

# THE GLOBAL SUPPLY CHAIN: CHALLENGES AND SOLUTIONS

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## ABSTRACT

While there have been independent examinations of several of the changes that affect the supply chain, to date there has been little in the way of studies that holistically examine the changes facing front line supply chain managers today and the solutions they have implemented to address those changes. Supply chain executives have been interviewed in depth to better understand how manufacturing or distribution network changes, technology implementation, corporate re-structuring and/or increasing customer demands have been addressed in the field. An understanding of the challenges and successes faced by Global 1000 firms as they address these changes should help others in the field to better accomplish supply chain change.

## INTRODUCTION

Over the last four decades the logistics discipline has managed two opposing goals: minimize costs of the firm and maximize customer service delivered by the firm. Cutting edge companies such as Dell, Wal-Mart and many others, have managed to do both. Supply chain managers have also designed their supply chains aimed at balancing cost and service. Mentzer (2004) suggests that “customer value is created through There have been a number of books and papers outlining the definition and scope of supply chain management (Mentzer, et al., 2001; Simchi-Levi, Kaminsky, Simchi-Levi, 2003,

collaboration and cooperation to improve efficiency (lower cost) or market effectiveness (added benefits) in ways that are most valuable to key customers.” The goal has been to minimize cost, while providing the required level of service. The costs are often measured in decreasing cash-to-cash cycle time and the customer service, whether internal or external, is often measured in availability, delivery quality, communication and the like (Emerson and Grimm, 1998).

Wisner, Leong, and Tan, 2004; for example), research studies to examine supply chain metrics (Lambert and Pohlen, 2001), as well as a comparison of two major supply chain

frameworks (Lambert, García-Dastugue, and Croxton, 2005), and sources of competitive advantage attributable to supply chain management (Mentzer, 2004). While there have been independent examinations of several of the changes that affect the supply chain (network changes (Chopra and Meindl, 2004), technology implementation (Boyson, Harrington and Corsi, 2004), and the demands of customers (Lambert, Cooper and Pagh, 1998)), to date there has been little in the way of studies that holistically examine the changes facing front line supply chain managers and the solutions they have implemented to address those changes. Supply chain executives have not been interviewed in depth to better understand how manufacturing or distribution network changes, technology implementation, corporate restructuring and/or increasing customer demands have been addressed in the field. This article attempts to fill that gap. An understanding of the challenges and successes faced by Global 1000 firms as they address these changes should help others in the field to better accomplish supply chain change.

The manuscript is organized as follows. First, the research questions and methodology are presented. Next, the results of the interviews are summarized, followed by a discussion of the results and implications for supply chains. Finally, future research opportunities and conclusions are presented.

## RESEARCH QUESTIONS AND METHODOLOGY

To better understand how companies are managing the issues arising from the balance of cost and service, the researchers conducted extensive interviews with thirty-one top-ranking supply chain professionals from diverse industries. The interviews focused on (1) the challenges that global companies face in managing their supply chains; (2) the resolution of these challenges; and (3) the lessons learned from their experiences.

An extensive interview guide was developed to aid in discussions with the supply chain profes-

sionals and to be sure that the necessary research questions were covered. A list of twenty possible changes in the supply chain was developed from the literature, from initial discussions with industry professionals, and from topics included in several professional conferences. The interview guide included seven research questions for each of the twenty changes. (See Figure 1 for an example of the interview guide for one change.)

Prior to conducting the interview, the researchers sent each interviewee a set of preliminary research questions for the purpose of determining which of the twenty changes had the highest impact upon the informant's company. (See Table 1 for an example of the Pre-Interview Questionnaire.) The informant's four highest impact changes were the topics of their particular interview. In general, each telephone interview lasted between one and two hours and was taped with the permission of the informant. (All informants gave their permission to be tape recorded.) Each of the thirty-one interviews was then transcribed and analyzed. The interviews took place between February and May 2004.

The informants were vice-presidents and directors of supply chain or logistics for Global 1000 companies known for leadership in their respective industries. Annual revenues of these companies ranged from \$839 million to over \$134 billion with average revenues of \$18 billion. Informants represented manufacturers, distributors, and retailers from a wide variety of industries. (See Table 2 for the sectors represented.)

## RESULTS

Prior to the in-depth interview, each informant completed the pre-interview questionnaire. Analysis of these questionnaires clearly shows the most important issues that impact the supply chain for the participating firms are:

1. Changing the number, location, or mission of distribution facilities (52%)

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**FIGURE 1**  
**INTERVIEW GUIDE FOR CORPORATE RESTRUCTURING**

1. Can you further explain this change as well as why and how this change impacted your supply chain?
  - a. Merger
  - b. Acquisition
  - c. Entered into a strategic alliance or partnership
  - d. Experienced business unit spin-off

2. Indicate any of the following that describe the impact of this change on your supply:

	N/	Lo	Me	Hig
Increased or decreased operating cost	.			
Increased or decreased inventory				
Increased or decreased lead times				
Improved or deteriorated service				
Increased or decreased revenue				
Other				

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3. What was your response to this impact upon your supply chain?
  - a. Operational changes such as:
    - i. New processes
    - ii. New policies
    - iii. Training
    - iv. Organizational changes
  - b. Changes to the manufacturing network such as:
    - i. New plant layout
    - ii. New plant equipment
    - iii. Expanded current manufacturing facilities
    - iv. Relocated manufacturing facilities
    - v. Added or eliminated manufacturing facilities
  - c. Changes to the distribution network such as:
    - i. New D/C layout
    - ii. New material handling equipment/systems
    - iii. Expanded current distribution facilities
    - iv. Relocated distribution facilities
    - v. Added or eliminated distribution facilities
  - d. Combined manufacturing and distribution operations into common facilities
  - e. Implemented new supply chain technologies
  - f. Changed relationships or services from supply chain partners
  - g. Changed relationships or services from service providers
4. Was your response successful?
  - a. Yes, ask why in Q. 6
  - b. No, ask why in Q. 7

**Figure 1**  
**(continued)**

5. How was this success measured?
    - a. Improved operating cost
    - b. Improved inventory turns or ROA
    - c. Improved lead times
    - d. Improved service
    - e. Increased revenue
    - f. Reduced cash-to-cash cycle time
    - g. Improved ROI
    - h. Increased shareholder value
  
  6. What were the success factors?
    - a. Communication (vision & on-going)
    - b. Collaboration (internal, supply chain partners, service providers)
    - c. Top management support
    - d. Culture change
    - e. Training
    - f. Change management
    - g. Project management
    - h. Technology
  
  7. What were the lessons learned?
    - a. Communication (vision & on-going)
    - b. Collaboration (internal, supply chain partners, service providers)
    - c. Top management support
    - d. Culture change
    - e. Training
    - f. Change management
    - g. Project management
    - h. Technology
-

**TABLE 1**  
**PRE-INTERVIEW QUESTIONNAIRE**

**Company X Pre-Interview Questionnaire**

Please rate the following as to their impact upon your supply chain in the last three years.

- None Has not occurred or does not apply to your supply chain  
 Low Has occurred with minimal impact on costs and or benefits  
 Medium Has occurred with moderate impact on costs and or benefits  
 High Has occurred with a high impact on costs and or benefits

	<b>Impact on Your Supply Chain</b>			
	<b>None</b>	<b>Low</b>	<b>Med</b>	<b>High</b>
1. Corporate re-structuring (e.g., merger, acquisition, business unit spin-off)				
2. Increased lead times from off-shore manufacturing				
3. Changing the number, location, or mission of your distribution facilities				
4. Changing the number, location, or mission of your manufacturing facilities				
5. Increasing customer service requirements (e.g., more frequent ordering, VMI, pay-upon scan)				
6. Selling via new market channels (e.g., direct-to-retailers, direct-to-consumers)				
7. Postponement-based order fulfillment (e.g., custom packaging, make-to-order, assemble-to-order)				
8. Adoption of automated materials-handling technologies				
9. Outsourcing any parts of your distribution facilities or processes				
10. Outsourcing any parts of your manufacturing facilities or processes				
11. Outsourcing any parts of your procurement of either direct or indirect materials				
12. Revising your manufacturing strategy (e.g., from make-to-stock to make-to-order)				
13. Serving global markets from globally dispersed facilities				
14. Product proliferation (e.g., increased items, products, or SKUs)				
15. Complying with new security measures (e.g., CTPAT reporting, new customs regulations)				
16. Adoption of Radio Frequency Identification Technology (RFID)				
17. Implementation of new supply chain software applications (e.g., APS, CRM, SRM,SCEM,TMS,WMS,ERP)				
18. Integration of information flow between supply chain partners (orders, forecasts, planning, tracking, inventory)				
19. Increased collaboration with supply-chain partners (e.g., business reviews, planning, shared processes, CPFR)				
20. Which changes, challenges or opportunities would you add to this list?				

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**TABLE 2**  
**INFORMANT COMPANY SECTORS**

**Manufacturing**

- Electrical equipment and appliances
- Food and beverage
- Cosmetics, health and personal care products
- Office equipment
- Computers and computer peripherals
- Electronic equipment
- Communications equipment
- Medical equipment, supplies, and pharmaceuticals
- Athletic apparel, sporting goods, and footwear
- Men's and women's apparel
- Automotive components
- Paper products
- Insulation and roofing materials

**Wholesale Trade**

- Industrial and consumer paper products
- Food and beverage
- Footwear
- Petroleum and chemical products
- Industrial supplies, machinery, and equipment
- Medical supplies, equipment, and pharmaceuticals
- Cosmetics, health, and personal care products

**Retail Trade**

- Food and beverage
  - Industrial and consumer paper products
  - Footwear
  - Apparel
  - Sporting goods and athletic apparel
  - Cosmetics, health, and personal care products
  - Home furnishings
- 

- 2. Changing the number, location, or mission of manufacturing facilities (35%)

- 3. Implementation of new supply chain software applications (35%)
- 4. Corporate re-structuring (32%)
- 5. Increasing customer service requirements (32%)

Meeting increasing service requirements while remaining cost competitive was viewed as a fundamental challenge. To meet the challenge, the respondents suggested that their respective companies were making major changes in the supply chain including the first four items in the above list.

The in-depth interview questions included the following:

- 1. Why and how did this change impact your supply chain?
- 2. What was the driver of this change?
- 3. What was your response to the impact?
- 4. Was your response successful?
- 5. How was the success measured?
- 6. What were the success factors?
- 7. What were the lessons learned?

The results for each of these questions will now be discussed for the four most important changes listed above along with the issue of increasing service requirements.

**Changing the Number, Location, or Mission of Distribution Facilities**

Sixteen of the thirty-one informants interviewed rated this change as having a high impact on their firm's supply chain strategy. Eight informants suggested that it was the number and location of distribution centers that changed.

This same group also indicated that the layout of the existing distribution centers changed and that the geographic area serviced by a particular distribution center changed. Some changed or added material handling systems, while three informants changed the technology used by the distribution center.

The primary drivers of these changes to distribution facilities included reducing cost and improving service. Before the change, the informants indicated that their company had experienced increased operating costs and inventory levels along with levels of service that no longer matched customer requirements. When asked about the response to this impact upon the total supply chain, eight informants indicated that distribution facilities were added or eliminated, seven implemented new supply chain technologies and six changed relationships with or services from their service providers.

Six of the eight firms felt the change had been successful. (The other two firms felt it was still too early to tell.) Operating costs improved, along with inventory turns and service levels such as lead times. More importantly, the informants identified factors that contributed to the success. These factors included (in order of importance): project management, top management support, communication, internal collaboration, technology, culture change, collaboration with supply chain partners, collaboration with service providers, change management and additional training. Several informants wished they had acted earlier and would have liked an increase in internal collaboration to accomplish the change.

### **Changing the Number, Location, or Mission of Manufacturing Facilities**

Eleven of the thirty-one informants also chose to comment on why and how this change impacted their supply chains. Six indicated that all or part of the manufacturing function had been out-sourced; five established offshore manufacturing facilities. Four of this same

group changed the established manufacturing strategy in some way.

The primary drivers of these changes in manufacturing facilities were more diverse than those behind the changes in distribution facilities. Only three informants indicated that cost reduction was a driver. Other drivers included a loss of market share, a gain in competitive advantage, growth, a merger or acquisition, competition from a low cost manufacturing region, changes in the market, service improvement including lead time reduction, and supply chain optimization. Before the change the informants indicated that their firm had experienced increased operating cost and levels of inventory along with an increase in both supplier and customer lead times. One firm noted a decrease in margins. The response to this impact upon the total supply chain included primarily changes to the manufacturing network such as adding or eliminating manufacturing facilities and providing new plant equipment. However, four informants indicated that in addition to the manufacturing network changes, there was a corresponding change in the distribution network as discussed above.

Five informants rated the response of changing the manufacturing network as a success. Measures of success included improved operating costs and improved inventory turnover, improved service including lead times, and improved ROI, revenue, and cash-to-cash cycle time. Factors that contributed to this success were quite similar to those that contributed to success in changes made to the distribution network. These included (in order of importance) communication, internal collaboration, top management support, project management, collaboration with supply chain partners, change management, culture change, collaboration with service providers, and training. Only one informant would have liked more communication. The others said they would have done nothing differently.

## **Implementation of New Supply Chain Software Applications**

Eleven informants reported this change as having a high impact on their firm's supply chain

strategy. The new software applications that were mentioned included warehouse management systems (eight firms), enterprise resource planning systems (five firms), and advance planning and scheduling systems (five firms). While nine informants spoke about this change, the drivers behind the change were varied. Cost reduction in general was mentioned as a driver by three informants, while distribution network optimization, inventory reduction, increases in productivity and improvements in forecasting and planning were mentioned by two informants each. All of the remaining drivers were mentioned by only one informant each. These included: distribution center design, gaining competitive advantage by increasing switching costs, service improvement, gaining control of the supply chain, improving supply chain visibility, increasing customer service requirements, asset utilization, and a reduction in lead time, errors, and damage. Once again, before the change, the informants indicated their firm experienced an increase in operating cost, declining service including increased customer lead times, despite an increase in inventory levels. Additionally two informants mentioned a decrease in margins. The response to this impact upon the entire supply chain, as one might expect, was the implementation of new supply chain technologies. In two cases, this required new processes and training as well as new material handling equipment and systems.

Success on this change was rated a bit more cautiously. Three firms said the implementation was a success, while the remainder indicated it was too early to tell. Measures of success included improved service (including improved lead times), improved operating costs, as well as improved inventory turnover. Once again the factors contributing to success included (in order) communication,

internal collaboration, project management, technology, training, top management support, change management, culture change, collaboration with service providers, and collaboration with supply chain partners. Unlike the other changes, there were a number of suggestions regarding what the informant would have liked to have done differently. These included more training, an increase in project and change management, matching existing processes to technology earlier, and dedication of more resources earlier to the project. Finally one informant indicated it would be useful to better understand the various system set-up issues.

## **Corporate Restructuring**

Seven informants suggested corporate restructuring as a high-impact change. Four informants indicated that the corporate restructuring was due to acquisition, with three indicating the change was due to reorganization or a merger. The justification given by each informant for the change was different and included: the leveraging of the supply chain advantage in one business unit into competitive advantage for other units, leveraging market-place and supply chain synergies, market access, economies of scale, and overall required cost reduction to remain competitive in the industry. Prior to the restructuring, the impact suggested by the seven informants who chose to comment on this change was either an increase in operating costs or an increase in inventory. Three informants also mentioned a deteriorating service level. The response to this impact upon the entire supply chain crossed operations, manufacturing and distribution. As one might expect, all seven informants indicated their firm had made organizational changes including new processes, policies and training.

Additionally three informants indicated manufacturing facilities had been added or eliminated, seven indicated that distribution facilities had been added or eliminated, while five mentioned new supply chain technologies, All seven informants felt the restructuring had been successful. They measured success by improved operating cost and inventory turns, improved service including lead times, reduced cash-to-cash cycle time and ROI, which also increased shareholder value. The factors of success (in order of importance) included internal collaboration, top management support, project management, communication, culture change, collaboration with supply chain partners and service providers, technology, change management, and training. There were few items that informants would have done differently and they were mentioned by only one person each. The items included increased communication, technology, change management, acting earlier, moving too fast (which resulted in a sub-optimization of the operation), too much focus on execution rather than leadership, and waiting for technology to catch up before making a distribution center network change.

### **Increasing Customer Service Requirements**

Ten informants reported that increasing customer service requirements had a high impact on their firms' supply chain strategy. These customer service requirements included (in order of greatest number of companies reporting): retailers placing orders more frequently, shorter required lead times, on-time delivery as measured by the customer request date, vendor managed inventory, store-ready product (tag-ging, packing, labeling, and display for a particular store), specific shipping windows, pallet ID by retailer, store, department, and aisle, distributors placing orders more frequently, retailers requiring minimum line-item order fill percentage, perfect order measures in place, drop-shipping to distributors' or retailers' customer and specific delivery windows. Prior to the strategic

and changed relationships from service providers. This change had the most overlap with the other four changes.

response, the informants indicated their firms faced increased operating costs and inventory levels, and decreased customer and supplier lead time. The response to this impact upon the supply chain was overwhelmingly to implement new supply chain technologies with all ten firms indicating this solution. Additionally, eight firms implemented new processes, while four added or eliminated distribution facilities, and changed relationships with supply chain partners and service providers, and three made organizational changes.

Eight of the ten informants reported the response to be successful, measured primarily by improved operating costs and service including improved lead times. Seven informants saw improved inventory turnover while three reported reduced cash-to-cash cycle time. The factors of success (in order of importance) included top management support, collaboration internally, communication, collaboration with supply chain partners, change management, culture change, collaboration with service providers, project management, technology, and training. There was no consensus on what the informants would have done differently. Each of the following items were reported by one informant only: more collaboration with service providers, increased change management, act earlier, simulate the impact of what the company would do before doing it, benchmark with other companies earlier, involve customers earlier and more often, involve the sales force earlier, and three informants reported that they would do nothing differently.

## **DISCUSSION AND IMPLICATIONS**

As the research was completed, a picture emerges of supply chain change for strategic reasons. The changes are not reactions to flashpoints, but rather they are major changes

with the goal of increasing competitive advantage through reduced costs and increased service. The following is a discussion of the five highest impact issues, including the linkage of each to competitive advantage along with specific comments from the informants.

### **Changing the Distribution Network**

The informants indicated that distribution networks consist of fewer, larger buildings. The reduction of the number of facilities ranged from an 85 percent reduction to a 25 percent reduction. Three reasons were given for this. First, the change was the result of a merger and/or acquisition; second, there seems to be a trend away from multiple building campuses; and third, fewer stocking locations lead to greater network efficiency. A merger/acquisition was often done precisely to increase synergy by combining distribution networks, leading to much larger distribution facilities. The outgrowth of a single facility seemed to be the cause of multiple building campuses, according to many of the informants. This, in turn led to material handling inefficiencies as a company would handle the product multiple times before it was shipped as part of an order. For example, one company reported that they transfer twenty truckloads of product *per day* between multiple facilities on the same campus. This leads to lengthy receiving times, which delays product availability and increases lead time and inventory on hand. Another company was handling product up to three times before customer shipment, increasing operating costs, and inventory and reducing customer service.

The informants indicated that their respective companies were also seeking the inventory and cost efficiency of stocking products in fewer locations and relying on larger distribution centers of up to one million square feet. To address this much larger size, one company is taking a “warehouse-within-a-warehouse” approach. One area or “warehouse” contained pallets only to support truckload orders of full pallet picks. Another supports consolidated orders, which are a combination of case and

The changes to distribution networks resulted in the following: (1) fewer, larger facilities, (2) distribution centers designed to meet increasing customer service requirements, (3) changed relationships with 3PL’s, and (4) resource intensive implementation projects.

pallet picks. A third is for customer specific pallets and the fourth is for third party assembly and packaging operations.

Informants also reported the distribution center design was a result of increasing customer service requirements such as customer-specific product identification on all products, preparation of store-level orders consolidated into truckload shipments, and a reduction in lead time from seven days to three. Overall, the customer service challenge is to do more in less time. One firm addressed these requirements by using a new building, a new automated material handling system, and a new warehouse management system, all designed to work together. This resulted in a facility that can prepare any customer order within 24 hours, fully addressing the above customer service requirements.

While the informants used 3PL’s extensively both before and after the distribution network change, the relationships and role of the 3PL has changed for these firms. Changes include the separation of the building and system ownership from operational management, consolidation of providers, control of information systems, and ownership of automated material handling systems. For example, one informant explains:

So part of our goal in this distribution network redesign is to separate our facilities from our 3PL’s to get more flexibility. We will lease the facilities, but still use a 3PL for operation. We want to be in a position with the 3PL where what we are doing is essentially buying labor. We have benchmarked this with some other companies. Where

they have had success is to separate their buildings from their 3 PL's, and also their software so that the cost or impact of switching 3PL's upon the organization is minimal. That drives competition in your distribution supply.

Another company illustrates the resource intensive implementation of a distribution network change. To help mitigate this, the implementation strategy focused on strategic partnerships with outside firms who could. The manufacturing network changed primarily by outsourcing manufacturing to contract manufacturers in low cost manufacturing regions. Anywhere from 50 percent to 100 percent of production was reported to be outsourced offshore. With this change, companies reported increasing lead times from offshore plants via ocean freight from three to eleven weeks longer than domestic production. A number of strategies were reported to mitigate the increased inventory costs from outsourcing offshore. These included (1) shifting inventory responsibility to the supplier using increased terms, (2) requiring VMI hubs to be positioned to support the manufacturing facility, (3) increasing collaboration so that accurate data is obtained earlier, (4) obtaining security certifications enabling more efficient border-crossings, and (5) employing postponement strategies.

Additionally, some of the informants explained that their company saw cost advantages to bring inventory closer to the customer via geographic-centric manufacturing rather than product-centric strategies. Several companies changed from a product-centric manufacturing strategy, where a plant was focused on one product or product family to a geographic-centric manufacturing strategy, where all products are made in plants that are geographically centered within a major market area. The objectives were to move product closer to the customer, reduce outbound logistics cost, and eliminate steps in the supply chain. For example, one firm has plants in the eastern and western U. S., Europe and Asia.

provide the needed resources. While two 3PL's were used, there was a single property manager, selected to be a common landlord, to manage the design and construction process of the new facilities, and to conduct state and local negotiations. This company brought five million square feet on line in thirty months by leveraging the strengths of its partners.

### **Changing the Manufacturing Network**

Traditionally, each of these plants produced a portion, but not all, of the product line. By allowing all products to be assembled in each of the plants and to be shipped directly to customers located in the same region as the plant, the firm is now able to assemble and deliver the item to the customer within 48 hours.

### **Implementation of Supply Chain Software Applications**

The applications implemented spanned the horizon of supply chain functions from planning the supply chain with demand planning,

transportation planning, and advanced planning and scheduling systems, to execution with transportation management systems, warehouse management systems, automated materials handling systems, supply chain event management, and e-procurement, to collaboration with Collaborative Planning, Forecasting, and Replenishment. These applications had a high impact upon the supply chain because they created a supply chain infrastructure, which provides visibility throughout the supply chain. The value of visibility was widely recognized as improving forecast accuracy through seeing more accurate demand, reducing inventory, executing faster in response to demand signals, reacting faster to problems, and improved planning of labor and transportation. One informant explains the value of visibility:

Before, our customer orders would come in. Customer service would just drop them on the warehouse, and the warehouse had to fill them as they were received. Now, we are so linked with

### **Corporate Restructuring**

While it is common that companies acquire or merge to leverage synergies between them, the informants indicated that their company specifically sought to leverage supply chain synergies. Supply chain was a central thought in these restructurings, not a post-merger after-thought. The supply chain synergies came from aggregating more volume through a common supply chain of facilities and transportation lanes to reduce cost and improve service. The informants also suggested that as merger and acquisition activity increases in many industries, it leaves a trail of challenges to supply chain professionals. The promise is a new supply chain which aggregates the volume of two or more companies to flow through a common network of distribution centers to the same retail outlets resulting in lower transportation cost, inventory efficiency, and lower distribution expenses. The challenges, however, come in consolidating facilities, opening new facilities,

capacities, planning and smoothing, they [the warehouse] actually pre-work the orders in such a fashion that the warehouse uses capacity to minimize overtime. We have linked the entire order-to-cash process to drive efficiency.

Another states,

The driver [for visibility] was a need to continue to reduce costs to remain competitive in an extremely competitive industry. Our response to this was to make the supply chain more efficient for us as well as the rest of the supply chain. We realize our supplier's inefficiencies will end up in the price of our product. We have learned that lack of visibility causes almost all of these inefficiencies, and providing visibility was the answer. We have established that 85 percent of the problems incurred in our supply chain are the result of a lack of communication.

integrating systems, and addressing change management issues. Nonetheless, the informants explained that, overall, the restructuring contributed to competitive advantage: "The driver for the merger was to collectively gain business synergies, of which supply chain offered the greatest competitive advantage."

### **CONCLUSION**

This research was conducted by interviewing thirty-one top level managers of Global 1000 companies. The top changes with which the firms were grappling included: (1) Changing the

number, location, or mission of distribution facilities (52%), (2) changing the number, location, or mission of manufacturing facilities (35%), (3) implementation of new supply chain software applications (35%), (4) corporate re-structuring (32%), and (5) increasing customer service requirements (32%).

Regardless of which change impacted the firm the most, the suggested success factors were all considered to be important by the informants in effecting a supply chain change. These factors included project management, top management support, communication, internal collaboration, technology, culture change, collaboration with supply chain partners and service providers, change management, and the presence of additional training.

Caution should be used in applying these results to a larger population. While the views of the informants represent thirty-one large firms across a variety of industries, this research is qualitative in nature. It is meant to show the issues facing these managers, the solutions they implemented and the factors the managers saw as contributing to their success. Additional research is needed to better understand if these changes, solutions, and success factors can be applied to a larger set of supply chains.

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### REFERENCES

- Boyson, Sandor, Harrington, Lisa H., and Corsi, Thomas M. (2004), *In Real Time: Managing the New Supply Chain*, Westport, CT: Praeger.
- Chopra, Sunil and Meindl, Peter (2004), *Supply Chain Management: Strategy, Planning, and Operation*, Upper Saddle River, NJ: Pearson Prentice Hall.
- Emerson, Carol J. and Grimm, Curtis M. (1998), "The Relative Importance of Logistics and Marketing Customer Service: A Strategic Perspective," *Journal of Business Logistics*, 19(1): 17-32.
- Lambert, Douglas M., García-Dastugue, Sebastián J., and Croxton, Keely L. (2005), "An Evaluation of Process-Oriented Supply Chain Management Frameworks," *Journal of Business Logistics*, 26(1): 25-51.
- Lambert, Douglas M., Cooper, Martha C., and Pagh, J.D. (1998), "Supply Chain Management: Implementation Issues and Research Opportunities," *International Journal of Logistics Management*, 9(2): 1-19.
- Lambert, Douglas M. and Pohlen, Terrance L. (2001), "Supply Chain Metrics," *The International Journal of Logistics Management*, 12(1): 1-19.
- Mentzer, John T. (2004), *Fundamentals of Supply Chain Management: Twelve Drivers of Competitive Advantage*, Thousand Oaks, CA: Sage Publications, Inc.

Mentzer, John T., DeWitt, William, Keebler, James, Min, Soonhong, Nex, Nancy W., Smith, Carlo D. and Zacharia, Zach G. (2001), "Defining Supply Chain Management," *Journal of Business Logistics*, 22(2): 1-25.

*Managing the Supply Chain: Concepts, Strategies, and Case Studies*, Boston, MA: Irwin/McGraw-Hill.

Simchi-Levi, David, Kaminsky, Philip, and Simchi-Levi, Edith (2003), *Designing and*

Wisner, Joel D., Leong, G. Keong, and Tan, Keah-Choon (2004), *Principles of Supply Chain Management: A Balanced Approach*, Mason, OH: Thomson South-Western.

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