

## Supply Chain Network Design and Optimization Service

An optimized supply chain network can greatly improve a company's competitiveness and profitability. A supply chain consists of suppliers, plants, warehouses, and flows of products from origin to customers. Typically 80% of a product's landed costs are locked in by the location of a company's facilities and the determination of product flows between them. Supply chain network design and optimization is the discipline to strategically determine the optimal location and size of facilities, and the flow through the network, in order to deliver a company's products to its customers at minimized costs and within the required service level. With supply chain network optimization, companies can typically expect to reduce long-term transportation, warehousing, and other supply chain costs by 5% to 15%, while improving their service level and operational agility.

Iowa DOT is partnered with Quetica Consulting to use this demand-based supply chain network design and optimization approach to assist companies in designing and optimizing their supply chains and to identify strategic locations for their facilities in Iowa, while reducing their overall supply chain costs. The service focuses on effectively analyzing constraints and opportunities in a company's supply chain, developing design alternatives, conducting both quantitative and qualitative analysis of the design alternatives, and recommending an optimized network design with financial analysis to help the company make informed business decisions.

### Why is the Service Needed?

Strategic site selection is an important decision in supply chain network design that can provide long-term, sustainable competitive advantages. Many factors, such as geographic location, land availability, transportation network infrastructure, utility, taxes, construction costs, labor costs, etc., are included in site evaluation and selection. Many companies are challenged to collect relevant data and do not have experienced supply chain network experts on staff to complete a comprehensive analysis to support their business growth.

Iowa DOT teamed with Quetica to provide access to this supply chain design and optimization expertise to help Iowa companies grow their revenue and reduce their supply chain costs by strategically selecting facility sites for an optimized supply chain. Iowa DOT manages a large database of the state's multimodal transportation network, state-wide commodity shipment data, site information, and multiple initiatives to continuously improve the state-wide transportation network. It has combined this valuable information with Quetica's specialized expertise in transportation and supply chain design, optimization and technologies. Quetica's principals designed, built, and operated the world's first internet-based, freight audit,

payment and financing network, called PowerTrack™. With this experience, they understand first hand that freight payment data is the best source of information (e.g. Bills of Lading, Tariffs, Pro's, etc.) to conduct transportation network design and optimization analysis. They leverage this data to its maximum benefit, using it with sophisticated computer algorithms and tools to provide supply chain and transportation consulting solutions to help organizations reduce their costs and increase profitability.

Iowa DOT and Quetica are applying a practical and proven demand-based approach to supply chain network design and optimization by focusing on the customer's demand of a company's products. The recommendations are specific and actionable with detailed ROI analysis for informed investment decisions.

### What is the Approach?

The demand-based approach starts with the customer's current and forecasted demand for a company's product(s), and works its way back to identify cost, capacity and service level in the company's supply chain network, including suppliers, plants, warehouse/distribution centers and its transportation network. Constraints in the network are then analyzed and optimization strategies created to address those constraints. The methodology includes four fundamental steps:

1. Analysis of demand and capacity across a company's supply chain.
2. Identification of constraints in production, transportation network, and inventory management.
3. Creation of supply chain optimization strategies:
  - a. Conducting baseline optimization to identify opportunities given the current supply chain network; and
  - b. Conducting what if analysis to analyze changes to plant, warehouse/distribution center, and transportation network and recommend new sites and/or new transportation network to lower total supply chain costs.
4. Development of business case to support recommended strategies.

A computer simulation model is developed to represent current and forecasted demand, transportation and inventory capacity, and quantitative performance measurements. Demand, capacity, forecast, and performance data are collected, cleansed, analyzed, and aggregated into the computer model.

Network design and optimization algorithms are utilized to run simulations and conduct what-if analysis to identify network constraints. Design alternatives are tested using computer tools to ensure the constraints are addressed effectively.

The design alternatives are evaluated using qualitative measurements and return on investment analysis conducted to define and prioritize the recommended optimization strategies. Figure 1 provides an overview of the supply chain network design and optimization approach.

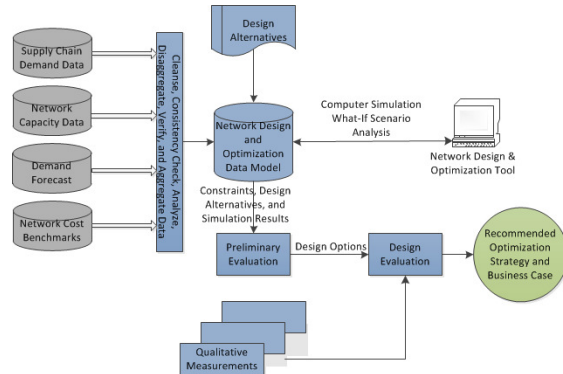


Figure 1: Supply Chain Network Design and Optimization Approach

### How can the existing supply chain data and business analytics capabilities of Iowa DOT and Quetica be leveraged?

Iowa DOT and Quetica have amassed a rich set of supply chain data to enable cost-effective supply chain network design and optimization project. This data includes:

- Supply chain cost benchmark data.
- Iowa transportation network data including highway, rail, and barge.
- Domestic freight flow data between all 3,143 U.S. counties.
- Iowa import/export data between all 99 counties in Iowa and 40 foreign countries/regions.
- Available sites with infrastructure support in the State of Iowa.

This rich dataset enables Iowa DOT and Quetica to accelerate the supply chain network and optimization process and deliver timely and actionable recommendations.

### What are the Expected Results?

A typical supply chain network design and optimization engagement will deliver the following results:

- Optimized current supply chain network to:
  - Use current transportation network more efficiently by leveraging lower cost shipment modes and alternative routes;

- And meet customer demand using the optimized assignments of facilities to customers with lower costs and better service level.
- Site selection and new transportation network design to:
  - Lower total supply chain costs; and
  - Improve robustness of the supply chain network.
- Develop facility consolidation recommendations to:
  - Lower operating costs; and
  - Improve service level.
- Financial model for the recommended design and optimization.
- Sensitivity analysis using forecasted data to improve the robustness of the recommended supply chain network.

As a result of a supply chain network design and optimization engagement, a company can optimize its supply chain network from Figure 2 to Figure 3.



Figure 2: An Example of the Current Supply Chain Network



Figure 3: An Example of the Optimized Supply Chain Network

This proven approach is leveraged by large Fortune 500 companies and government agencies to optimize complex global supply chains, improve profitability and increase operational efficiency.