CHAPTER 3

Network Planning

CASE The Bis Corporation

The Bis Corporation is a company that produces and distributes paints. Currently, eight manufacturing plants located in cities such as Atlanta and Denver serve about 2,000 retail stores including Home Depot, Wal-Mart as well Bis-owned stores. The current distribution system is a single-tier network where all products are shipped from the plants to 17 warehouses, located all over the United States, and from there to retail accounts.

The company was established in 1964 as a family venture and grew in the 1970s and 1980s at a fairly steady rate. Bis is now owned by 12 shareholders and run by a newly appointed CEO.

Bis produces and sells about 4,000 different SKUs (stockkeeping units) at a similar price and the gross margin in the paint industry is about 20 percent. Despite high profitability, the new CEO is concerned that the supply chain is not the most efficient one. Specifically, the CEO pointed out that inbound truck utilization, inventory turns, and service levels are just too low. In a recent shareholder meeting, he pointed out that the current production and distribution strategy used by Bis was designed about 20 years ago and was never modified. It consists of the following steps:

- Produce and store at the manufacturing plants.
- Pick, load, and ship to a warehouse center.
- Unload and store at the warehouse.
- Pick, load, and deliver to stores.

Thus, the shareholders decided to look for outside help in modifying their logistics network and supply chain strategy. Your company was able to secure the engagement, after six months of continuous work by the sales division. The commitment you made when you received the engagement was to improve the effectiveness and to align the cost of service with account profitability. In your original proposal, you mentioned that "this will be accomplished by reengineering the production, inventory, and logistics functions." It seems that the concept of reengineering the entire supply chain, together with your commitment not only to the design but also to the implementation of the new strategy, is what made your proposal attractive to Bis shareholders.

Your team has identified three important issues that need to be addressed:

1. *What is the best network configuration that the Bis Corporation should use?* An important observation made early on in the analysis was that the single-tier network currently used by Bis forces low truck utilization and hence high transportation cost. It was thus proposed that Bis needs to consider replacing the logistics network with a two-tier distribution network that includes primary and

Source: Bis is a fictional company. The material in this case is loosely based on our experience with several companies.

secondary warehouses. In such a network, primary warehouses receive products from the plants and transfer inventory to secondary warehouses. The secondary warehouses in turn will serve the retail outlets. Since the number of primary warehouses is relatively small, it can potentially allow for high truck utilization and hence reduction in transportation cost. The challenge is to identify the number, locations, and size of the primary and secondary warehouses.

2. *Given the new network configuration, where should the company position inventory? How much?* Specifically, with 4,000 SKUs in this supply chain, it is not clear how inventory should be positioned. Should inventory of every SKU be positioned at every facility or should some SKUs perhaps be stocked only at the primary warehouses while others only at the secondary facilities?
3. *Which plant should produce which product?* Should each plant specialize in a few products and thus be able to produce large batches and hence reduce production cost or should plants be flexible and able to serve all retailers in close proximity, thus focusing on reducing distribution costs?

To identify the best network configuration, you have grouped the retail outlets into 550 zones and the different products into five product families.

The data collected include the following:

1. Demand in 2004 by SKU per product family for each customer zone.
2. Annual production capacity (in SKUs) at each manufacturing plant.
3. Maximum capacity (SKUs) for each warehouse, new and existing.
4. Transportation costs per product family per mile for distributing products from the manufacturing plants and from the warehouses.
5. Setup cost for establishing a warehouse as well as the cost of closing an existing facility.
6. Potential locations for new warehouses.

Customer service is of particular concern to Bis because there are a number of competing products in the markets. No specific dollar figure can be attached to a specific level of service; however, the CEO insists that to remain competitive, delivery time should be no more than one day for most of the retail outlets.

The Bis Corporation has just finished a comprehensive market study that shows significant volume growth in its markets. This growth is estimated to be uniform across the different zones, but it varies from product family to product family. The estimated yearly growth for 2006 and 2007 is given in Table 3-1.

The variable production cost at the eight manufacturing facilities varies by product and by manufacturing plant. The CEO and company shareholders oppose building a new manufacturing plant because of the costs and risks involved. They are willing, however, to change the focus of different facilities so that each manufacturing facility produces the appropriate product based not only on manufacturing cost, as is currently done, but also on the entire supply chain costs, including transportation costs.

The Bis Corporation would like to address the following issues:

1. Should Bis switch from the current distribution network to a two-tier logistics network? How many primary and secondary distribution centers should be established and where should they be located?
2. Does the model used in this process truly represent Bis's logistics network? How can the Bis Corporation validate the model? What is the impact of aggregating customers and products on the model accuracy?
3. What is the optimal inventory positioning strategy within the network? Should each facility keep stock of all SKUs?
4. Should Bis manufacturing strategy change to one in which each facility specializes in a few products. What is the impact of transportation cost on the manufacturing strategy?

TABLE 3-1

ESTIMATED YEARLY GROWTH

Family	1	2	3	4	5
Multiplier	1.07	1.03	1.06	1.05	1.06

CHAPTER 4

Supply Contracts

American Tool Works

American Tool Works (ATW) is a leading U.S. manufacturer of high-quality power and hand tools, such as electric drills, hammers, and so forth. The company has manufacturing facilities all over the world, and its main markets are in Europe and North America. Products are sold through distributors and dealers or directly to home owners and tradesmen.

ATW enjoys a very successful partnership with its distributors and dealers. This channel provides about 80 percent of its revenue, and, as a result, is the focus of the new management team that took over in 2004. The relationship between ATW and its distributors and dealers may take two forms:

- Large distributors tend to have a vendor-managed-inventory (VMI) agreement with ATW. In this situation, ATW monitors the inventory levels of various products at the distributors' facilities, and makes additional shipments as necessary.
- Midsize and small distributors do not have the technical capability to participate in the VMI relationship, since they don't have the technology to automatically transfer the necessary sales and inventory information to ATW.

Many of these distributors sell not only ATW products, but many products from firms that compete with ATW.

The large distributors are typically pleased by the performance of the VMI agreement. ATW Supply Chain VP Dave Morrison recently instituted a series of meetings with ATW's key large dealers. In these conversations, the dealers emphasized the following:

- Their salespeople can direct demand to either ATW products or competitors' products. That is, buyers typically ask the distributors' sales team for advice on product/brand combination.
- Currently, distributors' sales team make decisions based on
  - Comfort level with different products/brand.
  - Promotional items.
  - Profit margin.
- ATW products' stock levels at the distributor do not effect sales since, in VMI, shipments are received frequently—a few times a week.
- For many products, space is limited due to indoor storage requirements. VMI considerably reduces inventory levels and thus the required space while maintaining or increasing service levels.

Dave also met with a number of small distributors. They identified three reasons for buying ATW products: name recognition, quality, and sales support. As in the case of large distributors, they also suggested that their salespeople can direct demand to certain product/brand combinations. Interestingly, they qualified their statement as follows:

- Sixty percent of sales are prespecified by the buyer and the distributor has no impact on the brand/product chosen by the contractor.
- The remaining 40 percent can be heavily steered by the distributor's sales force.
- When the sales force steers demand, it is done based on on-site inventory level.
- ATW's competitors use a variety of different approaches to increase sales at these small distributors. One encourages some dealers to increase inventory of tools with a promise to buy the tools back if they don't sell. One implemented a sales incentive program in which money contributed by both the manufacturer and the distributor is put into an account that is divided between the salespeople once a year.

After concluding his talks with the dealers, Dave felt very confident with the performance of the VMI program. However, he had the sense that there were both a tremendous opportunity to increase sales to smaller dealers and, at the same time, a risk that his competitors would steal some of ATW's business with small and midsize dealers.

By the end of the chapter, you should be able to answer the following questions:

- What can ATW do to increase inventory at small and midsize dealers?
- What can ATW do to increase sales at small and midsize dealers?
- Why are ATW's competitors using the two approaches described in the case when they deal with small and midsize dealers?
- Should ATW adopt these approaches?
- Should ATW try different approaches? What are the possible approaches they should consider?

4.1 INTRODUCTION

In the last few years, we have seen significant increase in the level of outsourcing; companies outsource everything from the manufacturing of specific components to the design and assembly of the entire product. For example, in the electronics industry, there has been a marked increase in purchasing volume as a percentage of the firm's total sales. For instance, between 1998 and 2000, outsourcing in the electronics industry increased from 15 percent of all components to 40 percent [186].

Interestingly, many brand-name manufacturers now outsource both the entire design and manufacturing of some of their products. For instance, it is expected that in 2005, about 30 percent of digital cameras, 65 percent of MP3 players, and about 70 percent of PDAs will be the work of original design manufacturers (ODM), that will be sold to consumers by brand manufacturers; see [62].

One important driver is the search for low-cost countries that allow manufacturers to significantly reduce labor cost. At the same time, many companies in the Far East developed significant capability to design and manufacture high-quality, low-cost products. These developments suggest both an opportunity and a challenge.

Indeed, the increase in the level of outsourcing implies that the procurement function becomes critical for an OEM to remain in control of its destiny. As a result, many OEMs focus on closely collaborating with the suppliers of their *strategic components or products*. In most cases, this requires effective supply contracts that try to coordinate the supply chain.

A different approach has been applied by OEMs for *nonstrategic components*. In this case, products can be purchased from a variety of suppliers, and flexibility to market conditions is perceived as more important than a permanent relationship with the suppliers. Indeed, *commodity products,* for example, electricity, computer memory,