

# Chapter 10

## Supply Chain (SC) Network Optimization: Introductory Concepts for Medium-Sized Enterprises

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### **ABSTRACT**

*Supply chain network design and optimization is one of the most important strategic decisions that an organization has to make. SC network design decisions are strategic-level SC decisions because they have long-lasting effect on the firms' supply chain performance and the decisions cannot be changed in a short period. In this chapter, the author aims to introduce the concept of SC network optimization to the managers of medium-sized enterprises. The chapter also explains the importance of the SC network optimization studies, educates readers about how they can benefit from the concept, and tries to show how the implementation of SC network optimization/design will improve the competitiveness of these organizations. The readers are also guided through the four steps of SC network optimization process. Finally, the chapter provides a brief review of the SC network optimization literature and proposes future research directions.*

### **INTRODUCTION**

A supply chain (SC) may be defined as an integrated effort where various entities (suppliers, manufacturers, distributors, and retailers) work together in order to; acquire raw materials, convert these materials into specified final products, and deliver these final products to the retailers. This chain is traditionally characterized by a forward flow of materials and a backward flow of information. Even though researchers have studied the various processes of the supply chain individually, there has been an increasing attention placed on the performance, design and analysis of the supply chain as a whole.

Specifically, for the last two decades, there has been an increasing number of studies to optimize the overall supply chain network in order to decrease the overall cost or maximize the total revenue (Tah-

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seen & Amos, 2010). In those studies, the number, location, capacity and type of plants, warehouses and distribution centers and the network traffic among those nodes are to be determined and optimized. Those are strategic level SC decisions because they have long – lasting effect on the firms' supply chain performance and the decisions cannot be changed in a short period<sup>1</sup>.

In this chapter, the author aims to introduce the concept of SC network optimization to the managers of the mid-size organizations. The author also aims to show the importance of the SC network optimization studies in the optimization of mid-size organizations. The chapter also educates the readers about how they can benefit from the concept of SC network optimization and try to show how the reconfiguration of SC network will improve the competitiveness of the organization. Finally, the readers are guided through the steps of the optimization process.

Target group of the chapter includes the mid-sized organizations that would like to optimize its supply chain operations. Depending on the types of the products, markets, countries etc. it is generally accepted that 20- 25% of the total costs come from logistics related activities such as transportation, storing, handling etc. As explained in SC network optimization section, the logistics related costs (i.e. transportation costs, inventory costs, and facility costs) are substantially influenced by the configuration of the network. Therefore, by optimizing SC network, the organizations may substantially decrease their total logistics related costs and SC network optimization studies play a crucial step in the competitiveness of those organizations. As the dispersion of the SC network of the organization gets wider, the potential benefit of these studies increase as well. Especially, organizations that would like to optimize the operations of the overall organization can learn more from the chapter. SC or logistics managers can also substantially benefit from the concept of SC Network optimization.

In the chapter, firstly, various descriptions of the SC will be provided. Then, various decision phases (Strategic, Tactical, and Operational) in a SC of organizations (including mid-sized organizations) will be explained. As being one of the most critical SC decisions, a brief description of the SC network optimization models, then, will be provided. After that, decisions made in SC network optimization models (such as the number and the location of SC nodes, traffic network among those networks etc.) will be presented along with the required data to execute the optimization process. In the next section of the chapter, a SC network optimization process is briefly explained. The chapter is to end with a brief discussion on the current issues and developments on SC network optimization following the literature review on the subject.

## **SUPPLY CHAIN MANAGEMENT AND DECISIONS**

Before getting into the details of the SC network modeling and its literature, a brief description of the SC Management and SC decisions is presented.

### **Supply Chain Management Concept**

During 80's, companies applied new manufacturing technologies and strategies such as just-in-time manufacturing, Kanban, lean manufacturing, total quality management to reduce costs and better compete in different markets. After applying these technologies and the strategies, companies have reduced manufacturing costs as much as possible and then focused more on effective SC management to reduce

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