

Please formulate the mathematical model for the following business problem. The mathematical model would consist of:

- Sets
- Parameters
- Decision Variables
- Objective function
- Constraints
- Necessary assumptions

You can write the mathematical model in MS Word, MS Powerpoint, or any other medium of your choice.

Alternatively, you can write the mathematical model on paper and upload the scanned image.

Please make any assumptions which you feel are necessary for solving the problem.

Also if you think there is any rule/metric which the model should try to attain, but is not mentioned in the document, please feel free to add that.

Deadline: Please submit the assignment by 9th April 11 PM.

Note: This assignment would have 15% weightage

Business problem:

- How to fit all employees within the limited capacity as teams have expanded in size after the COVID-19 pandemic (although the real estate space has remained same)? While doing so, different constraints around employees' visiting patterns must be honored. Certain teams would have collaboration days for its team members. Also it should be a fair share allocation across teams.
- How to allocate seats to employees? Seats are no longer fixed – employees would not have dedicated cubicles anymore but could be assigned different seats on different days.

How the model allocates fixed & floating seats:

Fixed seats – Assured allocation

Floating seats – Remaining seats after allocating fixed seats would be proportionally distributed across the teams, while ensuring that the minimum threshold provided in the collaboration map is reached.

If a team provides too high target in collaboration map, the model can do any of the following:

- Suggest feasible count (but allocate at least say 60% of the target)
- Shift the collaboration to a different day for not more than 1 day
- Shift some team members to a different floor

Model output

Number of employees from each team who can visit office on different days and which floor they would occupy

Objectives

Maximize total occupancy

Fair share allocation across teams

Minimize number of floors occupied by a team

Minimize number of teams who are occupying multiple floors

Ensure as much as possible that a team sits on the same floor across most days.

If seat requirement is less than capacity (Christmas, New year etc.) allocation would be done so that only some floors are occupied. This would save indirect cost (electricity cost, housekeeping cost, pantry/cafeteria cost etc.) for the unoccupied floors

Constraints

Do not exceed capacity of different floors

Fixed seats – Assured allocation

Collaboration pattern (eg: M/W/F, T/Th etc.)

Team leaders would have the following choices if the model cannot allocate the complete requirement on the desired floor(s)

- Move to other floors?
- Move to other days of the week?
- Reduced employee count (if the model can't allocate all the employees)?

Max loading across all teams on a day will not be x% more than min loading i.e. if $x = 20\%$, and min loading for the week = 1000, then max loading for the remaining 4 days of the week cannot exceed 1200.

To maintain social distancing norms, update available capacity to appropriate value eg: 25%, 50%, 70%

Night shift employees can be excluded from the model as they can occupy the same spaces vacated by day shift employees.

Teams needing a lot of collaboration should be on the same floor. Teams who do not need much collaboration can occupy different floors.

Minimum allocation on any day/team on a floor ≥ 5 (i.e. 0 or at least 5 employees)