Rewiring Supply Chain Networks

By embracing the latest modeling and simulation techniques, organizations can more accurately forecast true capacity, identify and eliminate bottlenecks, and develop optimal solutions for their supply chains.

Executive Summary

Despite slow but steady improvement in the global economy, companies face continuous pressure to simultaneously reduce costs and grow the business, as well as improve agility and proactively address ever-changing market conditions. Furthermore, as business becomes increasingly “digitized,” customers increasingly expect same-day delivery from their suppliers. This strongly impacts how players across industries need to manage inventory and design their supply chain networks.

Through supply chain network optimization, businesses can address these challenges and realize both bottom- and top-line growth by improving inventory turns and reaping competitive advantage from supply chain interactions and transactions.

In this point-of-view paper, we illustrate our latest thinking on a successful supply chain network design that embraces a reliable and flexible approach to supply chain network modeling to resolve thorny business challenges.

Solution Challenges Caused by Historical Data

The first step that many businesses take when designing new networks, redesigning existing ones or planning additional logistics investments, such as storage capacity extensions, is to analyze historical data. Taking this approach, however, means that solution verification is only possible through real-world evidence, that is, a fully implemented supply chain network. It also means the business is assessing investment priorities by using past assumptions rather than the most current priorities and goals, facts, figures and forecasts. Such journeys can end in costly failures, wasted time and missed opportunities.

With the latest modeling and simulation techniques, organizations can more accurately forecast capacity, develop scenarios and design solutions because they use reality-based inputs, including the true capacity of a machine, factory, process or production line. They do this by factoring the unknown into standard business assumptions, thereby improving investment accuracy. With these new insights, organizations can make decisions that align with their needs and business objectives.

Modeling and Simulation: Creating Long-term Value

The effectiveness of modeling and simulation networks hinges on obtaining the right information to effectively approximate supply chain behavior without actually testing it in real life.
When businesses can model and simulate various investment options, they can understand the impact of numerous variables and test imagined supply chain models (see Figure 1). For example, logistics would benefit from being able to simulate the outcome of various warehouse network designs and inventory policies in the effort to compress lead time, avoid out-of-stock issues and enable supply chains to support same-day delivery.

**Analyzing Complex Supply Chain Networks and Related Logistics**

Modeling and simulating tools can identify flaws throughout the supply chain. By understanding these shortcomings, businesses can optimize their sourcing, production, warehousing and delivery functions by improving lead time, reducing inventory costs, eliminating backlogs and boosting customer satisfaction.

Depending on the supply chain complexity, modeling and simulation tools can range from simple Microsoft Excel-based approaches, to tailored solutions, such as ProModel Corp.’s ProModel, Consideo’s iModeler, IBM’s ILOG, Llamasoft, Inc.’s Llamasoft or Dassault Systèmes’ Quintiq to drive simulation exercises.

Supply chain network modeling is usually divided into two core phases. In the first phase, the supply network’s true capacity must be calculated. This is accomplished by assessing numerous variables, such as inventory levels, labor issues, equipment downtime and quality levels. These variables are then analyzed, modeled and simulated to uncover hidden bottlenecks, inefficient throughput, inventory turnover and other capacity constraints. They are then evaluated against redesigned scheduling strategies and techniques to simulate the impact of changes to the variables.

The second phase is to define the future supply network layout, which requires scenario-based demand planning, followed by stringent network modeling. The goal is to create and assess various scenarios to identify the best option.

![Figure 1](image_url)
Framing the Solution

We recommend structuring the process using the approach shown in Figure 2.

A typical project starts with framing the problem to properly define the scope of analysis. Once the problem is fully understood, modeling begins with first interpreting the collected information, and then refining and entering the data into the modeling software. Here, various scenarios can be flexibly modeled, according to set targets, which are individual to each company. The model is then tested to verify its correctness.

Afterwards, simulations are run to retrieve data from various model scenarios, from which results are distributed. In the data interpretation phase, modeled data is compared, from which a best possible model is generated, reflecting the organization’s identified needs. Finally, this model and relevant data are used to drive decision-making. Since the results are based on proven tools and statistical algorithms, the outcomes of the model are typically very reliable.

Looking Forward

The use of modeling and simulation for supply chain network design is an essential driver for competitive advantage. Businesses can realize multiple benefits, such as reducing operating expenses, avoiding poor investments and realizing opportunities. These initiatives can also improve top-line results by designing a customer-centric network that ensures on-time delivery of orders and balanced lead times.

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