LECTURE – 3

FACILITY LOCATION DECISION FACTORS

Learning Objectives

- To discuss important considerations and decision factors of service facility location
Facility location decision is a strategic decision for any service organization as shown in figure 6.12.

- Offering service at a new location can be a part of growth strategy. Mc Donald’s has entered into India and planning to open new facilities from metro cities to tier 1 and tier 2 cities, city after city to grow in the country.
- Expanding business in an existing facility or to a new location to cater to increased demand can be a part of expansion strategy. Many hotels are expanding their facilities to include recreational activities, spa, gymnasium to cater to rising demand of customers. The other example is expansion of airports in metro cities of India.
- The competition in prices and increasing purchasing power of Indian citizens, the demand of air travel has been increased drastically in the past few years. The airports at Delhi, Mumbai and Bangalore in India have expanded their facilities to meet this increasing demand.

The facility location decisions are considered where service organization seek for new sites or regions with sufficient demand from their existing low demand facilities.
6.6 FACILITY LOCATION DECISION TO ACHIEVE COMPETITIVE ADVANTAGE

- Any service organization first takes decision on locating a facility followed by the decisions on design of the service and service delivery systems. Facility location decision is a strategic decision for service organizations. To remain competitive service organizations consider the following points while deciding about potential facility location.
  - Create entry barriers
  - Generate and manage demand
  - Flexibility
  - Competitive Positioning
  - Focus
Facility Location decision can be seen at macro level and micro level as shown in figure 6.13.

Create entry barriers

- Locate facilities in prime markets where competitors cannot enter. It can be the most expensive area.
- Example: Locate hotels in the heart of the city or near the airports.

Generate and manage demand

- Facility should be located so as to control quantity, quality and timing of demand.
- Some of the service facilities have fixed capacity like hotels (fixed number of rooms) which cannot reduce the capacity during poor demand time periods. To
have stable demand, so that the capacity is efficiently utilized, locate the facility near a diverse set of market generators that supply steady demand

- Example: Locate service apartments near Universities or near railway stations

**Flexibility**

- Facility location is one of the strategic and can be capital intensive decision which cannot be changed frequently.

- At the same time the facilities are expected to be responsive to future economic, demographic, social and competitive changes over a period of time.

- Flexibility is the ability of any service organization to react to changing economic, market and environmental changes.

- Example: Locating service facilities at multiple sites can reduce the risks of economic downturn at some specific site. The losses at one site can offset by the good market conditions at some other site.

**Competitive positioning**

- Locate the facilities at strategically important sites

- It may help to create entry barriers and hence a preventive strategy to restrict the competition

- Example: Locate hotels near the beach or own a private beach like Taj Exotica

**Focus**

- Catering to the needs and wants of some specific group of customers.

- Same, small and specific menu of services provided at multiple sites.

- Example: KFC, McDonald’s
Many factors go into facility location decision, which are given below and presented in figure 6.14.

1) Customer based
2) Cost based
3) Competition based
4) Support system based
5) Information and communication based.

Convenience & close proximity to the customers for example General grocery shops

Less operating costs for example wholesale markets

Locate near the competition clusters as travel agents do

Availability of support systems for example 24 hrs electricity requirements for research labs

Fast & smooth communication with whole world for example Banks provide financial services

6.7 CHALLENGING ISSUES IN FACILITY LOCATION DECISIONS

- Long term commitments
- Highly capital investment
- Site availability
6.8 CLASSIFICATION OF FACILITY LOCATION DECISIONS

There can be many issues related to facility location which will guide the decisions related to facility location. These issues are required to be identified first, which help in proposing an appropriate decision making tool for locating facilities.

- Types of service organizations as shown in Figure 6.15
- Geographic representation as shown in Figure 6.16
- Single facility location Versus multiple facility location
- Optimization criteria or performance measures

<table>
<thead>
<tr>
<th>Demand sensitive services</th>
<th>Delivered services</th>
<th>Quasi-Manufacturing services</th>
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<tr>
<td>• Attract customers through location</td>
<td></td>
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<tr>
<td>• Banks and retail stores</td>
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<td>• Cover a geographic area effectively</td>
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<td>• Public utilities like fire and police protection</td>
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<td>• Home delivery of food or medicines</td>
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<td>• Minimize the logistical cost of multiple location network</td>
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<td>• Back-office processing centers of banks, warehouses</td>
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All these types of service organizations can have different set of customers, different objectives or performance measures and hence may require different facility location models.
Location of a service facility based on geography of potential site

Plane

Network

Metropolitan metric

Euclidian metric

FIGURE 6.15 SERVICE FACILITY LOCATION BASED ON GEOGRAPHY
6.8.1 Geographic representation: location on a plane

There are infinite possibilities in a solution space to locate service facility on a plane. Location is represented by x-y Cartesian coordinate.

If point A \((x_1, y_1)\) is origin and point B \((x_2, y_2)\) is destination, the distance between points A and B, \(d_{AB}\), can be measured as Euclidian metric or Metropolitan metric.

Euclidian travel distance between A and B is
\[
d_{AB} = \sqrt{[(x_1 - x_2)]^2 + [(y_1 - y_2)]^2}
\]

Metropolitan travel distance between A and B is
\[
d_{AB} = |x_1 - x_2| + |y_1 - y_2|
\]
6.8.2 Geographic representation: location on network

7 nodes are potential locations where arcs represent the distance between the nodes.

6.8.3 Single facility versus multiple facilities

This classification is based on whether a service organization wants to open a single facility in a region or chain of facilities. It depends on the demand for a service and the service level an organization wants to achieve.

For example, a doctor can open a single clinic, whereas a state government would like to open schools or health clinics at various sites. The variable considered in such classification is the size of facility and computational complexity to determine the appropriate and optimal location.

6.8.4 Service facility based on optimization criteria

The optimization criteria or the main performance measure utilized for locating facility can be minimizing cost or maximizing profit. These are most commonly criteria used by private service organizations like decisions regarding locating retail stores or location of distribution centers. In contrast to such criterion are the criterion chosen by public sector. Public sector emphasize on reach and availability of service to specific
region and to specific community. The main criteria for public services are to maximize the social benefit like opening of school in rural area, opening of government hospital, locating public distribution stores which can be accessible to wider population. Such criterion in public service organization poses various challenges in terms of quantifying the social benefits.

An optimization criteria selected by any organization has influence on service facility location. Different optimization criterion which can be adopted by various service organizations are given below.

- Minimize cost of opening too many retail stores and transportation costs
- Maximize the total number of visits to the service facility
- Minimize the average distance per capita to the closest center
- Minimize the distance covered or time taken by the farthest located customer to reach to service facility
- Minimize the total time taken to reach to the farthest customer in some specific region.

6.9 Quantitative techniques for service facility location selection

There are some quantitative models which can help in selecting facility location as per following variations.

1. Single facility location problem on a line or on a plane
2. Single facility location problem based on objective function
3. Multi-facility location problem (Covering problem)
Single facility location decisions can be based on whether to locate facility on line or on plane or to locate based on some other criteria or objective function as shown in Figure 6.16

**FIGURE 6.16 SINGLE FACILITY LOCATION PROBLEM CLASSIFICATIONS**