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Operations Management Presenting By:Rahul Belkar Hiren Gada Siddhant Gaikwad Pooja Madam Manjiri Mulye Richa Randerwala 62 73 75 89 101 Contents:

What Is Facility Location Model? Facility Location Models Factor Rating Method Examples of Factor Rating Method Point Rating Method Examples of Point Rating Method Summary What Is Facility Location Models? A branch of operations research and computational geometry Mathematical modeling and solution To minimize transportation costs, avoid placing hazardous materials near housing, outpatient competitors' facilities, etc. Facility Location Models Factor Rating Method Point Rating Method Break Even Analysis Qualitative Factor Analysis Factor-Rating Method Definition: The Factor Rating method is widely used location technique. Useful for service & industrial locations Rates locations using factors Intangible (qualitative) factors Example: Education quality, labor skills Tangible (quantitative) factors Example: Short-run & long-run costs Steps in Factor Rating Method Used to evaluate location based on their relative factor Importance 1. 2. 3. 4. 5. 6. List the most relevant factors in the location decision. Rate each factor (say from) for very low & 5 for very high) according to its relative importance. Rate each location (say from 1 for very low & 10 for very high) according to its merits on each factor Compute the product of rating by multiplying the factor rating for each factor. Compute the sum of the product of rating for each location. Select location with maximum rating. Factor Rating Method: Example 1 SCORES (0 TO 100) LOCATION FACTOR Labor pool and climate Proximity to suppliers Wage rates Community environment Proximity to customers Shipping modes Rating 1 5 4 3 2 1 Site 1 Site 2 5 10 3 5 2 7 4 6 8 5 2 7 Solution SCORES (0 TO 100) LOCATION FACTOR Labor pool and climate Proximity to suppliers Wage rates Community environment Proximity to customers Shipping modes Rating 1 5 4 3 2 1 Site 1 Highest. Weighted Score of site 1 is Highest. Site 1 Site 2 (1*5) 5 (5*10) 40 (4*3) 12 (3*5) 15 (4*2) 8 (2*7) 14 (1*4) (5*6) 30 (4*8) 32 (3*5) 15 (4*2) (2*7) 14 104 103 Factor-Rating Example-2 Critical Success Factor •Labor availability and attitude •People-to car ratio •Per capita income •Tax structure •Education and health Totals Weight Scores (out of 100) France Denmark Weighted Scores France Denmark 25 70 60 50 60 10 39.85 75 80 70 (1.0/85) = 8.5 (1.0/80) = 8.0 (39/75) = 29.3 (39/70) = 27.3 21 60 70 (21/60) = 12.6 (21/70) = 14.7 1.0 (25/70) = 17.5 (25/60) = 15.0 (05/50) = 2.5 70 4 (0.05/60) = 3.0 68.0 Point Rating Method Definition The point method is widely used. It requires identifying several compensable factors (like skills and responsibility) each with several degrees and also the degree to which each of these factors is present in the job or location. Steps in Point-Rating Method Used to evaluate location based on their relative factor Importance 1. 2. 3. 4. 5. List the most relevant factors in the location decision. Rate each factor (say from 1 for very low & 100 for very high) according to its relative importance. Compute the product of rating by Adding the location rating each factor. Compute the sum of the product of rating for each location. Select location with maximum rating. Point Rating Method: Example 1 SCORES (0 TO 100) LOCATION FACTOR Labor pool and climate Proximity to suppliers Wage rates Community environment Proximity to customers Shipping modes Rating 10 20 30 40 50 60 Site 1 6 4 29 35 45 55 Site 2 5 3 27 30 45 50 Solution SCORES (0 TO 100) LOCATION FACTOR Labor pool and climate Proximity to suppliers Wage rates Community environment Proximity to customers Shipping modes Rating 10 20 30 40 50 60 Site 1 74 60 70 40 50 60 320 320 Summary The objective of the Facility Location Models is to achieve a maximal total service area from a specified number of facilities. Calculation of total service area from multiple facilities cannot be done merely by creating simple summary of service area polygons, as the polygons are overlaid one on top another. The Facility Location Models was introduced as an alternative method of calculation. Factor rating method To set up a new factory, an important strategic decision to be taken by the management of a company in which there is a new factory location such. There are several ways to determine the location of the factory, one of the methods or the trick is to use the Factor Rating Method or in the language of Indonesia is called the method of Weighting factors.Method of Weighting Factor or Factor Rating Method this is a method that is widely used because it combines quantitative and qualitative in determining the best locations for manufacturing or service companies.The steps in the Factor Rating Method (method of Weighting Factors)The following are some steps to determine the location of the plant or the location of facilities using the Factor Rating Method or a method of Weighting factors.

Factor Rating Method

CRITERIA SUB-FACTORS	1 = VERY POOR	2 = POOR	3 = FAIR	4 = GOOD	5 = VERY GOOD
1. TONE	1	2	3	4	5
2. TEXTURE	1	2	3	4	5
3. POROSITY	1	2	3	4	5
4. ELASTICITY	1	2	3	4	5
5. HYDRATION	1	2	3	4	5
6. PHENOLICITY	1	2	3	4	5
7. PIGMENTATION	1	2	3	4	5
8. ACIDITY	1	2	3	4	5
9. AROMA	1	2	3	4	5
10. REFLECTION	1	2	3	4	5
11. COMPLEXITY	1	2	3	4	5
12. OF ORIGIN	1	2	3	4	5
13. OF TYPE	1	2	3	4	5
14. OF COLOR	1	2	3	4	5
15. OF SIZE	1	2	3	4	5
16. OF SHAPE	1	2	3	4	5
17. OF TASTE	1	2	3	4	5
18. OF SMELL	1	2	3	4	5
19. OF TOUCH	1	2	3	4	5
20. OF SOUND	1	2	3	4	5
21. OF TASTE	1	2	3	4	5
22. OF SMELL	1	2	3	4	5
23. OF TOUCH	1	2	3	4	5
24. OF SOUND	1	2	3	4	5
25. OF TASTE	1	2	3	4	5
26. OF SMELL	1	2	3	4	5
27. OF TOUCH	1	2	3	4	5
28. OF SOUND	1	2	3	4	5
29. OF TASTE	1	2	3	4	5
30. OF SMELL	1	2	3	4	5
31. OF TOUCH	1	2	3	4	5
32. OF SOUND	1	2	3	4	5
33. OF TASTE	1	2	3	4	5
34. OF SMELL	1	2	3	4	5
35. OF TOUCH	1	2	3	4	5
36. OF SOUND	1	2	3	4	5
37. OF TASTE	1	2	3	4	5
38. OF SMELL	1	2	3	4	5
39. OF TOUCH	1	2	3	4	5
40. OF SOUND	1	2	3	4	5
41. OF TASTE	1	2	3	4	5
42. OF SMELL	1	2	3	4	5
43. OF TOUCH	1	2	3	4	5
44. OF SOUND	1	2	3	4	5
45. OF TASTE	1	2	3	4	5
46. OF SMELL	1	2	3	4	5
47. OF TOUCH	1	2	3	4	5
48. OF SOUND	1	2	3	4	5
49. OF TASTE	1	2	3	4	5
50. OF SMELL	1	2	3	4	5
51. OF TOUCH	1	2	3	4	5
52. OF SOUND	1	2	3	4	5
53. OF TASTE	1	2	3	4	5
54. OF SMELL	1	2	3	4	5
55. OF TOUCH	1	2	3	4	5
56. OF SOUND	1	2	3	4	5
57. OF TASTE	1	2	3	4	5
58. OF SMELL	1	2	3	4	5
59. OF TOUCH	1	2	3	4	5
60. OF SOUND	1	2	3	4	5
61. OF TASTE	1	2	3	4	5
62. OF SMELL	1	2	3	4	5
63. OF TOUCH	1	2	3	4	5
64. OF SOUND	1	2	3	4	5
65. OF TASTE	1	2	3	4	5
66. OF SMELL	1	2	3	4	5
67. OF TOUCH	1	2	3	4	5
68. OF SOUND	1	2	3	4	5
69. OF TASTE	1	2	3	4	5
70. OF SMELL	1	2	3	4	5
71. OF TOUCH	1	2	3	4	5
72. OF SOUND	1	2	3	4	5
73. OF TASTE	1	2	3	4	5
74. OF SMELL	1	2	3	4	5
75. OF TOUCH	1	2	3	4	5
76. OF SOUND	1	2	3	4	5
77. OF TASTE	1	2	3	4	5
78. OF SMELL	1	2	3	4	5
79. OF TOUCH	1	2	3	4	5
80. OF SOUND	1	2	3	4	5
81. OF TASTE	1	2	3	4	5
82. OF SMELL	1	2	3	4	5
83. OF TOUCH	1	2	3	4	5
84. OF SOUND	1	2	3	4	5
85. OF TASTE	1	2	3	4	5
86. OF SMELL	1	2	3	4	5
87. OF TOUCH	1	2	3	4	5
88. OF SOUND	1	2	3	4	5
89. OF TASTE	1	2	3	4	5
90. OF SMELL	1	2	3	4	5
91. OF TOUCH	1	2	3	4	5
92. OF SOUND	1	2	3	4	5
93. OF TASTE	1	2	3	4	5
94. OF SMELL	1	2	3	4	5
95. OF TOUCH	1	2	3	4	5
96. OF SOUND	1	2	3	4	5
97. OF TASTE	1	2	3	4	5
98. OF SMELL	1	2	3	4	5
99. OF TOUCH	1	2	3	4	5
100. OF SOUND	1	2	3	4	5

Chapter 8

Location Decisions

Location Factor Rating Approach

	Importance	Raw Site Scores			Weighted Scores		
	Weight	Plant A	Plant B	Plant C	Plant A	Plant B	Plant C
1 Labor Market	30%	4	5	5	12	15	15
2 Railways	20%	5	4	5	10	8	10
3 Road Access	20%	5	4	5	10	8	10
4 Rail Access	15%	4	4	4	6	6	6
5 Community	15%	4	4	4	6	6	6
		Totals			54	53	57

FACILITY LOCATION

2. [Factor Rating Method] A manager has received an analysis of several cities being considered for a new order fulfillment center (warehouse) for Shop at Home Network. The scores (scale is 10 points = best) are contained in the table below.

- Using the factor ratings shown below, determine which location alternative should be chosen on the basis of maximum composite score.
- If transportation costs and operating costs are given weights that are double the weights of the others, should the locations be ranked differently?
- If the manager weights the factors equally, how would the locations be ranked?

		Location		
Factor	Weight	A	B	C
Easy access	0.15	86	72	90
Parking facilities	0.20	72	77	91
Display area	0.15	86	90	90
Shopper (walking) traffic	0.10	94	86	80
Transportation costs	0.15	99	89	81
Operating costs	0.25	96	85	75

Since these factors have been determined, the company will identify potential countries to examine the pros and cons of establishing operations in these countries. After looking at pro and cons of the different countries and deciding on a country, then decision makers will identify a region within the country. When identifying a region, decision makers must take the four major factors explained above into consideration. The last two stages of the search include choosing a community and a site. Note: The above part is way too lengthy for this assignment. Summary below. Summary : There are several ways that are very helpful in evaluating location alternatives, such as locational cost-profit-volume analysis, factor rating, and the center of gravity method. First, let's take a look at Location Cost-Profit-Volume Analysis.

This analysis can be done numerically or graphically. The procedure for locational cost-profit-volume analysis involves these steps:

1. Determine the fixed and variable costs associated with each location alternative.
2. Plot the total-cost lines for all location alternatives on the same graph.
3. Determine which location will have the lowest total cost for the expected level of output. Alternatively, determine which location will have the highest profit. This method assumes the following:

- 1. Fixed costs are constant for the range of probable output.
- 2. Variable costs are linear for the range of probable output.
- 3. The required level of output can be closely estimated.
- 4. Only one product is involved.

Here're a couple of important formulas to remember: $\text{Total cost} = \text{Fixed cost} + \text{Variable cost per unit} \times \text{Quantity or volume of output}$ $\text{Total profit} = \text{Quantity}(\text{Revenue per unit} - \text{Variable cost per unit}) - \text{Fixed cost}$ In most situations, other factors besides cost must also be considered. We will now consider another kind of cost often considered in location decisions: transportation costs. Transportation costs sometimes play an important role in location decisions. The company can include the transportation costs in a locational cost-volume analysis by incorporating the transportation cost per unit being shipped into the variable cost per unit if a facility will be the sole source or destination of shipments. The company can also include the transportation cost as a fixed cost to be added to the system. The company should undertake a separate analysis of transportation. In this case, transportation mode of linear programming is very helpful. The model is used to analyze each of the configurations considered, and it reveals the minimum costs each would provide. Then the information can be included in the evaluation of location alternatives. Multiple Plant Manufacturing Strategies (page 381-382) When companies have several manufacturing facilities there are several different ways for a company to organize their operations. These ways include: assigning different product lines to different plants, assigning different market areas to different plants, or assigning different processes to different plants. These strategies carry their own cost and managerial implications, but they also carry a certain competitive advantage. There are four different types of plant strategies: Products or product lines are produced in separate plants, and each plant is usually responsible for supplying the entire domestic market. It is a decentralized approach as each plant focuses on a narrow set of requirements that includes specialization of labor, materials, and equipment along product lines. Specialization involved in this strategy

usually results in economies of scale and, compared to multipurpose plants, lower operating costs. The plant locations can either be widely scattered or placed relatively close to one another. 2. Market Area Plant Strategy Here, plants are designed to serve a particular geographic segment of a market. The individual plants can produce either most, or all of the company's products and supply a limited geographical area. The operating costs of this strategy are often times higher than those of product plants, but savings on shipping costs for comparable products can be made. This strategy is useful when shipping costs are high due to volume, weight, or other factors. It can also bring the added benefits of faster delivery and response times to local needs. It requires a centralized coordination of decisions to add or delete plants, or to expand or downsize current plants because of changing market conditions. 3. Process Plant Strategy Here, different plants concentrate on different aspects of a process. This strategy is most useful when products have numerous components; separating the production of components results in less confusion than if all the production were done in the same location. A major issue with this strategy is the coordination of production throughout the system, and it requires a highly informed, centralized administration in order to be an effective operation. It can bring about additional shipping costs, but a key benefit is that individual plants are highly specialized and generate volumes that brings economies of scale. 4. General-Purpose Plant Strategy Plants are flexible and have the ability to handle a range of products It allows for a quick response to products and market changes, but can be less productive than a more focused approach. A benefit to this approach is the increase in learning opportunities that happens when similar operations are being done in different plants. Solutions to problems as well as improvements made at one plant can be shared with the other plants Question 1: From a company standpoint, which factors determine the desirability of a community as a place for its workers and managers to live? A) The amount of parking spaces B) Retail stores C) Schools D) Locals attitudes towards the company. E) Both C and D. . Question 2: What is NOT a risk a corporation must consider when planning a location? A) Political B) Exporting C) Economic D) Cultural E) Economic Question 3: What do banks, fast-food chains, supermarkets, and retail stores view locations as? A) One in many intricate decisions for their organizations B) A crucial part of the marketing strategy. C) An easier way to distribute their product or service. D) New ideas for future investments. E) A second home. Question 4: What is the third step when making location decisions? A) Evaluate the alternatives and make a selection. B) Identify important factors. C) Decide on criteria for evaluating alternatives. D) Develop location alternatives. E) None of the above. Question 5: What is the center of gravity method? A) A method that determines the location of a facility that will minimize shipping cost and travel time to various destinations. B) A method that determines the location of a facility closest to the most number of consumers. C) A method that determines the location of a facility closest to the main supplier D) A method that determines the location of a facility in the middle-point of all suppliers. E) none of the above 1.) Location analysis assumes that both qualitative and quantitative factors are important in determining an ideal location when using: a. The Transportation Model b. The Center of Gravity Method c. Factor Rating d. Cost-Profit Analysis e. None of the above 2.) The transportation model can be applied to solve factors including: I. Cost II. Profit III. Capacity IV. Management a. I only b. I and II only c. I, II, and III only d. II, III, and IV only e. II and IV only 3.) The Transportation Model uses the following information to determine costs: a. A list of shipping origins b. Demand of destinations c. Unit costs d. None of the above e. All of the above 4.) Which is a TRUE assumption needed to perform Cost-Profit Volume Analysis? a. Fixed costs are exponential b. Variable costs are logarithmic c. All costs are linear d. At least 2 products are being compared e. Revenue is NOT included in the analysis 5.) In the Factor Rating Method of location analysis, which of the following is NOT adding the applied (weight x value) of various categories to get a composite for a location c. Determining the ultimate choice for the location d. Assigning information gathering on a location e. All of the above are managerial choices Question 5 needs an answer, also needs page numbers where answers are found 1) What does GIS stand for? A. General Information Systems B. Great Information Systems C. Geographic Information Systems D. General Institutions E. None of the above 2)The primary consideration for identifying a site is? A. Location B. Zoning C. Transportation D. None of the Above E. All of the above 3) What are the common techniques used to evaluate location alternatives? A. Locational cost-profit-volume analysis B. Factor ratings C. Center of gravity method D. Transportation model E. All of the above 4) What is a general-purpose plant strategy? A. A general approach to evaluating locations that include qualitative and quantitative inputs. B. A way to evaluate rating of geographic area C. A general approach to evaluating locations that include regional inputs. D. A way of being capable of handling a wide range of different products. E. None of the above 5) Method for locating a distribution center that minimizes the distribution costs. A.Location cost-poit-volume analysis B. Method for finding balance between company culture and geographic culture. C. Method that compares costs to benefits D. All of the above. E. None of the above 1) What is a primary factor in the regional level of location decisions? A. Location of raw materials or supplies B. Quality of life C. Location of markets D. A and C E. None of the above 2) In a geographic information system (GIS), which is NOT involved in the data? A. Age B. Incomes C. Quality of life D. Type of employment E. Type of housing 3) What is a disadvantage of globalization? A. Transportation costs B. Security costs C. Unskilled labor D. Import restrictions E. All of the above 4) Mining operations, farming, forestry, and fishing are all examples of which primary reason for firms locating near or at the source of raw materials? A. Necessity B. Perishability C. Transportation costs D. Processing E. None of the above 5) Which of the following would you establish a composite value for? A. The transportation model B. Factor rating C. The center of gravity method D. Locational Cost-Profit-Volume Analysis E. Geographic information system 1. Which of these is a computer-based tool for collecting, storing, retrieving, and displaying demographic data on maps? A. Geographic Data System B. Geographic Information System C. Demographic Data System D. CAM E. none of the above 2. Which is a major consideration when choosing to operate in a region? A. the minimum wage rate B. identifying a community C. location to raw materials D. possible sites available E. none of the above 3. Considering global expansion, decision makers need to be absolutely clear on the benefits and risks and the likelihood of their occurrences when deciding upon identifying: A. a continent B. a site C. a community D. a country E. none of the above 4. A dominant factor that influences the location decision of a manufacturing firm is: A. Climate changes B. Location to competitors C. Proximity to markets D. Transportation cost E. none of the above 5. Which of the following is Not a primary consideration when identifying a site for operations? A. Land B. Transportation C. Zoning D. Future expansion E. All of the Above 1 . When using the Center of Gravity Method, what are the two differing variables for equal and unequal quantities shipped, respectively? a. n 1 ; n 2 b. n;Q c. n; n i d. e; u e e. n; Q i 2. Which location alternative technique involves viewing the problem in economic terms? a. Factor Rating b. CVP c. GIS d. Center of Gravity e. Transportation Model 3. When considering foreign locations, crime, and the threat of terrorism fall under which category? a. Safety b. Cultural Differences c. Market d. Financial e. Customer Preferences 4. When using the factor rating method of location alternative evaluation, which of the following could be considered relevant factors? a. Location of market b. Water supply c. Parking facilities d. Revenue potential e. All of the above 5. Which of the following is not a step in the general procedure for making location decisions? a. Develop location alternatives b. Evaluate the alternatives and make a selection c. Gain government approval of location alternatives d. Decide on criteria for evaluating alternatives e. Identify important factors (e.g., location of markets) Chapter 8 Summary: The location of a business is crucial to it's growth. There are many factors that come into play when choosing a suitable location. Usually it is one or a few factors that dominate the decision making process. For example, a change in market supply and/or demand, perhaps even if inputs used by the business have run out. A business can suffer greatly if the right location is not chosen. Therefore a business should evaluate all their options very carefully before making a final conclusion. There are generally four options a manager has with regard to location planning. The first option would be to take the current facility and make it bigger. The second would be to keep the current facility and just create a (or many) new one(s). The third would be to close down the current facility entirely and build a new one. The last option would be to keep things the way they are. Questions: Questions need to be multiple choice format. 1. What is the name of the computer-based tool used for collecting, storing, retrieving, and displaying demographic data on maps? 2. True or False: Most organizations try to find the one best location. 3. What are the three primary regional factors involved in location decision making? 4. Name three trade agreements mentioned in this chapter. 5. What are five disadvantages to having global operations? 6. Suppose that the operating costs of a company has a weight of .20. There are three possible location choices. The first location has a score of 60/100. The second location has a score of 50/100. The third location has a score of 80/100. What are the weighted scores of each location possibility? 7. What are some benefits associated with a company moving it's operation's globally? 8. What is the center of gravity method used for? 9. Find the center of gravity with the information provided below. Destination x y L1 8 5 L2 6 2 L3 4 3 L4 3 5 10. Determine the center of gravity based on the following information: Destination x y Weekly Quantity L1 7 6 700 L2 5 3 500 L3 8 6 800 L4 6 4 600 L5 2 2 200 Total 28 21 2,800 11. Use the table below and the cost-profit-volume analysis to determine the B Superior range approximation. Location Fixed Costs per Year Variable Costs per Unit 1 \$250,000 \$20 2 \$150,000 \$50 3 \$350,000 \$25 4 \$225,000 \$40 12. Use the table from Question 12 and the cost-profit-volume analysis to find the C Superior range approximation. Use the following information to answer question 1-3: A firm paid \$2000 for rent, \$300 for maintenance fee in January. They sold 2000 units in the month and the cost per unit was \$5. The price for the product is \$10 per unit. 1. What is their total costs for the month? a. \$2300 b. \$10000 c. \$12300 d. \$2000 e. none of the above 2. What is the firm's total revenue for the month? a. \$20000 b. \$10000 c. \$2300 d. \$2000 e. none of the above 3. What is the firm's profit for the month ? a. \$20000 b. \$10000 c. \$12300 d. \$7700 e. none of the above 4. If two alternatives yield comparable annual costs, management would be indifferent in choosing between the two in terms of _____. a. total revenue b. total costs c. total profit d. total variable costs e. total fixed costs 5. The transportation cost must be converted into cost per unit of in order to correspond to other variable costs if raw materials are involved. a. input b. output c. initial input d. both a& b e. none of the above 6. Which of the following is NOT a governmental factor when locating in a foreign region? a) Import restrictions b) Currency restrictions c) Liability laws d) Local product standards e) all of the above Choose a business that you would be interested in opening in your community. How would you decide where to locate that business? What would you be most concerned about in making this choice?