability customers from area i travel to store j} \]
\[ C_i = \text{Number of customers in area i (e.g. census track)} \]
\[ B_{ik} = \text{Annual budget for product k for customers in area i} \]
\[ m = \text{Number of customer areas in the market region} \]

\[ E_{jk} = \sum_{j=1}^{m} \left( P_{ij} C_i B_{ik} \right) \]
Fourth, market share of product k purchased at store j can now be calculated.

\[ M_{jk} = \frac{E_{jk}}{\sum_{i=1}^{m} (C_i B_{ik})} \]
Example 10.2 Copying Service: Huff Analysis

- Assume that copying center has been established at \((x=2,y=2)\) i.e., at A.
- Further assume that each customer order represents an expenditure of approximately $10.
- Because convenience would be an important customer criteria, assume that \(\lambda = 2\)
- If we wish to open a competing store at location \((x=3,y=2)\) i.e., at B with twice the capacity of the existing copying center.
- Using the travel distances given in Table 10.8 as input to the Huff model, calculate monthly expenditure and market share for the proposed copying center.
### Example 10.2 Copying Service: Huff Analysis-2

- Travel distances in miles ($T_{ij}$) using Metropolitan metric

<table>
<thead>
<tr>
<th>Customer Location (i)</th>
<th>Site (j) 1</th>
<th>Site (j) 2</th>
<th>Site (j) 3</th>
<th>Site (j) 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proposed (3,2)</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Existing (2,2)</td>
<td>1</td>
<td>1</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Site (j)</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>-----------------</td>
<td>-------</td>
<td>-------</td>
<td>-------</td>
<td>-------</td>
</tr>
<tr>
<td>Proposed ($S_1 = 2$)</td>
<td>0.5</td>
<td>0.5</td>
<td>0.2222</td>
<td>0.5</td>
</tr>
<tr>
<td>Existing ($S_2 = 1$)</td>
<td>1.0</td>
<td>1.0</td>
<td>0.0625</td>
<td>0.111</td>
</tr>
<tr>
<td>Total attraction</td>
<td>1.5</td>
<td>1.5</td>
<td>0.2847</td>
<td>0.611</td>
</tr>
<tr>
<td>Site(j)</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>------------</td>
<td>------</td>
<td>------</td>
<td>------</td>
<td>------</td>
</tr>
<tr>
<td>Proposed</td>
<td>0.33</td>
<td>0.33</td>
<td>0.78</td>
<td>0.82</td>
</tr>
<tr>
<td>Existing</td>
<td>0.67</td>
<td>0.67</td>
<td>0.22</td>
<td>0.18</td>
</tr>
</tbody>
</table>
### Table 10.11: Monthly Expenditures ($E_{jk}$), Market Shares ($M_{jk}$)

<table>
<thead>
<tr>
<th>Site (j)</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>Monthly $M_{jk}$ Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proposed</td>
<td>2333</td>
<td>333</td>
<td>333</td>
<td>2340</td>
<td>9106 .57</td>
</tr>
<tr>
<td>Existing</td>
<td>4667</td>
<td>667</td>
<td>660</td>
<td>900</td>
<td>6894 .43</td>
</tr>
<tr>
<td>Total</td>
<td>7000</td>
<td>1000</td>
<td>3000</td>
<td>5000</td>
<td>16000 1</td>
</tr>
</tbody>
</table>
Multiple Facilities: Location Set Covering Problem

- We want to find the minimum number and location of facilities that will serve all demand points within some specified maximal service distance; this is known as the “location set covering” problem.
Example 10.3 Rural Medical Cliniks

A state department of health is concerned about the lack of medical care in rural areas, and a group of nine communities has been selected for a pilot program in which medical clinics will be opened to serve primary health care needs. It is hoped that every community will be within 30 miles of at least one clinic. The planners would like to determine the number of clinics that are required and their location. Any community can serve as a potential clinic site except community 6, because facilities are unavailable there. Fig. 10.7 shows a network identifying the cities as numbered circles; lines drawn between the sites show the travel distance in miles.
Example 10.3 Rural Medical clinics-2

- Step 1: Identify for each community the other communities that can be reached from it within the 30-mile travel limit (beginning with community 1, we see that 2,3,4 can be reached within 30 miles). They are listed in the second column of the Fig. 10.12.

- Step 2: Identify the set of potential sites that could cover a given community (third column in the Fig.10.12)
Example 10.3 Rural Medical clinics-3

- Step 3: Identify and circle the subsets which represents subset of other potential locations (e.g., community 2 can only be served by sites 1,2,3, one of these sites must be selected for a clinic location). Identifying these subsets reduces the problem size while ensuring that restrictions are satisfied.
Topics for Discussion

- Pick a particular service, and identify shortcomings in its site selection.
- How would you proceed to estimate empirically the parameter $\lambda$ in the Huff retail location model for a branch bank?
- What are the characteristics of a service that would make communication a good substitute for transportation?
- What are the benefits of using intermediaries in the service distribution channel?
- Go to http://www.mapinfo.com/ and find the definition of “location intelligence.” What use can be made of geographic information?
Interactive Exercise

The class breaks into small groups and each group comes up with examples of service facility locations that seem to defy the analytical models discussed in the chapter.
## COMPETITORS’ STORE SIZES

<table>
<thead>
<tr>
<th>Store</th>
<th>Sales area, sq ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>10,000</td>
</tr>
<tr>
<td>B</td>
<td>15,000</td>
</tr>
<tr>
<td>Z</td>
<td>10,000</td>
</tr>
</tbody>
</table>

## MAXIMUM SIZE LIMIT OF SITES

<table>
<thead>
<tr>
<th>Site</th>
<th>Maximum sales area, sq ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>15,000</td>
</tr>
<tr>
<td>Y</td>
<td>20,000</td>
</tr>
<tr>
<td>Z</td>
<td>10,000</td>
</tr>
</tbody>
</table>

## MINIMUM TRAVEL TIME BETWEEN POTENTIAL AND EXISTING SITES AND BLOCK GROUPS, Min

<table>
<thead>
<tr>
<th>Census block group</th>
<th>Site</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td></td>
<td>7</td>
<td>5</td>
<td>5</td>
<td>9</td>
<td>1</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>7</td>
<td>10</td>
<td>14</td>
<td>17</td>
</tr>
<tr>
<td>B</td>
<td></td>
<td>10</td>
<td>8</td>
<td>8</td>
<td>10</td>
<td>7</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>4</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>X</td>
<td></td>
<td>16</td>
<td>14</td>
<td>14</td>
<td>16</td>
<td>13</td>
<td>8</td>
<td>7</td>
<td>6</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Y</td>
<td></td>
<td>12</td>
<td>10</td>
<td>10</td>
<td>12</td>
<td>9</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Z</td>
<td></td>
<td>7</td>
<td>5</td>
<td>5</td>
<td>7</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td>4</td>
<td>3</td>
<td>8</td>
<td>10</td>
<td>13</td>
</tr>
</tbody>
</table>

## RELATIONSHIP OF STORE SIZE TO MARGIN ON SALES, EXPENSES, AND NET OPERATING PROFIT AS % OF SALES

<table>
<thead>
<tr>
<th>Sales area, sq ft</th>
<th>Margin on sales</th>
<th>Expenses</th>
<th>Net operating profit before taxes</th>
</tr>
</thead>
<tbody>
<tr>
<td>10,000</td>
<td>16.2</td>
<td>12.3</td>
<td>3.9</td>
</tr>
<tr>
<td>15,000</td>
<td>15.6</td>
<td>12.0</td>
<td>3.6</td>
</tr>
<tr>
<td>20,000</td>
<td>14.7</td>
<td>11.8</td>
<td>2.0</td>
</tr>
</tbody>
</table>
# MARKET DATA

<table>
<thead>
<tr>
<th>Census block group</th>
<th>Number of households</th>
<th>Average annual income</th>
<th>Average annual furniture expenditures per household</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>730</td>
<td>$65,000-$70,000</td>
<td>$180</td>
</tr>
<tr>
<td>2</td>
<td>1130</td>
<td>45,000-50,000</td>
<td>125</td>
</tr>
<tr>
<td>3</td>
<td>1035</td>
<td>80,000-85,000</td>
<td>280</td>
</tr>
<tr>
<td>4</td>
<td>635</td>
<td>150,000-over</td>
<td>350</td>
</tr>
<tr>
<td>5</td>
<td>160</td>
<td>25,000-30,000</td>
<td>75</td>
</tr>
<tr>
<td>6</td>
<td>105</td>
<td>20,000-25,000</td>
<td>50</td>
</tr>
<tr>
<td>7</td>
<td>125</td>
<td>20,000-25,000</td>
<td>60</td>
</tr>
<tr>
<td>8</td>
<td>470</td>
<td>40,000-45,000</td>
<td>115</td>
</tr>
<tr>
<td>9</td>
<td>305</td>
<td>30,000-35,000</td>
<td>90</td>
</tr>
<tr>
<td>10</td>
<td>1755</td>
<td>75,000-80,000</td>
<td>265</td>
</tr>
<tr>
<td>11</td>
<td>900</td>
<td>85,000-90,000</td>
<td>215</td>
</tr>
<tr>
<td>12</td>
<td>290</td>
<td>150,000-over</td>
<td>370</td>
</tr>
</tbody>
</table>
Store Site Selection

Store Profit as a Function of Lambda

Annual Profit ($) vs Lambda

- X10
- X15
- Y10
- Y15
- Y20
- Z10
## Market Share Analysis

<table>
<thead>
<tr>
<th></th>
<th>Now (%)</th>
<th>X15 (%)</th>
<th>Y15 (%)</th>
<th>Y20 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>33%</td>
<td>23%</td>
<td>22%</td>
<td>19%</td>
</tr>
<tr>
<td>B</td>
<td>67%</td>
<td>40%</td>
<td>39%</td>
<td>35%</td>
</tr>
<tr>
<td>Athol</td>
<td>37%</td>
<td>39%</td>
<td>46%</td>
<td></td>
</tr>
</tbody>
</table>

Are there any shortcomings in the use of the Huff mode?