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A Little Supply Chain Flexibility is Usually Enough, MIT's Simchi-Levi Says

Adding a little Flexibility Delivers Most of the Potential Benefits, with much Lower Investment Upfront

SCDigest Editorial Staff

Supply chain flexibility is a much sought after goal, but a tricky concept to really define and measure.

Dr.David Simchi-Levi of MIT and ILOG says there is another important consideration – determining the optimum level of supply chain flexibility.

"There is a cost to adding supply chain flexibility," Simchi-Levi said at a recent Supply Chain Executive Forum at Georgia Tech. As a result, companies need to perform the right analysis to determine the trade-offs between investment in flexibility and the total supply chain costs – and perhaps surprisingly, the optimum option is almost always improved but still relatively low levels of SCMN network flexibility.

"Building low levels of flexibility almost always produces the best total result," Simchi-Levi said.

Defining Flexibility

For manufacturers, one way to think about supply flexibility is to look at how many products, or more precisely "product families," a company's factories can produce. For analysis purposes, Simchi-Levi says if factories can produce just one product family, the company has "1X" flexibility. The ability to make two product families is considered "2X" flexibility and so on, up to "total flexibility, where every plant can make every product family (see graphic page 2).

Having flexibility in theory should provide a number of advantages. Transportation costs should be reduced by producing more products closer to customers. Variable demand can also be better managed as a result of more flexible production capacity and also shorter transportation lead times.

While sometimes somewhat higher levels of flexibility may be the best choice, "total flexibility" almost never is.

Using this framework and supply chain network modeling software, Simchi-Levi helped one food and beverage industry company determine its optimal supply chain flexibility strategy, which also demonstrates the core principles.

Starting with a baseline analysis of the company's current "1X" capabilities, an analysis was performed to see the impact of adding various levels of flexibility into the manufacturing network.

The analysis was of course complex and sophisticated, but is nicely summarized on the chart on page 2 The key point, as shown in the graphs on the left side of the illustration, is that total supply chain costs take a sharp drop when moving from 1X to 2X flexibility, **but flatten out significantly after that**. Since there is significant investment required to gain these additional levels of flexibility, the ROI from that investment is unattractive, making the simple 2X flexibility choice the optimal supply chain network strategy. The relatively modest investment to get 2X flexibility delivers about 80% of the total supply chain benefit of total flexibility, but at much lower upfront investment.

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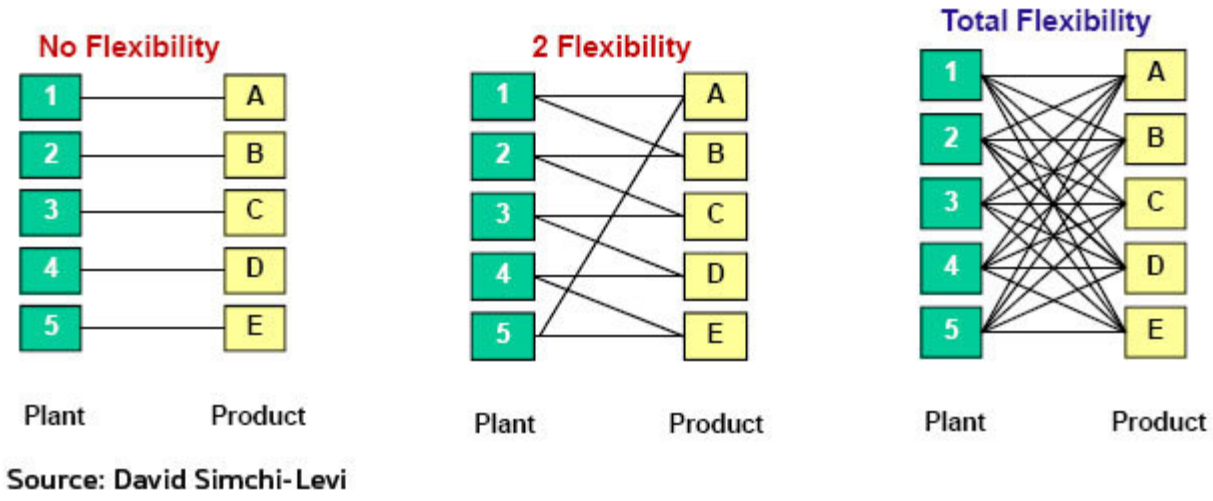
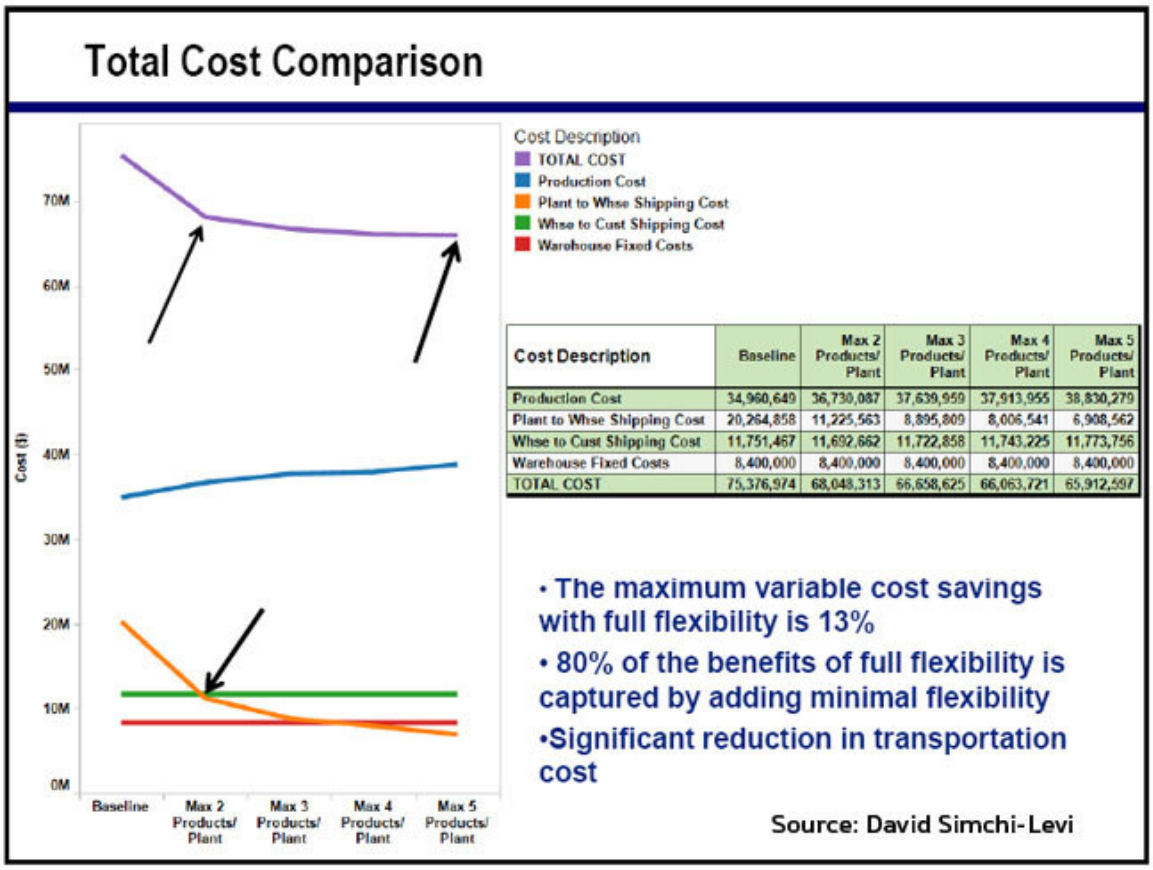


Source: David Simchi-Levi

Simchi-Levi says that 2X flexibility remained the right choice for the company when looking at several different scenarios in terms of demand changes and volatility. He says that while sometimes somewhat higher levels of flexibility may be the best choice, "total flexibility" almost never is.



Cost Description	Baseline	Max 2 Products/ Plant	Max 3 Products/ Plant	Max 4 Products/ Plant	Max 5 Products/ Plant
Production Cost	34,960,649	36,730,087	37,639,959	37,913,955	38,830,279
Plant to Whse Shipping Cost	20,264,858	11,225,563	8,895,809	8,006,541	6,908,562
Whse to Cust Shipping Cost	11,751,467	11,692,662	11,722,858	11,743,225	11,773,756
Warehouse Fixed Costs	8,400,000	8,400,000	8,400,000	8,400,000	8,400,000
TOTAL COST	75,376,974	68,048,313	66,658,625	66,063,721	65,912,597