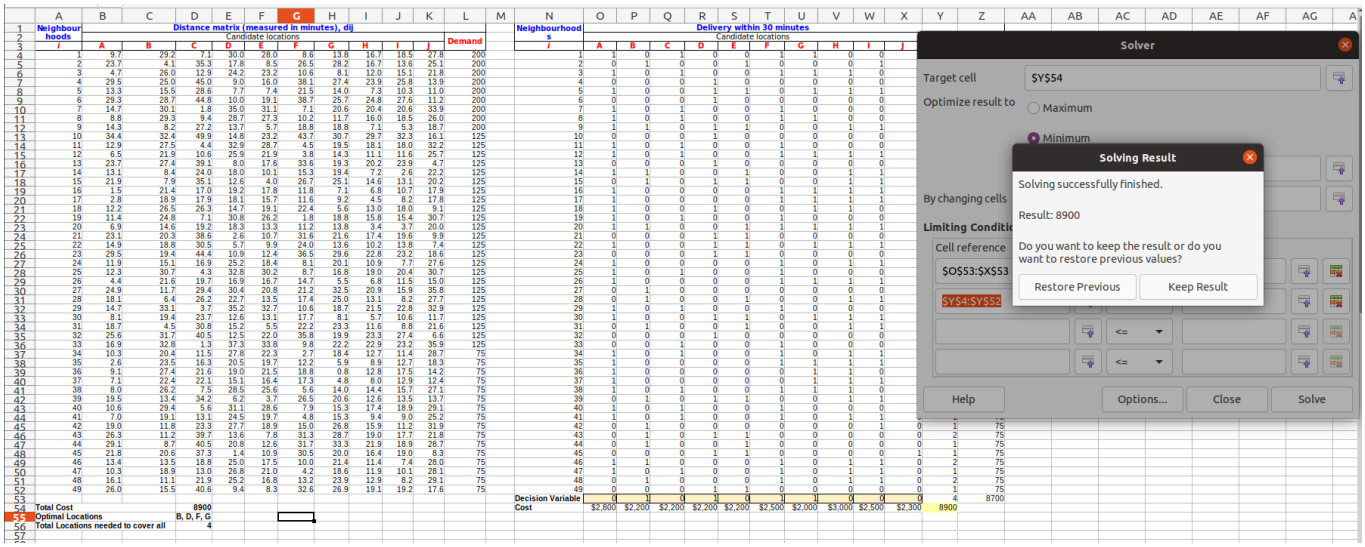
Case 2: IE7200 - Supply Chain Engineering

Part I: YumPizza initially started to serve all customers without a budget constraint.



1. Solve for the optimal pizzeria locations using Excel. How many facilities do you need to cover all neighborhoods? What is the total cost?

Answer:
According to Solver's solution, we need to open pizzerias at four locations — B, D, F, and G — to service every neighborhood. This configuration satisfies the coverage requirements and upholds the 30-minute delivery guarantee. The entire amount needed to open and run these facilities is **$8,900**.

2. What are your overall observations on your approach?

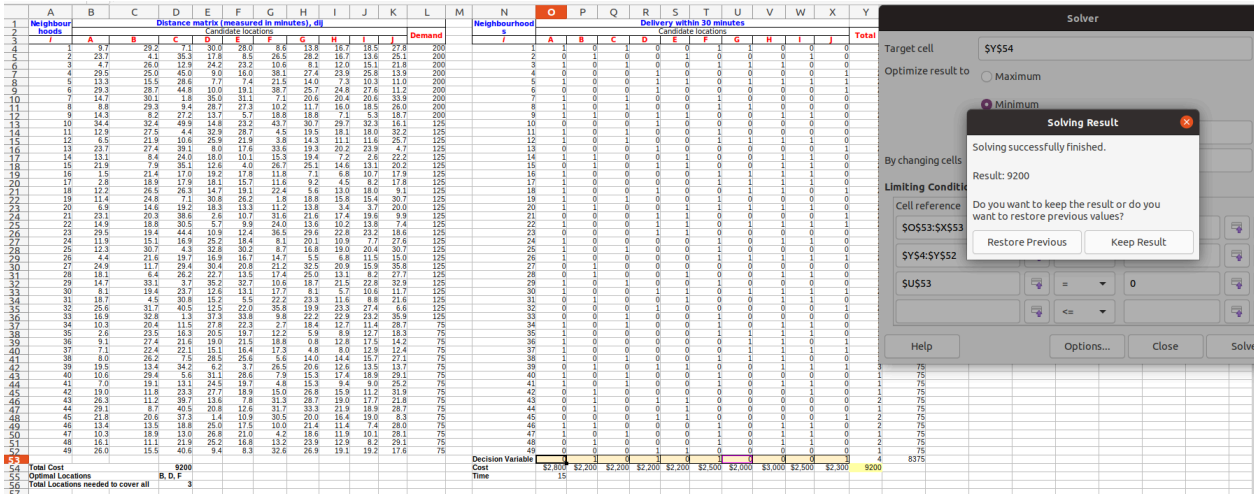
Answer:

- **Budget Constraint-Free Optimization:** YumPizza's original goal was to serve every neighborhood without taking financial restrictions into account. The only topics covered in this scenario were service level agreements (SLA) and coverage, specifically the 30-minute delivery guarantee.
- **Strategic Facility Placement:** According to the solver's solution, which calls for the opening of pizzerias at sites B, D, F, and G, these locations were most likely centrally located or purposefully positioned to effectively service all 49 neighborhoods.
- **Total Cost Calculation:** To evaluate the long-term profitability and sustainability of the ideal locations, the $8,900 total cost of those locations must be compared to the monthly leasing costs of those locations.

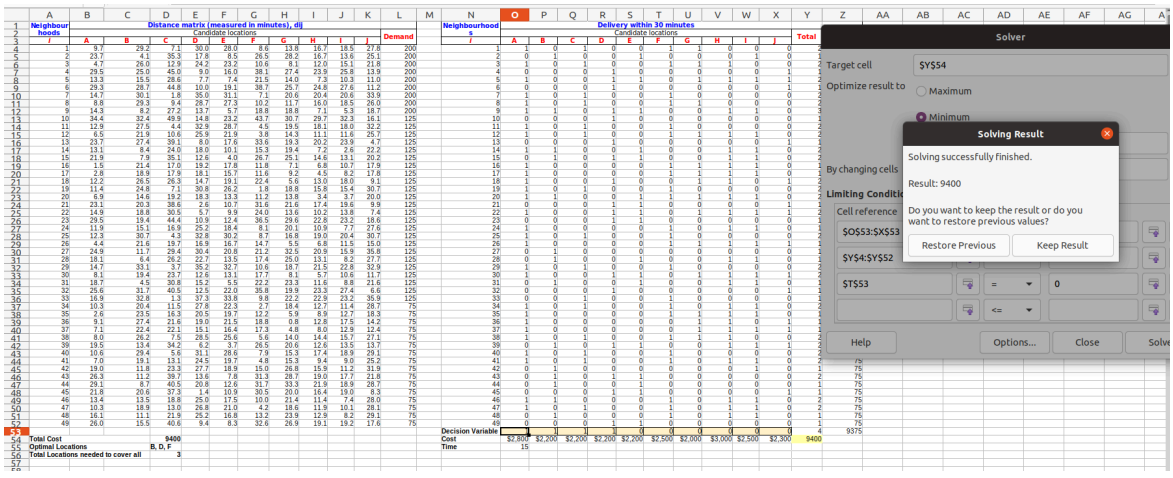
3. Perform sensitivity analysis such as the marginal coverage of the very last facility location, the second to the last facility and so on.

Answer:

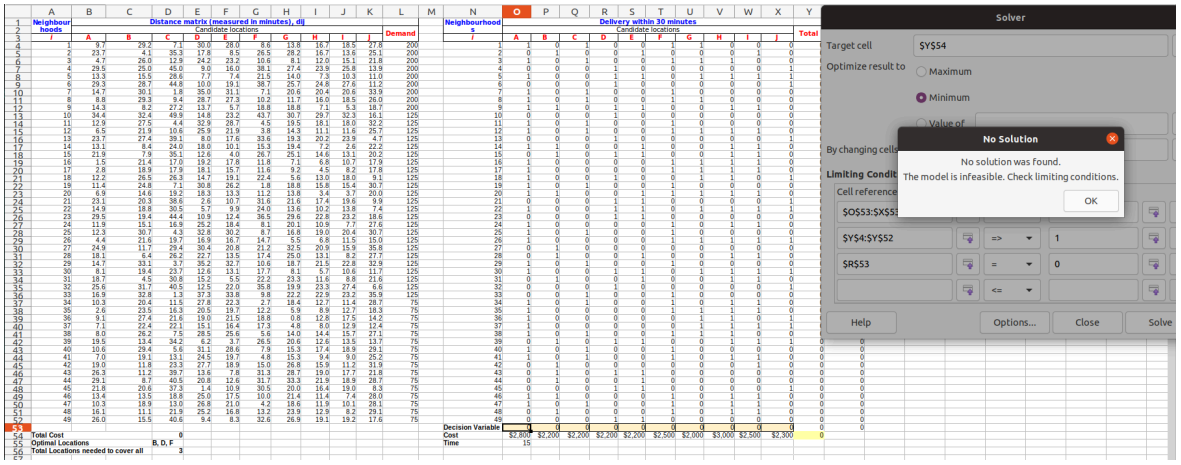
Without G: The entire cost is $9,200 without G. This suggests that the total cost goes up by $300 when facility G is removed from the network in comparison to the original solution ($8,900). This cost increase is probably the result of the extra distance that G's initial coverage of the neighborhoods requires the remaining facilities to travel, proving that G was improving the efficiency of the network.



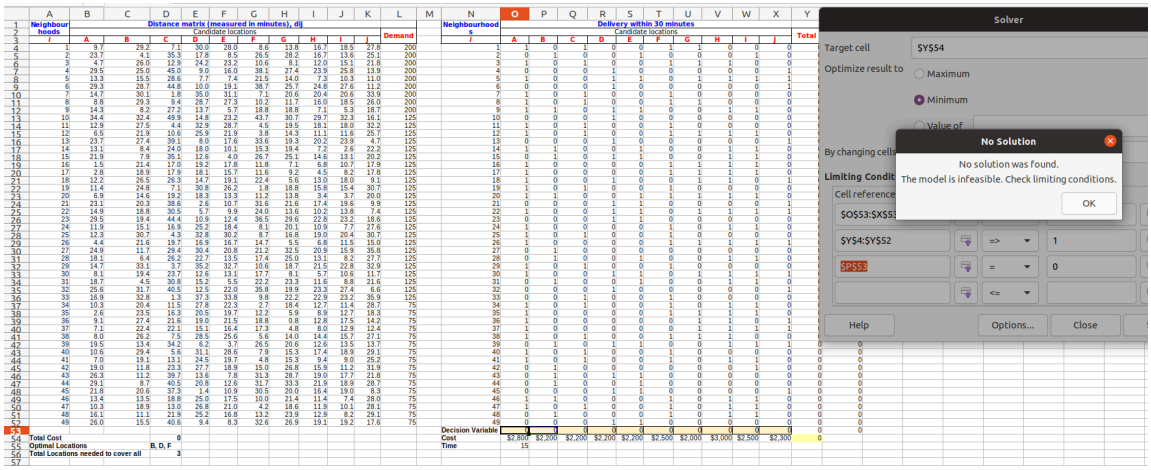
Without F: The entire expenditure goes up to $9,400. This is $200 more than what was originally paid when facility G was eliminated, indicating that facility F was also crucial to the effective servicing of certain neighborhoods. The additional expense is a reflection of the coverage that F was no longer offering.



Without D: The model can no longer be implemented. Given that the removal of facility D would prevent any possible configuration of the surviving facilities to serve every neighborhood within the 30-minute delivery window, this suggests that facility D is crucial to the network. Facility D acts as a bridge to cover the furthest neighborhoods, or it must be positioned strategically to cover areas that other facilities cannot.

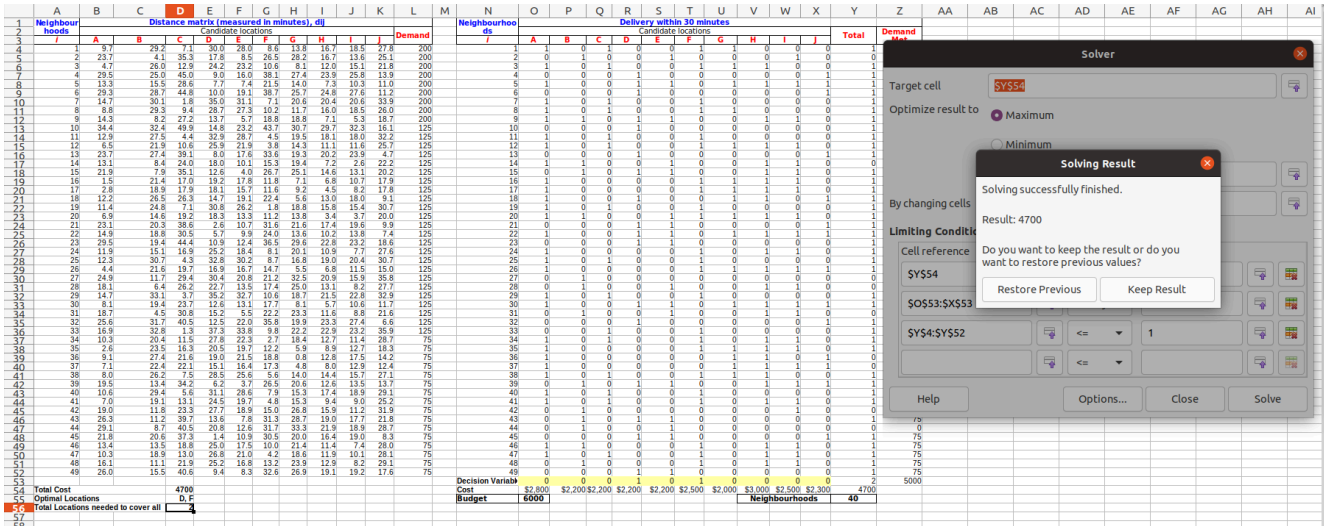


Without B: In the same way, eliminating facility B also makes a solution unworkable, suggesting that B is equally important to achieving the 30-minute delivery coverage as D. It could be covering a restricted area that other facilities are unable to get to in the allotted delivery time.



These findings show that while certain facilities (G and F) can be more adaptable regarding their network presence, other facilities (D and B) are required to maintain the required service level. YumPizza can use this type of sensitivity analysis to make well-informed decisions about future expansions or reductions by better understanding the significance and impact of each facility location within its service network.

Part II: YumPizza agrees that serving all customers may not be a realistic goal. Additionally, YumPizza can spend only $6, 000 per month for rent.



1. How would you suggest that YumPizza change its supply chain strategy? Specifically, what should they choose as an objective function and why?

Answer:

YumPizza should aim for an optimal balance between cost efficiency and customer satisfaction. The goal of their objective function would be to maximize the reach within the constraints of their budget, ensuring as many neighborhoods as possible are served while also minimizing the operational footprint by limiting the number of pizzeria locations required. This approach seeks to maintain their commitment to a 30-minute delivery promise.

2. Solve for the optimal pizzeria locations using Excel under the strategy and objective function proposed above. How many neighborhoods does YumPizza now serve? What is the total cost? What are your overall observations?

Answer:

Under the revised strategy, YumPizza manages to service 40 neighborhoods at a reduced expense of $4,700, utilizing just two facilities. This budget-conscious approach comes with the trade-off of not reaching all potential customers but focusing on servicing the highest density of demand within the financial limitations.

3. Compare with the previous solution in Part I where all neighborhoods are covered. Comments.

Answer:

The initial part of the strategy aimed for universal service coverage regardless of cost, ensuring every neighborhood had access to delivery services. The subsequent part shifts the strategy towards optimizing service delivery to the largest customer base possible without exceeding the budget. The company must evaluate if the extra expense of comprehensive coverage in the initial approach is offset by the additional revenue it could potentially generate.