



Network Reconfigurations – Springboard for Supply Chain Efficiency

By Leonard Sahling

Supply chain executives face formidable challenges. They are under unrelenting competitive pressures to increase inventory turns, improve delivery times and accuracy, and shrink their operating costs. Meanwhile, distribution networks — or supply chains, as they are more commonly known — keep getting more complicated. Today's supply chains stretch thousands of miles, span oceans, cross multiple country borders, involve multiple handoffs, pass goods through multiple distribution facilities, and utilize multiple modes of freight transport.

To meet these challenges, companies dedicate considerable resources to analyzing and streamlining their distribution networks. Companies typically review and redesign their distribution networks every few years, and some tweak theirs almost continuously. After each re-design, companies usually have ended up with fewer, but bigger, distribution facilities, all placed in strategic locations designed to minimize their total operating costs, including transportation. Network consolidations have been one of the main drivers behind the substantial improvements in supply chain efficiency recorded during the past 15-to-20 years.

During the past year or so, however, many companies have purportedly shelved plans for network consolidations and focused instead on the merits of expanding their networks. Indeed, the recent run-up in oil and fuel prices has sent supply chain professionals scrambling in search of ways to mitigate the impact on their companies' operating costs. The consensus among analysts is that higher fuel costs (eventually) will compel some companies to add one or two additional distribution facilities to their networks. Not all companies will find it worthwhile to do so, and there are many other ways for them to reduce their transportation costs. In any event, supply chain professionals are still running the numbers and exploring their options, and

companies are unlikely to make any major changes in their distribution networks until the economic recovery gains more traction.

Network Consolidations

Network re-designs are costly and fraught with risk. If anything goes wrong with its order-delivery system as the new network is implemented, a company will have to deal with unhappy customers — many of whom will take their business elsewhere. No company would embark on such a risky endeavor without being totally convinced that its future success depends on its distribution network.

Despite the risks, companies have continued to consolidate their distribution networks. Their goals are to cut costs, improve customer service, and sharpen their competitive edge. Toward these ends, they use sophisticated network modeling tools to determine the optimal number, placement, size, and physical attributes of the distribution facilities needed to fulfill their customer service requirements — all provided at the lowest possible operating cost. It's a costly exercise — but one that is critical to their survival.

It is also an exercise that needs to be repeated frequently. The optimal design for a distribution network will change in response to changes in the economic environment — e.g., upgraded customer service requirements, corporate mergers and acquisitions, systemic changes in transportation costs, new global sources of supply, new product offerings, or the withdrawal of non-core brands or slow-moving products. No company can afford to be complacent in the current highly competitive environment.

Until recently, in optimizing their distribution networks, companies invariably ended up with fewer distribution centers (DCs) than they had used previously. By reducing the



number of facilities and placing them in strategic locations, companies are able to ship more freight as full truckloads (TLs) instead of less-than-truckloads (LTLs) — achieving substantial cost savings inasmuch as LTL freight rates are typically 3-to-4 times costlier than TL rates. Plus, in relying more heavily on TL shipments, truck fleets end up traveling fewer freight-miles and consuming less fuel.

The structural shift to distribution networks with fewer DCs also generates large cost savings in terms of inventory management. As the number of DCs is reduced, each of the remaining ones then services a larger share of the company's customer base. The bigger the service area or market share, the smaller the average sales forecast error – for each DC as well as for the entire network. In turn, the lower the forecast error, the smaller the safety stocks (i.e., just-in-case inventories) that suppliers must hold to avoid stock-outs. In short, fewer stocking locations are a win-win: they reduce a company's inventory carrying costs as well as its operating costs.

Rising fuel prices

With oil and fuel prices having surged during 2009, some analysts are predicting that companies will respond by adding extra facilities to their distribution networks. The additional DCs, they maintain, will reduce the average distance traveled

between shipping points and customers, thus economizing on freight-miles and fuel consumption. "As outbound transportation becomes more expensive," Professor David Simchi-Levi of MIT points out, "it becomes increasingly important to minimize the distance of the final leg [of the supply chain]."

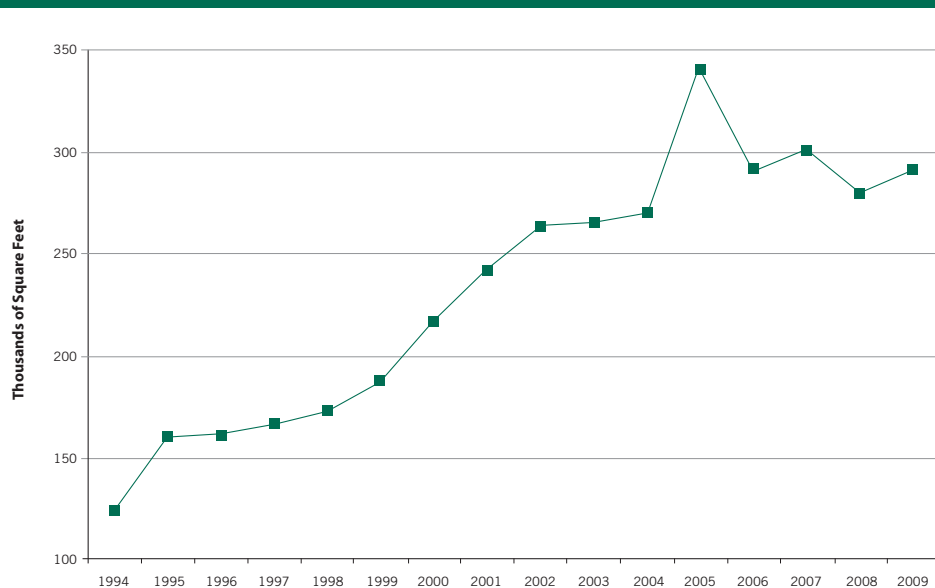
However, these new-found transportation efficiencies will be offset in part by greater inventory carrying costs and higher fixed-facility costs. In fact, having already optimized their networks, some companies will no doubt find it suboptimal to add anymore DCs, despite the higher fuel costs. As more DCs are added to a network, companies end up having to carry larger aggregate inventories. The larger the number of facilities, the smaller the geographic region served by each one, the less often will the Law of Large Numbers succeed in smoothing out random fluctuations in demand, and the larger the average safety stock that each one must carry to avoid stock-outs. Hence, when they run the different scenarios, some companies will find that the transportation cost savings would be more than offset by the incremental operating costs of the additional facilities as well as the higher inventory carrying costs.

Experts who are familiar with network modeling tools concur that a network re-optimization in response to higher fuel prices is unlikely to result in major large-scale revisions in these previously optimized networks. Whirlpool, for example, may decide to add an eleventh facility to its current distribution network, but it surely will not revert to its former inefficient network with 41 facilities.

Big, Bigger, Bigger-Still

Distribution facilities are indeed getting bigger. Fifteen-to-twenty years ago, a DC with 200,000 square feet was regarded as exceptionally big. Today, it would take a facility larger than a million square feet to raise eyebrows. In fact, the average size of newly built facilities has more than doubled in size during the past fifteen years that we have been tracking them – growing from 124,000 square feet in 1994 to approximately 300,000 square feet today. (See Exhibit 1.)

Exhibit 1: Average Size of Newly Started U.S. Distribution Facilities



Source: ProLogis.



The new facilities differ from the older ones in many respects besides the size of their floor-footprints. The new ones have higher ceiling clear-heights — 32-to-36 feet today versus 20-to-24 feet, fifteen or twenty years ago. The new ones have many more dock doors, one for every 3,500-to-5,000 square feet of floorspace today versus one for every 10,000-to-15,000 square feet, fifteen or twenty years ago. The new ones also have larger on-site trailer storage yards where trailers or freight containers can be parked while they are waiting either to be moved up to the dock doors for unloading or to be picked up after having been unloaded.

These changes in the physical attributes of DCs reflect fundamental changes that have occurred in warehousing operations during the past 15-to-20 years. Previously, warehouses were used to store stuff, and inventories turned over much less frequently. Today, these buildings are called distribution facilities or distribution centers, and they are designed to promote and facilitate the rapid movement of goods from production sources to customers.

Companies today want to hold inventories in storage as briefly as possible. Supply chain professionals continue to increase inventory turnover to ever-higher levels, with goods delivered by truck through one dock door and then, within minutes or hours, reloaded through another dock door onto trucks destined for customers. One major retailer, for example, has refined its input-output operations at its 1.5 million square foot “flow-through” facility to the point where full pallet loads are unloaded at one dock door, broken down, and then the individual cartons are cross-docked to other dock doors — all within 20 minutes.

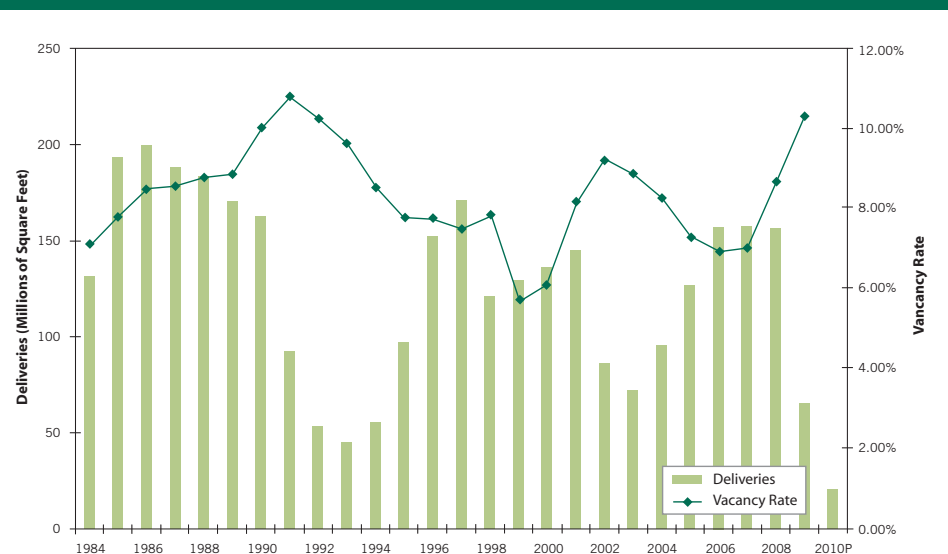
Additionally, with customer service requirements continuing to ratchet higher, many suppliers have had to increase the size of their new distribution facilities to accommodate these higher requirements. Customers are insisting, for example, on such services as shorter lead times, 24x7 shipping programs, higher fill rates, store-ready displays, customer-specific labeling, promotional packaging, and integrated supply. Often, suppliers devote large portions of their new

distribution facilities to these so-called value-added services. The big challenge facing suppliers is to figure out how to provide or improve these customer services while remaining cost competitive.

The major national and multinational corporations have been the industry leaders and principally responsible for the vast improvements in supply chain performance posted during the past 15-to-20 years, and it is they too who have spearheaded the demand for the modern distribution facilities. Meanwhile, the national market for warehouse/distribution space has continued to grow vigorously in recent years (except for the past year or two). (See Exhibit 2.) Evidently, as the national and multinational companies have shifted away from the older, less spacious facilities in favor of the larger, modern DCs, regional and local companies have “back-filled” the market and occupied the older facilities to accommodate their own expanding needs.

With the physical attributes of distribution facilities having changed so much in recent years, property owners often find that their older facilities are prone to functional obsolescence. Some older buildings may remain partially competitive because of their advantageous in-fill locations, yet end up commanding subpar rents. Other older facilities will cease to be competitive and will ultimately either be converted

Exhibit 2: U.S. Bulk Warehouse/Distribution Market – 31 Major Markets



P: Preliminary estimates.
Source: ProLogis.

to alternative uses or torn down and replaced by buildings designed for other uses. No one has documented how fast the stock of warehouses and distribution facilities obsolesces, but it is generally assumed to be about 1-to-2% a year in the U.S. and even higher in many European and Asian countries.

Faster Inventory Turns and Lower Operating Costs

Companies worldwide invest tens of billions of dollars each year, on average, to upgrade their distribution networks, in order to reduce their operating costs and sharpen their competitiveness. The cost savings alone usually provide ample returns that justify these investments. One consumer goods manufacturer, for example, had gone through a series of mergers and acquisitions with similar companies and ended up with a highly inefficient distribution network. Its re-designed network replaced the twelve DCs that it had formerly used with five new ones. The new ones were situated in new locations and their combined footprints slightly exceeded the total square footage of the previous twelve. And once the new network was up-and-running, the company realized cost savings amounting to over \$20 million a year.

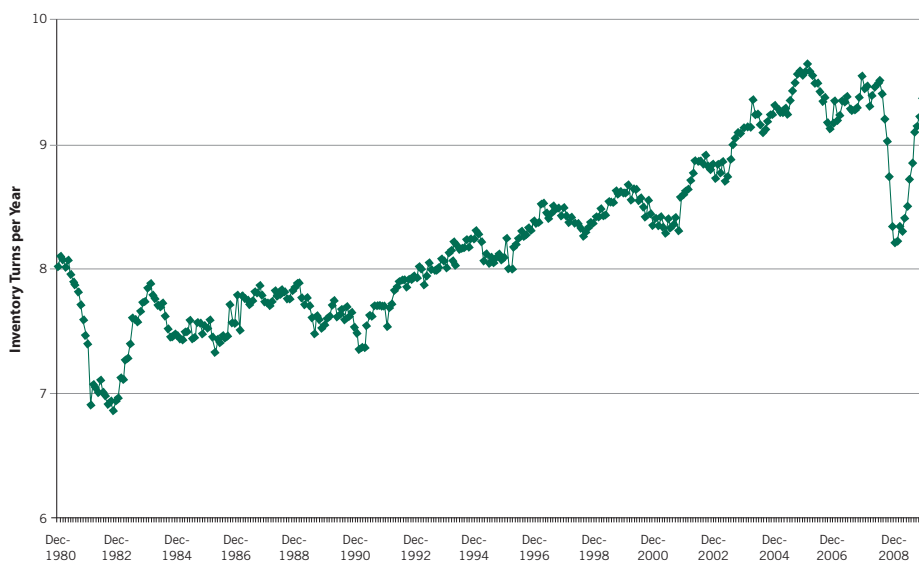
Nor is this an exceptional case. At the macroeconomic level, there are several metrics that reflect the resulting gains in supply chain efficiency. One commonly used metric is the inventory turnover rate. Throughout most of the 1980s, the inventory turnover rate hovered in the range of 7.5-to-7.75 turns per year for U.S. nonfarm businesses. (See Exhibit 3.) Then, from about 1990 onward, the inventory turnover rate trended upwards and topped out at about 9.5 turns per year in 2007 — a remarkable 27% gain in efficiency. The inventory turnover rate did fall sharply during 2008-09, with the onset of the Great Recession. But this ratio performed exactly the same way during the severe 1980-81 recession. By late-1983, the inventory turnover rate had regained all of the ground lost during the cyclical downturn, and we expect to see a similar rebound in the inventory turnover rate going forward.

Another commonly used metric is the ratio of the cost of logistics to nominal GDP. The total cost of logistics includes the costs associated with warehousing, inventory carrying costs, hiring 3PLs, and transportation costs for trucking, railroads, and all of the other modes. This ratio has trended downwards fairly steadily for the past 25 years, albeit with a few occasional upward blips. (See Exhibit 4.) In 2008, total U.S.

logistics costs amounted to 9.4% of GDP, down from the previous year and well below the ratios posted 25 years ago. This compression in the relative cost of logistics has occurred even as supply chains have been getting longer and more complex. (Transportation costs, we note, account for nearly two-thirds of total logistics costs.)

Variety may be the spice of life for consumers, but it can wreak havoc on supply chain professionals' work lives. Product proliferation has created new, formidable challenges for supply chains, with the number of stock-keeping units (SKUs) having exploded during the past 10-to-15 years. The greater the number of SKUs; the more difficult and costlier it is to sell, plan, forecast, track, manufacture, and deliver those units on time. If companies had not simplified and streamlined their distribution networks, this explosion in SKUs would have greatly

Exhibit 3: Inventory Turnover Rates, Total U.S. Business



Source: U.S. Census Bureau.



reduced the efficiency of supply chains and increased the costs of distribution.

The nation's overused and under-maintained freight transportation infrastructure poses additional challenges. Companies today must cope with port and rail congestion, highway congestion, rising oil and gasoline prices, a dearth of long-haul drivers, complex security measures, and crew and equipment shortages. These problems add to the complexity and risks of supply chains, yet supply chain executives have succeeded in overcoming them and delivering better service at lower cost.

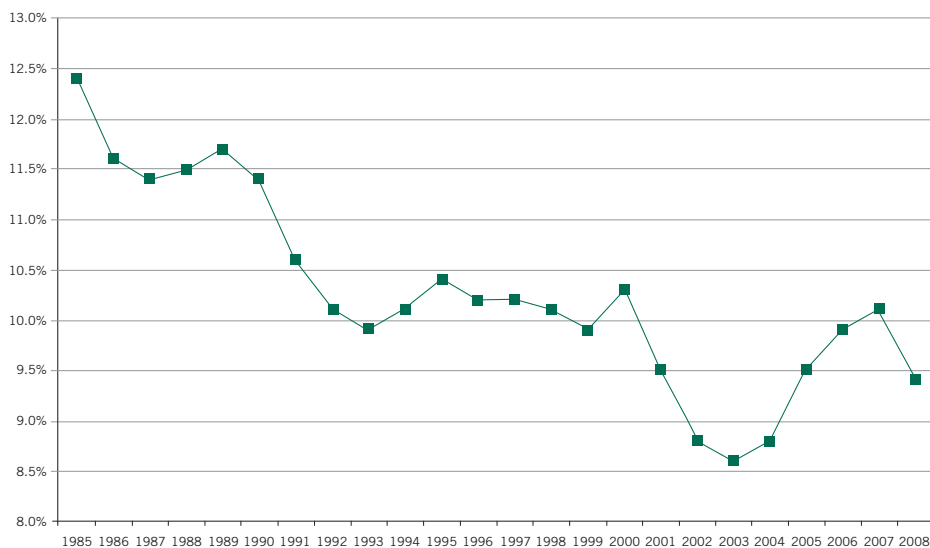
Concluding Remarks

Each day, supply chain professionals strive to keep the freight moving and get the right product to the right place, at the right time, and without damage. At the same time, they are also expected to increase inventory turns, improve delivery times and accuracy, and reduce the operating costs of their distribution networks.

Keeping the freight moving and getting it to its proper destination safely and on time have always been challenging tasks. Lately, however, these tasks have become even more daunting. Distribution networks have gotten longer and more complex. Product proliferation has resulted in escalating SKUs, adding to the cost and complexity. The nation's overused and under-maintained freight infrastructure is creating bottlenecks, congestion, and delays.

Despite the numerous obstacles and challenges, supply chain professionals not only have kept the freight moving, but also have managed to accelerate the rate at which it moves, increased the number of inventory turns, improved customer service, and kept a tight lid on logistics costs. There is no one secret to their success, but one of the key elements is surely their ongoing efforts to consolidate and streamline their distribution networks.

Exhibit 4: U.S. Total Cost of Business Logistics as Percent of GDP



Source: State of Logistics Report, CSCMP, Selected Issues for Various Years.



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