

Chapter 19

Achieving Alignment in Production and Logistics Operations in Three Echelon Supply Chain Network Through New Heuristic Optimizer

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ABSTRACT

During the past decade, great studies have been made in the development of standardized tools for supply chain modeling and network optimization. Network optimization is the most basic type of modeling that can be performed with tools which helps to identify optimum paths or flow of goods in supply chain network. In this case, the network is defined by the flow of finished goods from origin to destination. Network modeling becomes more complex as the dimensions and scope of the supply chain expand. Uncertainties in the supply chain usually increase the variance of profit or cost to the company, increasing the likelihood of decreased profit i.e. increase in total supply chain cost. Demand uncertainty and constraints posed by the every echelon are important factors to be considered in the supply chain design operations. This chapter specifically deals with the modeling and optimization of a three echelon supply chain network architecture using new Particle Swarm Optimization algorithm.

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INTRODUCTION

The supply chain is made up of all the activities required to deliver products to the customer, from designing product to receiving orders, procuring materials, marketing, manufacturing, logistics, customer service, receiving payment and so on. Anyone, anything, anywhere that influences a product's time-to-market, price, quality, information exchange or delivery, among other activities, is part of the supply chain. The old way of delivering product was to develop relatively inaccurate projections of demand, then manufacture the product and fill up warehouses with finished goods. The old ways are fading fast as management across all industries has come to accept that collaboration with customers and suppliers in the planning and replenishment process can and must be made to work very effectively. As customers and suppliers band together in mutually beneficial partnerships, the need for better supply chain management processes and systems are more evident and becomes a very high business priority. For many companies, it has become clear that a supply chain that flows information and material best can be a significant differentiator, the competitive winner. All the way to the boardroom, improving supply chain management is getting lots of attention because forward-thinking management knows it is the best strategy to increase and maintain market share, reduce costs, minimize inventories and, of course, improve profits. In many industries, market share will be won and lost based on supply chain performance. With the stakes so high, there is a frenzy of activity along the supply chain front. Executive managers are assessing how their companies do business, especially in supply chain activities. They often find dysfunctional sets of policies, processes, systems and measurements. And these exist at all points in the supply chain, including business partners. The former vague image of a company of silos is very apparent and, most importantly, a new clarity of needs and goals emerges for supply chain management.

There is a need to transform from dysfunctional and unsynchronized decision making—which results in disintegrated and very costly supply activities—to a supply chain that performs in such a way that it is one of the company's competitive advantages.

Effectively integrating the information and material flows within the demand and supply process is what supply chain management is all about. In most companies, however, two major and very interdependent issues must be simultaneously addressed. The first deals with delivering products with customer-acceptable quality, with very short lead times, at a customer-acceptable cost—while keeping inventories throughout the supply chain at a minimum. The second issue, which tends to be less understood and accepted, is the need for high-quality, relevant and timely information that is provided when it needs to be known. For any customers and manufacturers, business processes and support systems will not measure up to the task of quickly providing planning and execution information from the marketplace to production and on to vendors so that the customer's objectives are consistently met. The fact is, most information supplied is excessive, often late and frequently inaccurate. Regardless of your industry and customer base, more effective supply chain management will be a prerequisite to your future success. In fact, effective supply chain management must become an integral part of your competitive and survival strategy.

Supply chain decisions are broadly classified into strategic, tactical, and operational. Supply Chain Management (SCM) research based on these three categories, and addressed the SCM research with operational perspective in terms of four operational problem areas, namely, Inventory Management and control, Production Planning and Scheduling, Information Sharing, Coordination, Monitoring, and Operation Tools. Some of the important objectives of SCM are inventory management, procurement, production scheduling and storage and distribution management opera-

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