Recruiting Office Placement and Sizing: Frommer #1(v1.3)

This was based on a 2017 ORCA Capstone and updated for a 2024 MGMT Capstone.

Warning: this is a draft model and has not be verified nor validated.

Indices

i = Recruiting office (RO) number, $i = 1, 2, ..., R$

j = Market (CBSA) number, $j = 1, 2, ..., M$

Sets

IR_i = Set of markets within the inner ring (60 miles) of RO i

OR_i = Set of markets within the outer ring (60-120 miles) of RO i

AR_i = Set of markets within any ring of RO i, equals $IR_i \bigcup OR_i$

IR_j^{-1} = Set of ROs for which market j is an “inner-ring” market

OR_j^{-1} = Set of ROs for which market j is an “outer-ring” market

AR_j^{-1} = Set of ROs for which market j is any type of market, equals $IR_j^{-1} \bigcup OR_j^{-1}$

Model Parameters

d_j = Total potential accessions from market j

c = Expected “supply” (i.e. recruits accessed) per recruiter

μ = Recruiting office size for each office (in number of personnel)

w_{OR} = Outer ring reduction weight reflecting reduced recruiter effectiveness in its “Outer Ring” markets

a_i = attraction factor of recruiting office i, values greater than 1 indicate the RO can more effectively attract recruits than is normal, which would be a value of 1.

n = Maximum number of recruiting offices that may be opened

M = ”Big M” larger than the max expected supply from an RO, used to ensure RO indicator variable is turned on as appropriate

ϵ = very small number used to ensure RO indicator variable is turned off as appropriate, can be set to $1/M$

Decision Variables

x_{ij} = Amount of recruitment "received" (i.e. number of accessions serviced) at market j from RO i

$$\delta_i = \begin{cases} 1 & \text{if RO } i \text{ is established,} \\ 0 & \text{otherwise} \end{cases}$$

μ_i = size of recruiting office (in number of personnel)

Objective

$$\text{maximize} \sum_{i=1}^{R} \sum_{j \in AR_i} x_{ij} \qquad \text{Maximize Total Accessions}$$

Constraints

$$\sum_{j \in AR_i} x_{ij} \leq c\mu, \quad i = 1, 2, ...R \tag{1}$$

(ensure recruiting transmitted does not exceed office "supply")

$$\sum_{i \in IR_j^{-1}} a_i x_{ij} + w_{OR} \sum_{i \in OR_j^{-1}} a_i x_{ij} \leq d_j, \quad j = 1, 2, ..., M \quad \text{(limit to accessions in a given market)} \tag{2}$$

$$\sum_{i=1}^{R} \delta_i \leq n \quad \text{(number of ROs does not exceed maximum allowed)} \tag{3}$$

Next 2 constraints insure RO indicator variables are switched on or off depending on whether the RO transmits supply or not.

$$\sum_{j \in AR_i} x_{ij}/M <= \delta_i, \quad i = 1, 2, ..., R \tag{4}$$

$$\delta_i <= \sum_{j \in AR_i} x_{ij}/\epsilon, \quad i = 1, 2, ..., R \tag{5}$$

Variable Restrictions

$x_{ij} \geq 0$

δ_i binary

μ_i integer (and constraints above enforce that $\mu_i \in \{0, \mu_L, \ldots, \mu_H\}$)

Additional Explanation

- As formulated above, the model contains no “demand” satisfaction constraints, that is, there is no requirement for any potential accession to be obtained. This could easily be added with a set of constraints either uniformly or on a market case-by-case basis.