

Network Optimization for Industrial Distributors

If you are a distributor who has had any of the following questions, you may want to consider network optimization.

1. “My company has only one distribution facility in Dallas. Does it make financial sense (i.e., will it be more profitable) to open another facility to support the surging sales in the West Coast?”
2. “My company has 20 warehouses across the country. How many should we have in 2 years when we expect our revenue and profits to double? How about in 4 years? What is our optimal growth strategy in terms of facilities?”
3. “My company has 40 warehouses across the country. The company was built through mergers & acquisitions and we believe that we now only need about 30 warehouses. Is this right? What are the best locations? Which ones are redundant? Will I be able to maintain the current level of next day service?”
4. “My company has 15 warehouses across the country. Each warehouse independently sources material from suppliers. Does it make financial sense to locate one or more central distribution centers (hubs)? Will the scale economies at the hubs help cut total operating expenses and inventory costs?”
5. “I have 30 warehouses across the country. I have a reasonably good inventory stratification system. I want to stock A & B items at all locations. How should I manage my C & D items across the network? Should I move them to central hub(s)? Should I have multiple hubs, each supporting different items? What transportation capabilities do I need to manage

customer service with such a stocking policy?”

Network optimization could mean several things in different contexts, but a common definition in a distribution environment is - *Network optimization is the process of mathematically designing an optimized distribution network that minimizes total operating expenses (facility, inventory, and transportation), or maximizes operating profits, while ensuring the customer service levels are satisfied.*

How is network optimization performed? An analyst who is familiar with the firm’s operations and strategic objectives designs a graphical representation of the firm’s current physical distribution network (Figure 1).

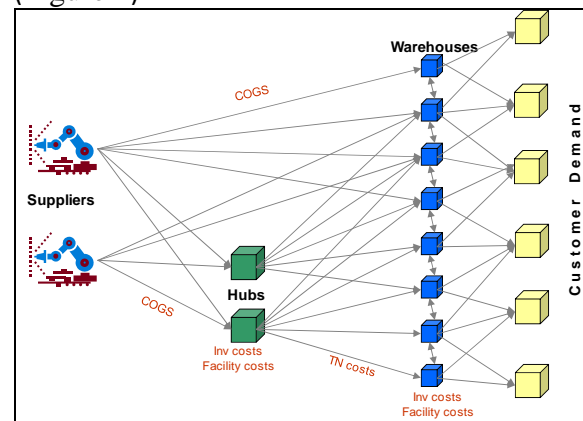


Figure 1 : Typical Distribution Network

This representation is then abstracted into a mathematical form – this is called a mathematical model.

A mathematical model typically has an objective and several constraints. The objective usually represents total distribution costs, and in some cases, could represent total profits. This objective is minimized or maximized subject to constraints that ensure that the solution of the optimization is realistic and reasonable. The optimization is performed using

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specialized software called solvers. During optimization, the solver tries to push the total costs down, but it runs into constraints such as capacities and customer service requirements that tend to push the costs up (Figure 2). The optimal solution provides the min-cost or max-profit method of satisfying customer demand within the boundaries set by the constraints.

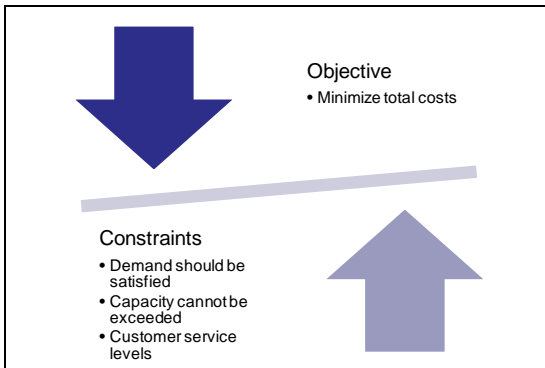


Figure 2: Math model overview

Mathematical details aside, the typical network optimization model requires a variety of data (Figure 3). The models can be made to include different cost structures (for example, fixed transportation costs if the firm uses its own fleet, and variable costs depending on the weight shipped if a 3PL provider is used). A network optimization model, once set-up and validated, can be used to answer a number of what-if questions.

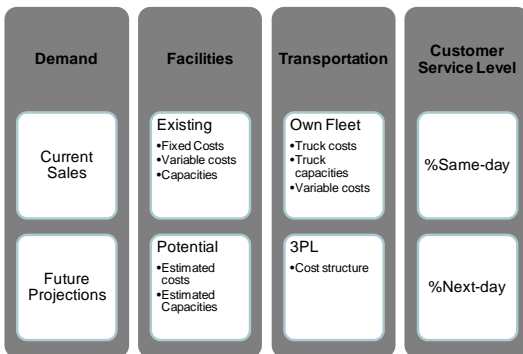


Figure 3: Typical data needed to run a network optimization model

For example, what if the fuel prices drop down to under \$50 / barrel? Will that reduce the number of facilities a distributor needs? What if the fuel prices stay at over \$100 / barrel?

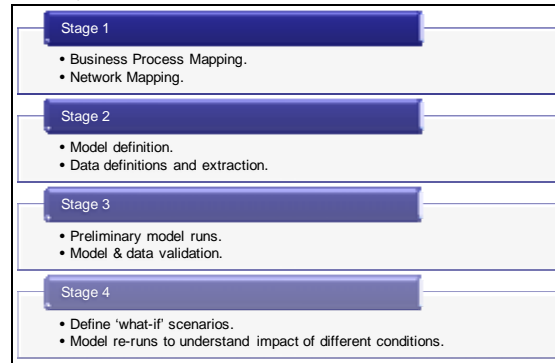


Figure 4: Network Optimization Procedure

Today's rapidly changing market conditions necessitate every company to perform network optimization at least once a year to analyze strategic alternatives.

For a company with more than a few locations that has never performed network optimization, this process could lead to significant cost savings, as well as improved service levels.

World-class companies typically perform network optimization 2-4 times a year to evaluate the effect of the changing environment on their costs and profitability.