Workspace Assignment Project
SCMA 645 Management Science
Virginia Commonwealth University
Spring 2020

We have discussed mathematical programming modeling techniques and implementation. Our focus turns now to a real-world project where we will put what we have learned into practice. The project will give us the opportunity to use our modeling, software, and written communication skills to provide services for a real-world client.

You are to form two-person teams with another member of the class. Send an email with your team members to the instructor at `jpbrooks@vcu.edu` by April 3rd, 2020, or indicate that you have no partner.

1 Milestones

1. **Questions for client.** Submit one to three questions for the client on Blackboard.
2. **Develop prototype.** Your group will work to develop a prototype optimization model based on the information that we have. You will need to improvise in order to produce a complete model, both in terms of a lack of information and a lack of data, and you should note how you address these gaps in your initial submission. Include the Essential Components of an Optimization Solution.
3. **Incorporate data and client visit.** The clients will visit class to answer questions about their processes and respond to requests for data.
4. **Final report.** In your final report, you will provide recommendations from the modeling exercise. More details on the format of the report are included below.

2 Timeline

1. April 10th. Submit questions for the client via Blackboard.
2. April 16th (to be verified). Client visit to class.
3. April 17th. Turn in a prototype model. Include all essential components of a mathematical programming model solution. The data for the model should be a small example using data that you generate. You do not need to incorporate input from the client visit into this initial report.
4. May 1st. Final report due.

3 Evaluation

The initial report should contain all of the "Essential Components of an Optimization Solution," consistent with other homework assignments.

The final report is limited to 10 pages (double spaced, 12 point font) excluding the appendix. The report should be written in narrative form using complete sentences and correct grammar. Submit your report in pdf format via Blackboard. Turn in your code and data as separate files.

The final report should have the following format:

1. A one page executive summary with an introduction to the problem, an introduction to you and how you came to work on the project (i.e., explain that you are students and that this was assigned as a class project and a general timeline for your work on the project), a description of the problem, a summary of the approach, and a summary of the results and recommendations. The executive summary should explicitly state all major findings - do not save them for the body of the report.

2. A presentation of the model with all of the "Essential Components of an Optimization Solution." To address the nuances of the problem and explain assumptions, it will be necessary to expand on the essential components and provide further explanation.

3. Additional information about the modeling methodology and results.

4. Conclusions and recommendations.

5. An appendix with your code along with other implementation details.

The final report should describe the problem, summarize results, and make recommendations for the client. Write the report in a manner that allows the reader to understand the outcomes without needing to understand the mathematical details of your model. When describing the methodology, describe the software tools that you use and how you use them.

Your project grade will be comprised of the following: questions for the client 5%, prototype model and initial report 20%, final report 75%.

4 Project Overview

The Information Technology (IT) functional groups hosted within the Federal Reserve Bank of Richmond reorganize approximately every six months. Each worker and team is potentially assigned a new workspace in the facility in downtown Richmond.

Objective. Our objective is to build a model that can help the Federal Reserve Bank of Richmond to decide how to allocate office space to workers and teams according to bank policy.

Requirements.

- There are approximately 100 workers for each floor. There are 17 floors and so approximately 1,700 workers to locate. Addressing assignments for a floor would be helpful; perhaps the same model can be scaled for the entire building or be incorporated into a framework for allocating space for the whole building.
- Workers are eligible for certain spaces based on their rank in the organization.
- The kinds of workspaces include: corner office, 3-window office, 2-window office, external (near a window) cubicle, internal cubicle, internal conference room, internal office.
- Workers belong to teams. Team sizes may vary, but are typically between 5 and 30 workers.
- There are 2 objectives: minimize the number of moves and minimize the distances of workers to other members of their team.
- A typical assignment for a team with 10 workers with seniority would be: a corner office, an adjacent 3-window office, and adjacent 2-window office, and 7 external cubicles.
- A typical assignment for a team with 8 workers without seniority would be: an internal conference room and 5 internal cubicles. Again there are more workers than offices plus cubicles. At any given time, multiple workers will occupy the conference room while the remainder are in the cubicles. The maximum capacity of a conference room is 6.
- A typical floor consists of 4 corner offices, 4 3-window offices (1 along each side), 8 2-window offices (2 along each side), 8 internal offices, and 2 conference rooms, 24 internal cubicles, and 24 external cubicles.
- Each of the 4 sides of a floor has a set of cubicles. Side A has 14 cubicles, side B has 14 cubicles, side C has 12 cubicles, and side D has 8 cubicles. In each set, half of the cubicles are internal and half are external. The internal offices are on sides A and C of each floor (there are no internal offices on the other 2 sides). Sides A and C are opposite each other.
- There are 4 floors with shared conference rooms and 13 floors without shared conference rooms.
- On floors with shared conference rooms, the ratio of those assigned a workspace to spaces reserved for teleworkers is 1:3. On floors without shared conference rooms, the ratio is 1:2.
- On floors with shared conference rooms, there are 84 seats. On floors without shared conference rooms, there are 72 seats.
- The distance from corner office to corner office is 110 feet.
- Cubicles are 6 feet by 8 feet. Sets of 4 cubicles can be arranged to be open to one another with collaboration shell tables in the middle. There are also sets of 6 and 7 cubicles.