Title

Tanvi Chandel

Introduction:

The case study talks about a real world industry problem while making us aware of the upcoming technologies and various industrial practices to mitigate the lack of water management with an introduction of a proper water management solution. The overall project talks about the Suez town water network system that supplies water to three regions from a single source. The overall network also has various other facets or resources which are important in terms of the proper management of the supply and demand cycle which is the pumps, valves and tanks. The aim of the case study is to provide an optimal 24-hour schedule which could help the organization to minimize their overall cost with respect to some constraints in the network. We also consider the up gradation of the pump efficiency to analyze the section of the pump that would be profitable to upgrade and also the effect of increasing population to the existing solution and its various facets that might need some up gradation with time considering the optimal cost as well.

# Three Learning Points:

During the course of the case study there was a complete learning graph with three most important learning points:

**Technical learning:**

While working on the case study the first step was to identify the decision variables in the LPP formulation task which was the starting point of the project as this would define the overall solution.  We identified the overall decision variables for the formulation with proper constraints using Opt-Model with the help of an extended linear formulation of a pump scheduling problem. The only point where the team struggled was when the extensions were formulated and coded in SAS because for instance in the case of source which could only change flow after every 4 hours didn’t restrict to change at every 4 hours which was a big challenge for us and this was the only thing that didn’t go right for the first weeks as we spent a lot of our time working on the extensions even though we succeeded at the end. I would focus more on the town growth analysis as I feel that there is more to this section if provided with proper and more details about the resources used in the system. In future I would want to further optimize my code and look for some additional insights that may be used as a constraint to further minimize the cost.

**Team collaboration Experience:**

The project was allocated in teams of 4 – 5 members each to work on all the tasks. Our group members were quite supportive when the tasks were divided as each one of us was eager to work on each and every task of the project. The only thing that didn’t go well was that one of our group members never showed up to meetings, class or even in the presentation so we were left with just 3 members in the team. I would change the allocation of tasks next time as Surafel(one of my team members) and I were working together for the linear formulation and the SAS code for extensions which took a lot of our time in the project. It would have been a better idea if we would have divided this task as well to complete it as earliest as possible. If given a chance to do the project again I would want to talk to the organization people more to understand the cost required to upgrade each pump for cost benefit analysis which I missed to ask this time and then in future I would want to apply that understanding to provide even better results in cost benefit analysis section.

**Learning visualization using tableau:**

Attending forums provided us an idea to use tableau which would be an efficient way to visualize the optimal schedules for each resource available in the water network system. Tableau helps to visualize the data in an efficient way so that better investigations and actions could be taken to understand the valuable insights hidden in the data(McDaniel & McDaniel, 2013)**.**Thus, the user-friendly tool assisted us to have better graphs with various useful insights about the activation status of the pumps and valves which in turn helped in the cost benefit analysis discussions. Being a naïve user of tableau made work a bit time-consuming which was the only hurdle during the report formulation but the final results were satisfying. If I could do the case study again I would provide some more visualizations in the report to explain the cost benefit analysis and therefore, in the future I would want to explore more of Tableau and find even better ways of visualization which were not explored due to time constraint. This made me realize the extensive use of tableau that can be scaled to other projects as well which would be a better way to explain any type of analysis.

**Conclusion:**

This case study helped us to achieve an optimal 24 hour schedule for the Suez water distribution network in such a way that all the constraints are met with a minimized cost of $1910.5 which was further reduced to $1905.22 with the additional extension constraints that helped further improve the water supply and demand in the network. Further analysis also helped us to claim that with increased efficiency, Cornwall pump would provide improved profit to the organization. The compound growth of population by 10% also revealed that there is a need to upgrade the existing system which would become infeasible after the third year. This case study helps us to understand the need of a proper agile approach to build any solution as the requirement of a particular project or any solution changes with time that requires some alterations in the overall solution as well as helps us to understand several future opportunities that could be included in any working scenario or solution. With this case study we could understand the value of optimization to conserve water which is a very important resource in our day to day life and how SAS could help us to formulate this problem in an optimal and easy way.

# References

McDaniel, S., & McDaniel, E. (2013). Analyzing Your Data for Success at Work. In *Rapid Graphs with Tableau 8* (pp. 1–12). Apress. <https://doi.org/10.1007/978-1-4302-6736-2_1>