PROJECT

The following case study concerns a retail company that has a central warehouse in the Boston area. This warehouse serves 24 retailers all located in that region. Our objective is to establish effective reorder intervals for a single product that accounts for more than 80 percent of total sales. The company uses direct shipping strategy to distribute the product, i.e., each truck delivers items to one retailer per trip.

Table 1 provides information on the warehouse and the 24 retailers served by it: the X and Y coordinates for each retailer and the warehouse, D, the demand rate per year for the main product faced by each retailer, H, cost of holding an item per unit of time (year) at each retailer and at the warehouse.

Each time the warehouse delivers items to a retailer there is an additional set-up cost proportional to the distance between the warehouse and that retailer. This cost is approximated by

$$\alpha d_i + C$$

where d_i is the distance between the warehouse and the retailer, $\alpha = 0.32$ dollar per mile and $C = 150\$$. Finally, every time the warehouse places an order, it pays a set up cost of 400\$.

(i) Find an effective reorder interval for each retailer and the warehouse.

(ii) Find the total cost associated with your distribution strategy.

(iii) Show that your solution is within 6% from the optimal solution.

(iv) Can you improve the solution?

Table 1

Retail No.	X	Y	Holding Cost $/item/year	Demand in a Year
0	4.7	3.9	1	
1	0.2	5.6	10	200
2	2.7	0.9	10	700
3	6.1	4.3	5	50
4	7.1	7.9	2	20
5	8.4	2.4	10	300
6	5.7	6.1	2	20
7	8.7	6.2	2	40
8	1.5	4.6	10	500
9	9.9	4.3	3	60
10	7.9	2.9	10	70
11	9.7	2.5	3	80
12	6.5	1.5	2	700
13	3.3	5.8	2	900
14	3.6	9.1	10	600
15	6.9	0.6	14	500
16	5.0	0.5	5	1200
17	5.7	6.8	10	600
18	3.7	8.0	3	300
19	3.7	5.6	5	400
20	5.7	4.7	4	500
21	6.3	3.2	3	50
22	3.4	4.4	5	100
23	5.1	3.8	3	70
24	4.0	6.0	5	150

Retailer # 0 is the warehouse.

The coordinates are given in hundreds of miles.