Juice 2U Direct: Network Design Case Study

Background:

- You have been asked to help plan a new supply chain for Juice 2U Direct. Juice 2U Direct manufactures and sells their product direct to customers in the US, volume for each market is provided. Your deliverable will be a report to the Juice 2U Direct management team describing your recommendations under the various scenarios. Also, provide a detailed discussion of the model assumptions, explaining the choice of decision variables, objective function, and constraints.

Key points about the Juice 2U Direct model:

- An outbound shipment contains 6 bottles. Juice 2U Direct pays the shipping, it has a deal with a major parcel company where it is charged a fixed cost of $9.75/shipment, plus $3.5 for every 500 miles a shipment travels to a customer. Packaging materials are included in the shipment costs.
- Each candidate location has potential to be a manufacturing and/or distribution (warehouse) site. Fixed and variable costs are different by function at each location and available in the file.

Part 1 (Initial Analysis)

- Perform the network study, where should the company set up points of manufacturing and distribution (among the candidate facilities) minimizing fixed, variable, inbound and outbound costs.
- Note, manufacturing sites can service multiple warehouses facilities. Assume inbound costs of $3.00/mile between manufacture and warehouse locations, shipments are in truck load quantities 2000 bottles per.
- The company desires to make a 20% margin, what should their average per order charge be (include all costs)?

Part 2 Sensitivity Analysis (each to be analyzed separately unless noted)

- How is the model vulnerable to cost changes? What if fixed manufacturing, fixed distribution, inbound and outbound costs all separately increased and decreased by 50%?
- The company estimates sales will grow by 25% a year, what does the optimal network looks like in year 5?
- Growth in Texas (all cities) is expected to be double that of other markets (ie 50%), does this impact the network 5 years from now?
- The company is considering charging for shipping, they forecast losing 50% of customers, what is the impact to overall profits (note lost revenue but with less expenses)?
- A new shipping option is available, where a customer will receive 12 bottles at a time. The shipment cost will be a flat rate of $25 and order processing cost is estimated to be 50% higher. How will this influence the network if implemented across all shipments?

Develop a solution using Python (suggest PuLP library), Excel Solver or other network design software. Research and create a robust network design model with logical assumptions, parameters and trade-offs. Using sensitivity analysis and what if scenarios to present your recommendations. Articulate the following in your report: Introduction/Overview of Problem, Assumptions, Modelling / Methodology, Results (including Sensitivity Analysis), Discussion, References.