Business Case Study- Staff Planning Report

Q1. The company wants to know the optimised staffing recommendations for the business case described. Write the mathematical model for the deterministic optimisation problem. Define and explain your decision variables, objective function and the constraint.

Decision Variables are:

1. Number of Staff Members

2. Number of Outsourced Members

Objective function is:

Total Cost = (Number of Staffs) x (Salary of Staffs) + (Number of Outsourced Members) x (Cost of Outsourced members)

N.B.: 40 x StaffAvPer is number of applications of each staff member

Number of Outsourced Members = Number of Outsourced applications

- Constraints:

1. Number of Staffs x 40 x (StaffAvailability) +

   (Number of outsourced members) == Demand

2. For state A:

   Number of Outsourced Members <= 0.3 x (Demand)

3. For state B:

   Number of Outsourced Members <= 0.4 x (Demand)

Q2. Code the problem in Python using any optimization package of your choice. Refer to the notebook

Q3. The company also wants to know the staffing recommendations for the worst-case and best-case scenarios. As mentioned earlier, there are days that an employee will be unavailable to process applications due to training, off days, etc. This will affect employee availability.

3.1 Worst case analysis

3.1.1 What is the optimal number of staff members for the worst case?

State wise optimal number of staff members for the worst case is

]:

	State	Month	Number of Staffs	Number of Outsource	Demand	Staff Availability	Total Monthly Cost
0	A	Jan	187	0.0	5240	0.81	935714.29
1	A	Feb	131	1463.4	4878	0.76	920065.85
2	A	Mar	212	0.0	5942	0.75	1061071.43
3	A	Apr	77	0.0	2297	0.80	382833.33
4	A	May	71	0.0	1992	0.78	355714.29

3.1.2 What is the percentage of outsourcing for the worst case?

35.14%

3.1.3 What is the average cost per application for the worst case?

173 %

3.2 Best case analysis

3.2.1 What is the optimal number of staff members for the best case?

State wise optimal number of staff members for the best case is

	State	Month	Number of Staffs	Number of Outsource	Demand	Staff Availability	Total Monthly Cost
0	A	Jan	146	0.0	5240	0.81	727777.78
1	A	Feb	143	0.0	4878	0.76	717352.94
2	A	Mar	186	0.0	5942	0.75	928437.50
3	A	Apr	68	0.0	2297	0.80	337794.12
4	A	May	59	0.0	1992	0.78	292941.18

3.2.2 What is the percentage of outsourcing for the best case?

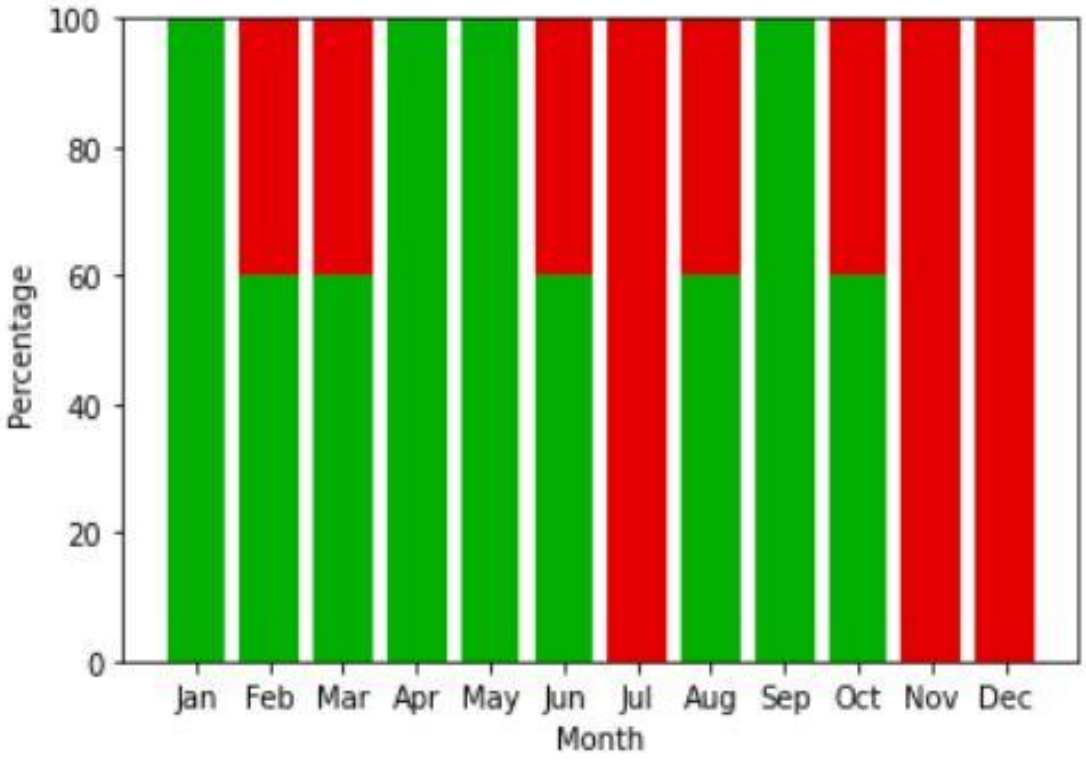
- 10.25%

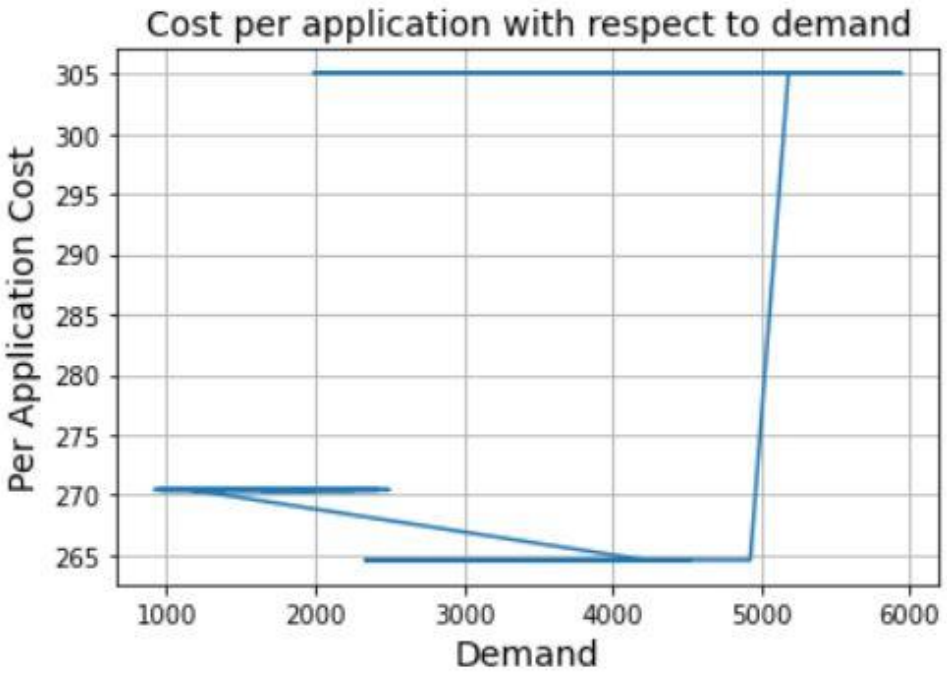
3.2.3 What is the average cost per application for the best case?

- 145.4%

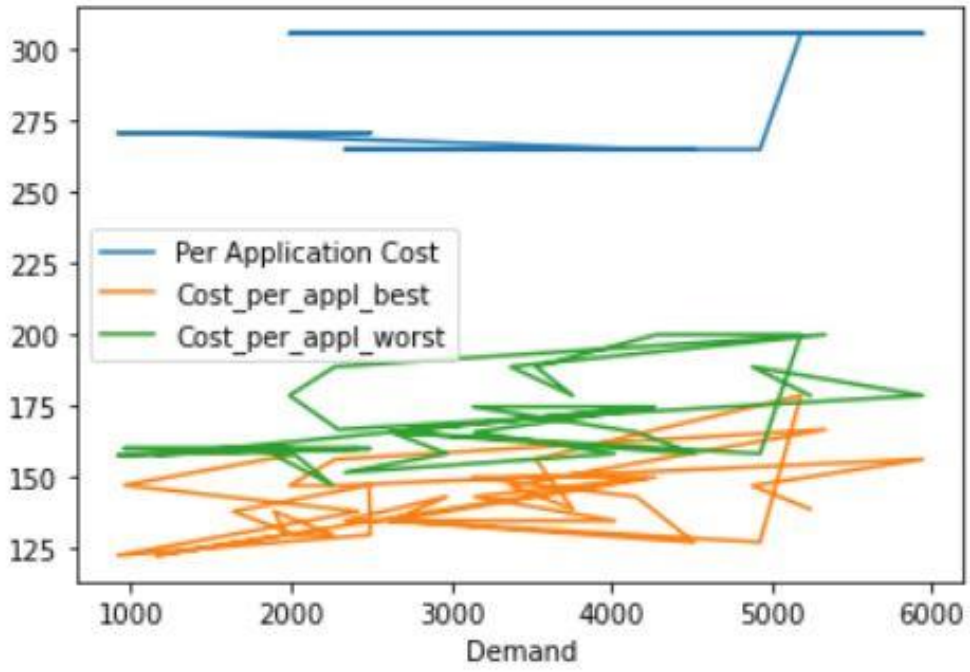
Q4. Create the following visualisations using your preferred method (i.e. Python, PowerPoint, Excel, etc.) and add it to your report

Stacked column chart that shows the percentage of applications processed by the staff and by the vendor for each month. Here, %staff processed applications + %vendor processed applications adds up to 100%.





Line graph displaying the cost per application increases with respect to changes in the parameters in your analysis for the generic, best- and worst-case scenarios.



INFERENCES:

• Optimisation is done for the total cost for the application approval process by distributing the right number of applications between the FTEs and the vendors while meeting the monthly demand for each state at the same time. • The company has to spend around 17.9 m$ in total for the application approval process.

• The company has to spend around 19.6 m$ in total for the application approval process if the staffs are working with the minimum availability.

• A less number of FTE (2761 FTE) in the worst case approve of the fact that less number of employees were available every month and hence more number of applications were outsourced to vendors, thus leading to higher total cost and average cost per application.

• The company has to spend around 16.5 m$ in total for the application approval process if the staffs are working with the maximum availability.

• A large number of FTE (3344 FTE) in the best case approve of the fact that more number of employees were able every month and hence less number of applications were outsourced to vendors, thus leading to lower total cost and average cost per application.

• For the months November, December and July an increase in outsourced applications can be seen which could be due to seasonal holidays leading to less employee availability.

• For the same months cost of applications also see a rise as we are outsourcing applications more which is more costly.