SNS COLLEGE OF TECHNOLOGY

Coimbatore - 35

23BAT613 – Operations Management

UNIT-III - OPERATIONS AND THE VALUE CHAIN

Location Models

Presented by

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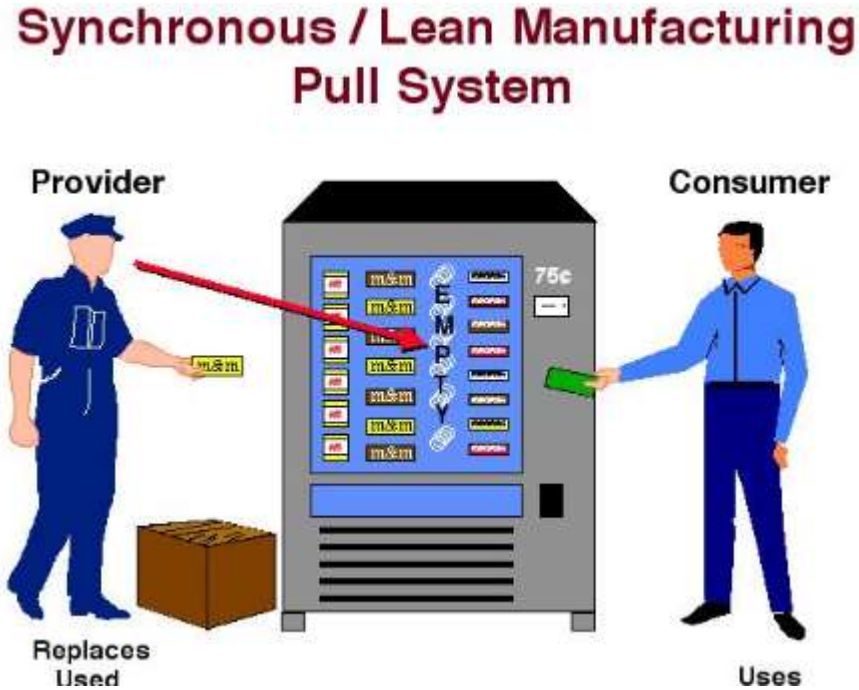
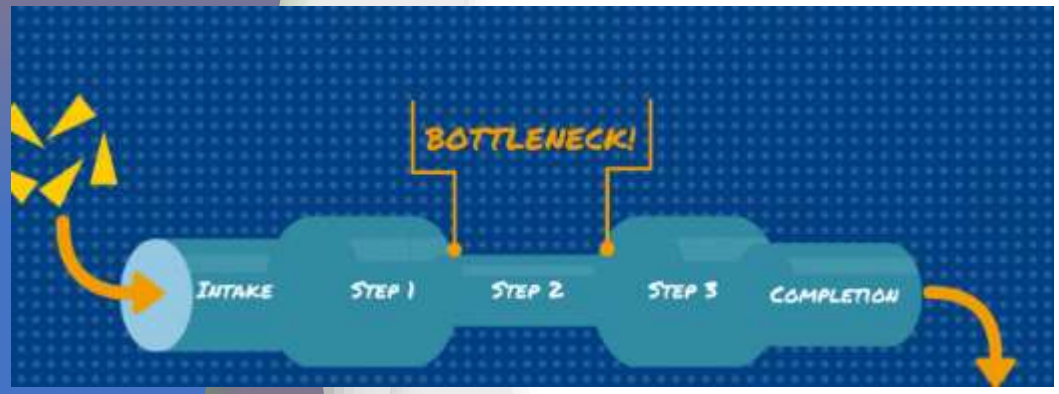
Recap:

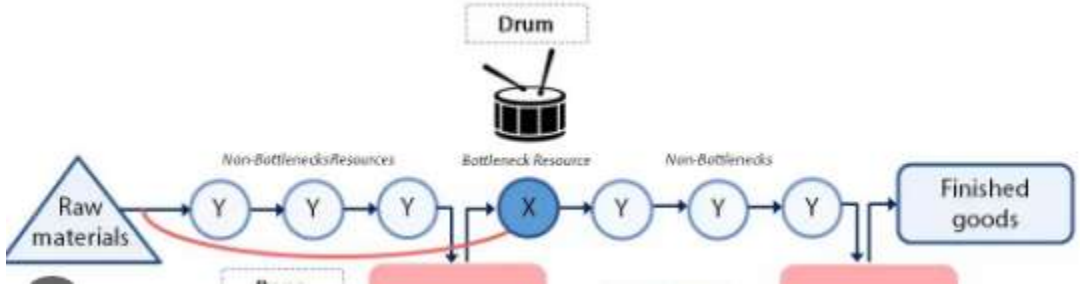
Steps in Selection



Today's Topic:

Location Models





Location Models - Meaning

Location models are mathematical and conceptual frameworks used to determine the optimal placement of facilities to minimize costs and maximize benefits. Here are some key location models commonly used in business and urban planning

Location Models - Types

The Center of Gravity Model

Concept: This model is used to find a central location that minimizes the transportation costs for delivering goods to multiple locations.

Application: Ideal for warehouse and distribution center location planning.

Calculation: It involves finding the weighted average of the coordinates of the demand points, with weights representing the quantity of goods to be shipped.

Location Models - Types

The Median Model (Minisum Problem)

Concept: This model aims to minimize the sum of the distances between the facility and all demand points.

Application: Suitable for locating public facilities like hospitals or fire stations where accessibility is crucial.

Calculation: The optimal location is often found by solving for the median of the demand points.

Location Models - Types

The Covering Model

Concept: This model ensures that all demand points are within a specified maximum distance from the facility.

Application: Commonly used for emergency services like fire stations, police stations, and hospitals.

Variations: Includes the Set Covering Problem (SCP) for minimal facility number and the Maximal Covering Location Problem (MCLP) for maximal coverage within constraints.

Location Models - Types

The p-Median Model

Concept: This model generalizes the median model by determining the optimal locations for multiple facilities to minimize the total distance from demand points.

Application: Used for multiple facility location problems such as placing multiple warehouses or service centers.

Calculation: Solved using optimization techniques such as linear programming or heuristics.

Location Models - Types

The p-Center Model

Concept: This model focuses on minimizing the maximum distance between any demand point and the nearest facility.

Application: Useful for critical service facilities where the farthest distance needs to be minimized, such as emergency response units.

Calculation: Typically involves complex optimization methods to find the minimum of the maximum distances.

Location Models - Types

Gravity Model

Concept: This model predicts the interaction between two locations based on their size and distance. Larger and closer locations have stronger interactions.

Application: Retail location planning, urban planning, and transportation modeling.

Calculation: Interaction is proportional to the product of the sizes of two locations divided by the square of the distance between them.

Location Models - Types

Hotelling's Model of Spatial Competition

Concept: This model describes the optimal location in a competitive environment, typically on a linear market.

Application: Retail stores, service outlets, and political campaign offices.

Principle: Businesses will tend to cluster at the center of a linear market to maximize market share and minimize competitive disadvantage.

Location Models - Types

Network Models

Concept: These models are used to locate facilities on a network, such as a road or transportation network, considering nodes (locations) and edges (paths).

Application: Urban logistics, supply chain design, and transportation planning.

Types: Includes models like the Shortest Path Problem, Traveling Salesman Problem (TSP), and Vehicle Routing Problem (VRP).

Considerations for Choosing a Location Model:

Objective: Whether the goal is to minimize costs, maximize coverage, or balance between various factors.

Data Availability: The type and granularity of data available for analysis.

Complexity: The complexity of the problem and computational resources available.

Specific Needs: Industry-specific requirements and constraints

ASSESSMENT:

Which of the following best defines capacity planning?

A. Planning for financial resources
B. Planning for human resources
C. Planning for optimizing operational efficiency
D. Planning for aligning resources with demand forecasts

Summary

By following these steps systematically, businesses can make informed and strategic decisions when selecting a location for their facilities, minimizing risks and maximizing benefits.

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