

Parameters:

f_i : Operating expense for center i

O_i : Opening expense for center i

K_i : Center capacity for center i

d_{ij} : Distance between center i and region j

Variables:

y_{it} : whether to open center i at time t

x_{ijt} : number of hours allocated from center i to region j at time t

h_{it} : number of new hires for center i at time t

w_{it} : number of existing workers for center i at time t

Objective Function:

$$\text{Max} \sum_{t=1}^T \sum_{i=1}^n \sum_{j=1}^m c_{ijt} x_{ijt} + \sum_{t=1}^T \sum_{i=1}^n f_i y_{it} + \sum_{i=1}^n O_i y_{i1} + \sum_{t=1}^T \sum_{i=1}^n h_{it} * 15,000$$

$$\text{where: } c_{ijt} = 37.85 * 1.025^{t-1} + 0.25 * d_{ij} - 42$$

Constraints:

- Constraint for the variables bounds:

$$\begin{aligned} x_{ijt}, h_{it}, w_{it} &\geq 0 && \text{for } i = 1, \dots, n; \text{ for } j = 1, \dots, m; \text{ for } t = 1, \dots, T \\ h_{it} &\leq 300 && \text{for } i = 1, \dots, n; \text{ for } t = 1, \dots, T \\ y_{it} &\in \{0,1\} && \text{for } i = 1, \dots, n; \text{ for } t = 1, \dots, T \end{aligned}$$

- Constraint for Center A, B, C, D must be open:

$$y_{i1} = 1 \quad \text{for } i = 1, \dots, n$$

- Constraint for opened centers in period 1 must remain open:

$$y_{it} = y_{i(t-1)} \quad \text{for } i = 1, \dots, n; \text{ for } t = 2, \dots, T$$

- Constraint for Demand - all demand must be satisfied:

$$\sum_{i=1}^n x_{ijt} = D_{jt} \quad \text{for } j = 1, \dots, m; \text{ for } t = 1, \dots, T$$

- Constraint for Center Capacity – all centers would not pass it's maximum capacity

$$\sum_{j=1}^m x_{ijt} \leq K_i y_{it} \quad \text{for } j = 1, \dots, m; \quad \text{for } t = 1, \dots, T$$

- Constraint for HP's (workers) Capacity – all centers should not surpass their maximum working hour

$$\sum_{j=1}^m x_{ijt} \leq 6 * 250 * (h_{it} + w_{it}) \quad \text{for } i = 1, \dots, n; \quad \text{for } t = 1, \dots, T$$

- Constraint for total number of worker that can be allcated in the first year:

$$\sum_{i=1}^n w_{i1} = 560 \quad \text{for } i = 1, \dots, n$$

- Constraint for the flow of workers (workers can not reallocated to other places after year 1)

$$w_{it} = w_{i(t-1)} + h_{i(t-1)} \quad \text{for } i = 1, \dots, n; \quad \text{for } t = 2, \dots, T$$