CHAPTER 2

FACILITIES IN THE MANUFACTURING CONTEXT

In the manufacturing context, a facility is a place where raw materials, processing equipment, and people come together to make a finished product.

2.1. Logistics Management

Logistics management can be defined as the management of the transportation and distribution of goods.

Goods → Raw materials
Subassemblies obtained from suppliers
Finished goods shipped from plants to warehouses or customers

Logistics management includes all distribution and transportation activities from suppliers through to customers.

Logistics management is the management of a series of macro-level transportation and distribution activities with the main objective of delivering the right amount of material at the right place at the right time at the right cost using the right methods.

The decisions typically encountered in logistics management concern facility location, transportation and goods handling and storage.

Logistics management problems can be classified into three categories:

1. **Location Problems:**

   Location Problems involve determining the location of one or more new facilities in one or more of several potential sites. The number of sites must at least equal the number of new facilities being located.

   The cost of locating each new facility at each of the potential sites is assumed to be unknown.

   It is the fixed cost of locating a new facility at a particular site plus the operating and transportation cost of serving customers from this facility-site combination.

2. **Allocation Problems:**

   Allocation Problems assume that the number and location of facilities are known and attempt to determine how each customer is to be served. That is, given the demand for goods at each customer center, the production or supply capacities at each facility, and the cost of serving each customer from each facility, the allocation problem determined how much each facility is to supply to each customer center.

3. **Location – Allocation Problems:**

   Location – Allocation Problems involve determining not only how much each customer is to receive from each facility but also the number of facilities along with their locations and capacities.

2.2. Classification of Facility Location Problems

Facility Location problems can be classified as:

- *Single-Facility Location Problems*
  Single-Facility location problems deal with the optimal determination of the location of a single facility.

- *Multifacility Location Problems*
  Multifacility location problems deal with the simultaneous location determination for more than one facility.

  Generally, single-facility location problems are location problems, but multifacility location problems can be location as well as location-allocation problems.

Another classification of location problems is based on whether the set of possible locations for a facility is finite or infinite

- *Continuous Space Location Problem*
  If a facility can be located anywhere within the confines of a geographic area, then the number of possible locations is infinite, and such a problem is called a *Continuous Space Location Problem*.

- *Discrete Space Location Problem*
  Discrete Space Location Problems have a finite feasible set of sites in which to locate a facility.

Because facilities can be located anywhere in a two-dimensional space, sometimes the optimal location provided by the continuous space model may be infeasible. For example, a continuous space model may locate a manufacturing facility on a lake!

2.3. Facility Location Problem

The facility location problem consists of selecting a site for new facilities that will minimize the production and distribution cost of products and/or services to potential customers.

2.3.1. Reasons for considering Location Problems

- Significant changes in the level of demand,
- Significant changes in the geographical distribution of demand,
- Changes in the cost or quality requirements of critical production inputs (labor, raw materials, energy or others),
- Significant increases in the real-estate value of existing or adjacent sites or in their taxation,
- Need to change as a result of fire or flood for reasons of prestige or improved public relations.

2.3.2. Alternatives to New Location

- The increase of existing capacity by additional shifts or overtime, especially for capital-intensive systems.
- The use of seasonal inventories to reduce the need for maintaining capacity for peak demand.
- The use of subcontractors.
- The purchase of new equipment for the present location.

2.3.3. Important Factors in Location Decisions

- Production inputs (raw materials, human resources, etc…),
- Process techniques,
- Environmental factors
    - The availability and reliability of supporting systems
    - Social and cultural conditions
    - Legal and political considerations.

Example:

Consider the NIKE distribution center in Laakdal, Belgium.

- This warehouse employs 800 people,
- It has an annual turnover of 10.5 million of units of footwear and apparel,
- It covers 25 acres,
- It cost $139 million to build.