

# Product Design Collaboration: Capturing Lost Supply Chain Value in the Apparel Industry

<http://johnson.ASCET.com>

**M. Eric Johnson**  
Tuck School of Business  
Dartmouth College

**Outsourcing has transformed supply chain dynamics in the apparel industry. Adversarial relationships were unsustainable, and collaboration was the only way to maintain profitability.**

## Introduction

Sustained revenue growth in any industry requires a steady stream of innovative products. This is particularly true for short-life products like apparel or computers, where product lifecycles have shrunk dramatically, driving the need for even more new products. However, developing and bringing new products to market is becoming increasingly complex. With the driving forces of outsourcing and globalization, apparel supply chains have been rapidly disintegrating. Product designers, marketers, and manufacturers are no longer in the same building or organization. More likely, they are spread over several continents in organizations with different cultures, languages, and business objectives. For example, brands like Levi's used to do it all – operating their own U.S. production plants along with their core design and marketing activities. Now, Levi Strauss and Company has shuttered the production plants that once dotted the southeastern United States and outsourced much of that production, and even product design. While such outsourcing has had many positive effects on product cost structure and asset management, it has dramatically increased supply chain complexity. Most apparel makers' supply chains now span the globe with many hands touching the garment before it reaches the consumer. Coupled with shrinking product lifecycles, the resulting increased supply chain complexity has strained every player in the industry. Like a band trying to play a song faster and faster and eventually unraveling into a disjointed collision of sound, global supply chains in apparel often miss the beat. When this happens, products fail to meet

customer expectations or arrive too late for the intended season, requiring deep markdowns to liquidate the inventory before the next season of products arrives.

With the slowing economy, the past year has witnessed a near epidemic of retail markdowns. In many cases, products were marked down before they hit the retail floor, creating increased consumer expectations for even more markdowns. Yet this problem was not the result of a single bad year. Over the past eight years, apparel has consistently landed at the very bottom of the consumer price index. Racking up negative price increases in every year but one, apparel makers have been unable to increase prices while the overall index has increased by around three percent each year (Figure 1). For every player in the apparel industry, pricing pressure at the retail level has translated into a desperate struggle to reduce costs. From retailers and brands like Macy's and the Gap, to manufacturers and textile mills like Warnaco and Cone Mills, the cost pressures have been excruciating. The relentless pricing pressures and increasing supply chain challenges have eroded shareholder value across the industry and driven many players to the brink of bankruptcy. Even before the economic slowdown of 2001, apparel stocks had been performing miserably. During the good times of 1997-2000, Lehman Brothers' baseline price index for 62 apparel companies lost nearly half its value while the broad S&P 500 almost doubled.

After a decade of searching the globe for ever-lower costs, it has become clear to

nearly everyone in the industry that adversarial supply chain relationships focused on extracting cost reductions from suppliers is unsustainable. Winners in this industry must find new ways to leverage their supply chain partnerships through information integration and collaboration – improving products, driving down cycle times, and reducing supply chain costs. Players throughout the apparel supply chain are reinventing their businesses with Web-centric collaborative product management. Starting from raw fiber producers and working to the retail stores, companies from DuPont to Dillard's can collaborate and change the structure of the supply chain.

## The Apparel Chain

The apparel supply chain is indeed complex. Even simple garments like t-shirts are often touched by hands in several countries before ending up in the target markets of Europe or the United States. A more complex product, like a winter parka, often sports components from all over the world: snaps from Germany, zippers from Japan, insulation from China and Thailand, and the outer shell from Taiwan (Figure 2). To manage this complexity, many brand owners turn to facilitating agents like Li & Fung who add value by coordinating the far-flung supply chains.

Brands and agents that bring their products to market orchestrate a long supply chain starting with fibers (wool, cotton, synthetic) that are spun, woven, knit, and dyed in large mills, then on to cut-and-sew assembly operations, and finally laundry and finishing facilities before joining a global distribution system. With components like zippers and snaps added along the way, the final garment

*Professor Johnson is the director of supply chain research at the Center for Digital Strategies, Tuck School of Business at Dartmouth College.*

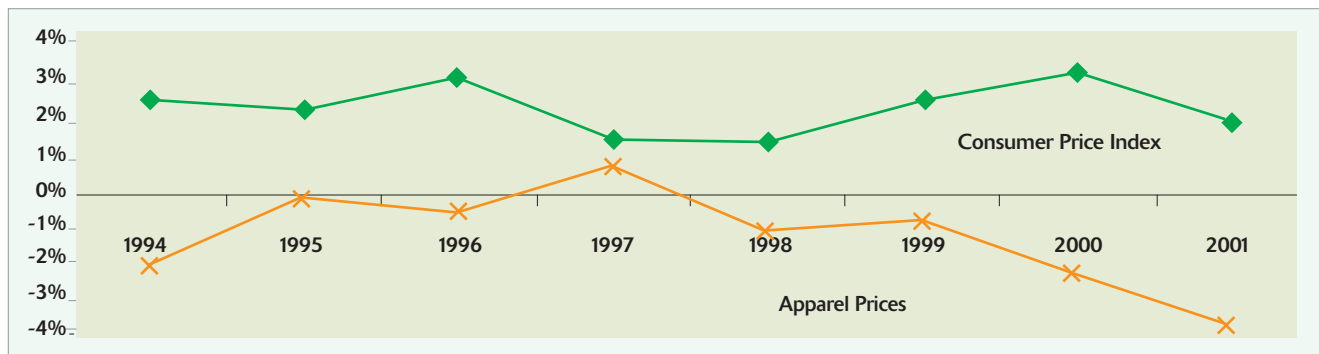
is the joint effort of many companies like DuPont (fiber), Burlington (mill), Kellwood (cut and sew), Liz Claiborne (brand), Dillard's (retailer), along with numerous transportation providers, freight forwarders, export agents, and warehouse providers (Figure 3). This whole process typically takes six to 12 months. The actual cycle time through the system is far less. Including transportation times, the value-added cycle time

off-goods. Getting the fabric right can mean multiple trials – each requiring weeks.

But developing a technical specification for the fabric is only the beginning. Artwork for prints that are transferred to the fabric surface come next. Then there is the specification of the garment itself – the patterns, cutting and sewing instructions, sizing specifications, and preferred vendors for buttons, snaps, zippers, and other components.

aging a distributed, complex supply chain.

An executive at Burlington lamented that the change process looks like a child's whispering game. Starting at one end of the chain, a designer may call a manufacturing coordinator requesting a change to the left rear pocket of the pants. But, by the time the request makes its way to the manufacturing floor in Mexico, the request becomes a change to the right front pocket.



**Figure 1** | The competitive apparel industry has experienced relentless deflation.

Source: Bureau of Labor Statistics and Tuck Analysis

without problems or changes is more like six to 12 weeks. But along the way, the complexity of coordinating the product definition and managing the associated miscommunications across multiple companies slows the process to a crawl. So, brands routinely begin working on their product lines well over a year before the selling season.

### Managing the Product

One of the biggest challenges in the industry is simply defining the product. Each garment has many technical specifications. First there is the fiber and fabric itself. Working with fiber producers and mills, brand designers first must define many attributes of the fabric: its make-up, texture, weight, associated strength and elastic qualities, color, and finish. Even for what seems like a simple product, like jeanswear, this process can take months. After developing the concept with the brand, the mill runs a pilot production run of the fabric and submits it for testing. After review with the brand, changes are made and another pilot is run. Because of the scale of a high volume mill, each pilot run means producing several thousand yards of material that ultimately gets scrapped or dumped as

Together with the bill of materials, associated drawings, process instructions, testing specifications, and technical color definitions, the total information content defining each product is massive. Even final garment finishing can be complex. For jeanswear products, the science behind laundering the garments to achieve the desired look is a key area of competition among brands and a high value-adding step to the garment.

As with many old industries, the information management supporting all the different facets of a garment specification has been slow to keep up with the increased complexity of the supply chain. Ensuring that everyone in the supply chain has an accurate and up-to-date description of the product is one of the biggest challenges. Like all products, once designed, garments are subject to many design changes in the pre-production phases. Typical products see more than 50 changes or enhancements before production is complete. And often changes made by brand designers are slow to reach the production floor of a contract manufacturer. In many companies, the change process is conducted through faxes, phone, and emails – all poor means of man-

Getting the right information to the right people at the right time is the biggest challenge. Equally important is visibility to the entire product and sourcing team with a documented history of product changes. All too often, a change made by one member of the design team would be unseen by others creating confusion and finger pointing. Off-spec products arriving at a brand distribution center would be turned back by inspectors only to find out later that a single manager in the chain verbally approved the changes.

At Liz Claiborne, the first step toward information integration was bringing designers online using a consistent set of tools. Designers, long focused on hand sketching, were hesitant to move to computer-aided design. The organizational change of bringing hundreds of users online with digital design tools was painful, but after a five-year effort they have cut design time by 50 percent. Yet firms like Liz found out that automating the design process, while improving internal efficiencies, did not help solve the supply chain problems. Vendors, who were less technically sophisticated or used different proprietary design systems, couldn't profit from the digital product designs. Often artwork created

in a CAD system by a brand would be printed and shipped by overnight mail to a manufacturing partner where the document would be scanned (re-digitized) to drive the manufacturing system that actually created the material. Even for those who could use the digital artwork, moving very large files over the Web required more than simply attaching the CAD file to an email message. It required a content management system that provided centralized product information, where changes could be tracked and everyone was sure to have the most recent information.

300 to 500 faxes a day during crunch periods. For each of the more than 6,000 styles produced, a 12-page fax is sent, including the bill-of-material, sketches, cut and sew instructions, and other process information. Color pictures and print specifications were transferred by express mail throughout the world. At a subcontractor in India or China, the collection of documents would arrive over a period of days and weeks – completing the specification of the products. However, if there was a change in the design and assembly process the product would be side-lined until the issues could be resolved

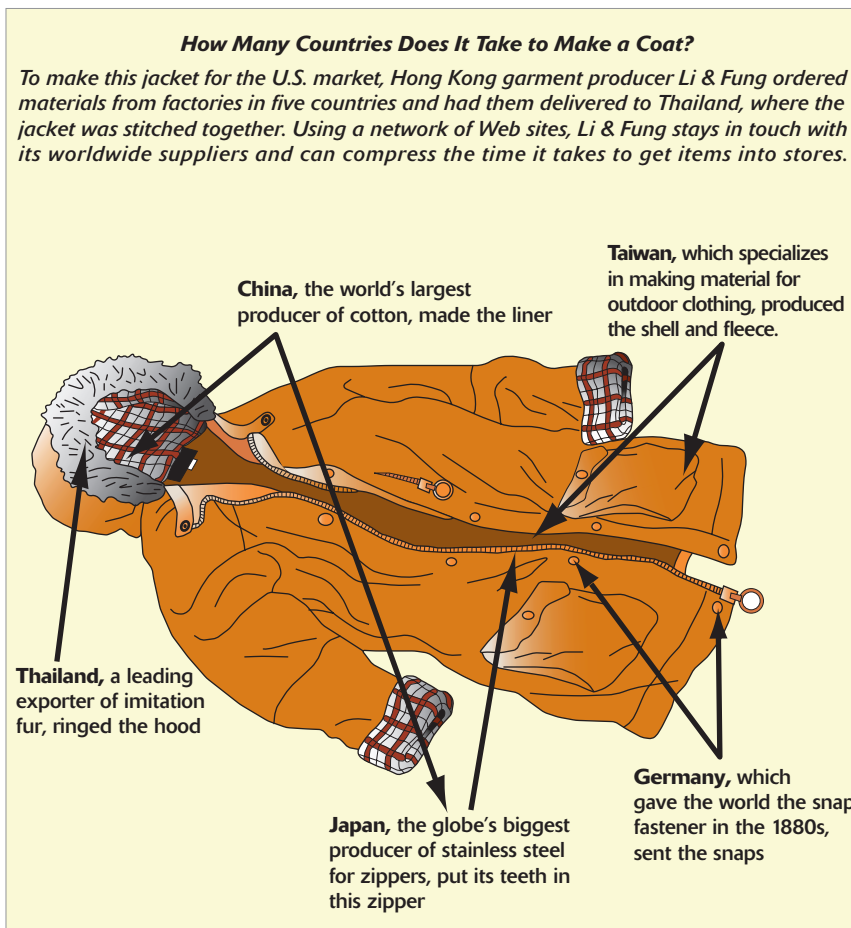
## Web-Centric Product Content Management

Tormented by the rising cost of complexity, many apparel designers began adopting digital design systems 10 years ago, but like Liz, found that transferring the information within the rapidly disintegrating supply chain was tedious. Large firms like Gap and The Limited invested in their own systems only to be paralyzed by the integration issues. With the opportunities of moving design processes onto the Web, third party apparel product management software companies like Applied Intranet (now Freeborders) and later Gerber began developing Web-based solutions. Levi's was one of the first large apparel companies to begin implementing a collaborative product management system from Freeborders to facilitate fabric development, linking textile mills to Levi's product development, sourcing, pattern-making, and quality.

For Dillard's, even the simplest features of these tools dramatically changed their product content management. Using a publishing and content management tool called Freeborder's CPM Design, Dillard's eliminated the faxing and emailing of product documents to their vendors. Each style is now managed with a virtual folder where designers and manufacturing partners can access documents over the Web. With important product content stored in a single place, everyone is assured to be working from the most recent version. More importantly, changes cannot occur without being visible to all parties. Email is limited to reminders to check changes in the folder and no changes can be made outside of the system. Besides saving weeks in communication time, the system helped eliminate costly mistakes and confusion.

Liz implemented a similar system, cutting weeks out of the cycle time. At Liz, the time saved using a Web-based system ensured more on-time deliveries and helped avoid costly markdowns due to late shipments. In some cases, with extra time in the design cycle, products could be further improved or shipments could leverage less-cost ocean transport rather than air freight. The advantages of even a simple Web-based system are enormous including:

- Reduced cycle time
- Reduced faxing and express mail costs

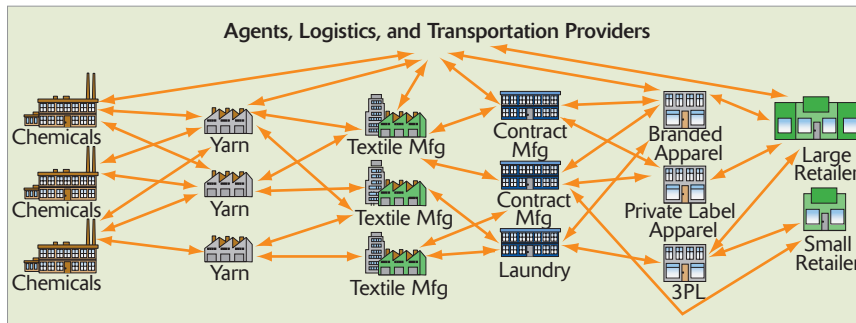


**Figure 2** | The Global Apparel Industry

Source: *The Industry Standard*

At Dillard's, information transfer between in-house private-label designers and their 50 subcontracting partners once depended on massive faxing and overnight mail shipments. As recently as two years ago, Dillard's employed a staff whose sole job was to send

and the required people in each organization had signed-off on the changes. When crunch time came, changes often happened over the phone or via email with others in the design team left out of the loop, causing confusion and mistakes.



**Figure 3** | The Apparel Supply Chain

- Faster time to volume production
- Reduced scrap costs and mistakes
- Fewer markdowns due to late arrivals
- Secure environment using fewer paper and emailed documents
- More reuse of standard design elements saving time in the design process
- Archived product history and product change information leading to better accountability

For contractors and mills, getting the product right the first time reduces scrap and costly delays that drive down manufacturing utilization. But escaping the the endless blame game when changes occur is one of the largest benefits.

### Making the Leap to Collaboration

Reducing costs and speeding the design process are important benefits of Web-centric product management systems. However, the biggest prize is leveraging the intelligence of all partners to enhance the product. Study after study has shown that the majority of the final product cost (80 percent or more in some cases) is locked in early in the design process when concepts are considered and materials selected. More importantly, the options for cost-effective product improvement are also greatest in the early stages of design. At this point, designers could benefit from collaborating with suppliers, like DuPont, to better understand the cost of their product and alternative concepts. Material suppliers and manufacturers could bring their knowledge of new materials and processes to designers and help them brainstorm enhancements and entirely new products. The results of such collaboration are better products, more innovation, lower costs, and higher customer value.

For the apparel industry, examples of true

collaboration are hard to find. While firms like Dillard's have migrated all of their vendors to a Web-based system for product assembly specifications, more complex specifications of the fabric itself and color management still reside in the off-line world. In some cases, the barriers are technology adoption and cost. For example, spectrophotometers can precisely measure color of sample items, but some designers are not comfortable abandoning personal, eye-witnessed samples. Information transfer speed in many third-world countries where most apparel is produced is also a limitation of true, two-way collaboration. While plants may be able to successfully download specifications and sketches, the concept of real-time interaction around the product design is limited by long intervals between communications.

Additionally, complex CAD specifications of fabrics with detailed color pictures create data movement problems even within the United States and Europe, let alone rural China or Thailand. For a vendor in Sri Lanka to download a specification over a phone line could take hours. In those cases, physical samples of materials and drawings still must be moved by express mail. As with many other industries, trust and technology adoption are still the largest barriers to collaboration. Technology itself is rarely the limiting factor. Decades of cost-focused procurement has created an environment of distrust in the industry that hinders firms from working together. Resistance to change itself also leaves many companies squabbling internally rather than moving forward. Nevertheless, given the current financial state in the industry, few firms have the luxury to do nothing. With cost and efficiency improvements available in the cur-

rent generation of Web-based tools, the benefits of content management systems are easily justified. Adopting these tools is the first step in the move towards product collaboration.

Possibly some of the most exciting initiatives to enhance collaboration have been focused on helping the designers and manufacturers early in the textile and garment development process. For example, DuPont has vast experience working with textile mills to help them better use DuPont fibers in manufacturing. When fashions move towards more stretch garments, DuPont is there to help fabric producers better use Lycra to produce a wide variety of stretchy material. This service offered to mills has given DuPont a working knowledge of worldwide textile producers to help designers find plants that can produce the high-quality fabrics required by the brands. Building on this service has opened an exciting opportunity for DuPont to collaborate and add value in the apparel supply chain. By developing a Web-based system that can be integrated into a product content management system, DuPont could help designers both design fabric and find manufacturing partners to produce it. Recently, DuPont introduced the Lycra Assured Network, a collection of textile and apparel industry partners that collaborate to bring innovative stretch garments to market faster and at reduced costs. A cornerstone of the Network is the development of a suite of online collaborative tools that will increase the efficiencies and the marketing reach of the partners. The first generation of this tool, the Lycra.com® Online Fabric Library, allows users to develop libraries of fabrics and reduce the need for physical samples. Additionally, it speeds up the search process for high-quality fabric vendors. Integrating those libraries into product content management systems is the next step in creating a valuable tool for the apparel industry and bringing DuPont into a collaborative relationship with designers.

For the apparel industry, making the leap to true collaboration will be the key to survival for many firms. Building trust and an organization that embraces Web-centric technology are vital to move forward. ■