

Reducing Cycle Time in the Apparel Retailer-Manufacturer Global Supply Chain Through Interorganizational Linkages

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Executive Summary

Given increased global competition and consumers' increasing price sensitivity, apparel retailers such as J. C. Penney have begun to focus on quick response and cycle time reduction as part of their overall business strategy. Extensive use of interorganizational linkages with major suppliers has become a key component in designing more effective, responsive strategies to meet changing corporate objectives. Electronic links with customers, suppliers, business partners, and the firm's vast network of retail stores are critical to successful relationships.

CTR Through Interorganizational Linkages

This field study examines cycle time reduction (CTR) opportunities across the retailer-manufacturer supply chain in the U.S. apparel industry. The global supply chain (GSC) extends from customer order placement at the apparel retailer to the apparel manufacturing facility. The primary focus of the project was on the retailer's purchasing and sales functions with respect to the apparel manufacturer and the retailer's customer. The project objective was to identify opportunities to reduce cycle time in key business areas through *interorganizational linkages* between the retailer and the manufacturer in a way that reduced cost and/or improved customer service.

A number of CTR opportunities were identified. They included identifying "high-performing" interorganizational linkages such as control linkage, pure linkage, intensive linkage, and integral linkage. The article concludes with lessons learned from this real-world field study and offers recommendations for both management practitioners and researchers to consider.

Introduction

In March 1994, Dave Evans, Chief Information Officer of J. C. Penney Co. Inc., gazed out over the Texas plains and pondered the future of information technology and retailing. The trade press had recently been speculating about the transformation of retailing. Advances in telecommunications and information systems had sparked a revolution in retail industry competition. Combined with related changes in apparel manufacturers' production methods, far-reaching changes in the fundamental buying and selling practices of apparel retailers have been made possible. Retailers such as The Limited, Dillard's, J. C. Penney, and The Gap are combining innovative uses of information technology and strong merchandising programs to create an unprecedented gap between retail winners and losers (Caminiti, 1990).

CTR Through Interorganizational Linkages

This article consists of three sections. The first section presents an overview of the U.S. apparel industry and offers a global supply chain perspective on retailer-manufacturer relationships. The next section explores the relationship between CTR and the interdependencies between organizations in the GSC. A field study is used in which the experiences of actual research participants are shared and discussed. The third section presents CTR opportunities between the retailer and manufacturer. These reductions were facilitated by process, structure, and information technology changes in their relationships.

The Dynamics of the Apparel Industry

The U.S. apparel industry offers a useful context in which to explore the changes in retailer-manufacturer partnerships enabled by technological improvements (Hammond and Kelly, 1990). The industry is enigmatic; most of its segments compete primarily on low cost, yet the industry wastes an estimated \$25 billion per year through inefficient practices (Frazier, 1986; Wetherbe, 1995). Both retailers and manufacturers are unable to meet the demands of a highly dynamic marketplace, in which new products routinely take more than a year to market (Hammond, 1993). Because production at the manufacturer's end must be planned far in advance, it is invariably based on speculative forecasts. The time lags and errors inherent in the planning process result in staggering losses, primarily because of forced markdowns, stockouts, and high inventory levels (Sharp, 1986). In an effort to avoid these losses, retailers have traditionally tried to shift risk,

either back to their manufacturers or forward to their customers. This has set up an adversarial retailer-manufacturer relationship that has characterized the apparel industry.

The Global Supply Chain Perspective

To fully understand how CTR opportunities can be efficiently and effectively achieved, both the firm and GSC levels are analyzed. Here, GSC refers to the sequence of activities from the acquisition of raw material to the delivery of product to the final customer. The firms included in the GSC activities include the fiber provider, yarn manufacturer, textile manufacturer, apparel manufacturer, and retailer, as well as firms that supply supporting information or distribution services to the companies that actually manufacture or sell the product. Given the intense competition and "geographical shrinking" of distant markets, a global perspective of the supply chain is crucial. Retailers and manufacturers that have succeeded in coordinating their GSC activities have found that the speed, flexibility, and the cost advantages of a global network can give companies a competitive edge. The Limited, Benetton, Levi Strauss, and Liz Claiborne are all formidable competitors who have effectively managed global supply chains to great advantage (Hammond, 1993).

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Figure 1 shows the GSC in the U.S. apparel industry. It is essential that CTR capabilities, such as speed and customer responsiveness, be recognized as GSC capabilities. Thus, the set of capabilities that a retailer offers its customers is very much the result of its suppliers' (i.e., apparel manufacturers) capabilities, as well as its own. In order to achieve CTR capabilities, companies must choose or develop supply chain partners that have the necessary capabili-

ties, and establish coordination linkages that ensure the rapid flow of both product and information through the supply chain.

Cycle Time Reduction Through Interorganizational Linkages: A Field Study

A number of companies in different sectors of the apparel industry have implemented CTR programs by focusing on supply chain management. Some of these programs link only two partners in the supply chain (e.g., a manufacturer and a retailer), while others span a broader portion of the supply chain. For

example, in 1972 Benetton implemented a production process in which garments were dyed after they were knitted, in contrast to the standard industry practice of knitting garments from pre-dyed yarn. This innovative quick response strategy allowed Benetton sales agents to ensure greater customer satisfaction by reducing the product-to-market cycle time. They were able to change their preseason orders from unpopular colors to popular colors after witnessing demand at the retail level (Signorelli and Heskett, 1983). Similarly, Haggar Apparel Company's H.O.T. (Haggar Order Transmission) system was able to successfully leverage interorganizational linkages with textile suppliers and retail stores to achieve a reduction in its manufacturing cycle from 14 days to 7 days (Susan, 1989).

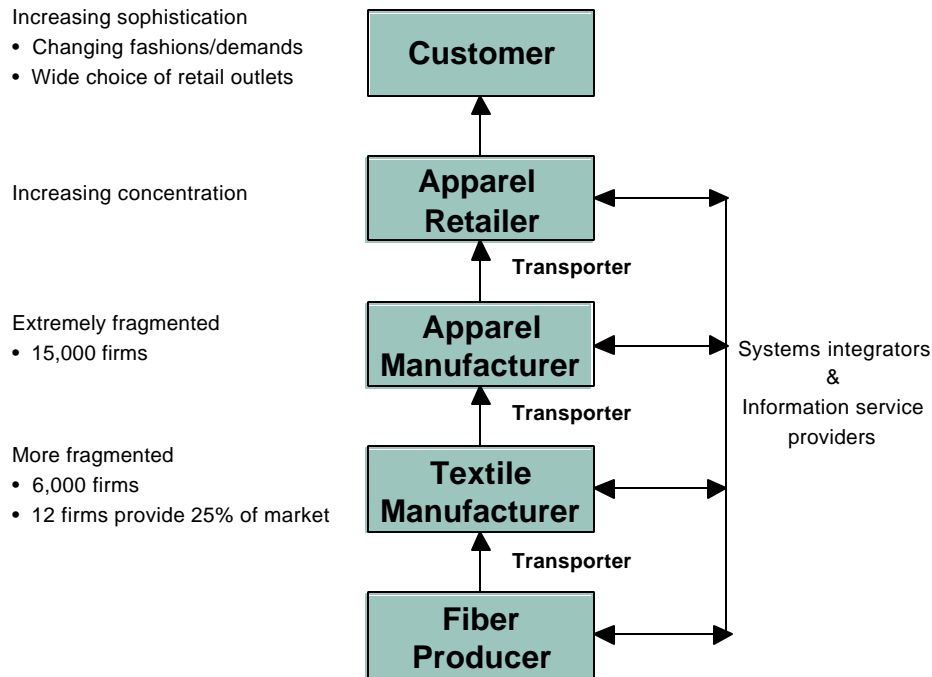


Figure 1: Global Supply Chain in the U.S. Apparel Industry

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These examples illustrate that achieving CTR in the GSC through interorganizational linkages is not only feasible, but imperative to succeed in the global marketplace.

Essential Elements of the GSC in the Apparel Industry

Figure 2 suggests that the presence and interaction of seven key components are essential in achieving CTR in organizational processes across the GSC.

Effective, Integrative Information Pipeline. An effective information pipeline, characterized by information sharing and rapid information flow, is a vital component of the GSC. This benefits all partners by allowing them to: (1) plan production more accurately so that only goods for which there is likely to be consumer demand are produced, (2) eliminate

redundant quality control and distribution practices, (3) reduce the amount of paperwork associated with ordering and inventory control, and (4) ensure that changes made at one stage of production (e.g., a cost reduction effort by a yarn manufacturer that results in the production of yarn of uneven diameter) do not impede the effectiveness of changes made later in the production process (e.g., a cost reduction effort by a textile manufacturer such as the installation of high efficiency, automated looms that require consistency of incoming fiber or yarn).

Shortened Process Cycle Times. Considering the dynamic and short life cycle of apparel, coordination—both intraorganizationally and interorganizationally—is critical in achieving cycle time reductions in business processes. Recent research reveals that product development processes, in which functional areas overlap and managers in different functions make decisions jointly, produce

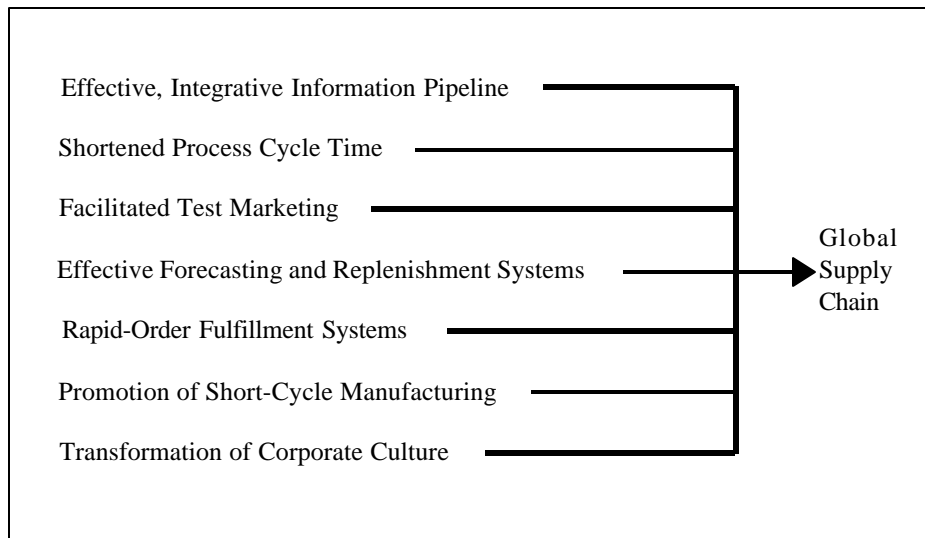


Figure 2: Elements of Global Supply Chain in the Apparel Industry

shorter, less costly development projects and better designs (Hayes, Wheelwright, and Clark, 1988). Moreover, as Wetherbe (1995) points out, CTR often results in multiple effects across business functions because of the existence of interdependencies among them. In this area, technological advancements in the areas of computer-aided design (CAD) and EDI have been instrumental in achieving process gains in the area of CTR. For example, J. C. Penney uses Sony's "Still Image System" to electronically transmit detailed color photographs of its new designs from its Texas headquarters to its overseas production offices in a matter of minutes. After viewing the images, store managers transmit orders to the production facility or to a Penney buyer, who consolidates individual store orders and electronically places an aggregate order with the manufacturer. Use of systems such as these improves new product designs by incorporating feedback from market-conscious store managers, dramatically reducing order lead times and greatly reducing uncertainty in buyer's orders.

Facilitated Test Marketing. The advent of quick response has made eliciting consumer feedback on new products and product concepts not only viable, but vital. When new products can be made available at retail in a matter of weeks, consumer test marketing becomes beneficial. In a GSC, close coordination between companies in the chain is again necessary. For example, The Limited tests new product designs extensively. Upon completion of a preliminary design, the company sources and delivers "floor sets" of sample products to a few representative store locations. The Limited buyers and merchandisers travel to the test sites to observe customer reaction to the new products. Based on this feedback, The Limited orders larger quantities of products with the strongest selling indications, thereby reducing ordering risk and increasing customer satisfaction.

Effective Forecasting and Replenishment Systems. In the apparel industry's GSC, merely collecting and transmitting data is insufficient to support the complexities of retail decision making. Effective decision support systems that incorporate current sell-

ing trends with existing sales history must be used to develop accurate demand forecasts. This in turn helps buyers determine appropriate order quantities. Automatic replenishment systems (ARPs), operated by either apparel retailers or manufacturers, are becoming increasingly prevalent and effective mechanisms for determining appropriate replenishment quantities. Manufacturers are also developing the capability to interpret retail sales data in order to determine appropriate replenishment quantities for their retail customers.

Rapid Order Fulfillment Systems. To have an efficient GSC, it is vital that apparel manufacturers rapidly fill the orders and deliver them to specified retail locations. Delivery times vary with the demand characteristics of products and the production disciplines employed by manufacturers. Many manufacturers, such as Levi Strauss, hold limited quantities of a set of core products in inventory so that orders for those goods can be filled from stock. Fashionable items may be made to order, thereby adding the product's manufacturing cycle time to its order fulfillment time. Thus, it is important to establish inter-functional linkages in a GSC context in order to have smooth, effective operations.

Promotion of Short Cycle Manufacturing. Through various interorganizational linkages, an efficient GSC can promote short cycle manufacturing, providing more timely delivery of goods to retail stores. Whether orders are filled from stock or made to order, long manufacturing cycle times add significant risk to the manufacturing process. Flexible manufacturing practices, such as manufacturing cells ("modules") or unit production systems (UPSs), are being employed by manufacturers to significantly reduce manufacturing lead times. Electronic pattern-making and laser-based cutting technologies also help to expedite manufacturing, improve accuracy, and reduce waste.

Transformation of Corporate Culture. Perhaps the most important, and in many ways most elusive, requirement of a GSC is the establishment of broad changes in corporate culture to support a CTR strategy throughout the supply chain. For example,

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MAST Industries, the sourcing subsidiary of The Limited, has effectively implemented changes in organizational focus to support its time-based competitive strategy. MAST employees quote lead times in hours instead of the weeks, months, or even years that most other apparel firms use.

Interdependencies in the GSC

In a GSC there are three kinds of interdependency: (1) *environmental interdependency* about the general business processes (such as purchasing, sales, and manufacturing), (2) *relationship interdependency* about a focal firm's (e.g., retailer) business relationship with a partnering organization in the supply chain (e.g., manufacturer), and (3) *internal interdependency* with the specific function jointly accomplished (e.g., order fulfillment). These interdependencies are interorganizational in nature because of the relationship that exists among the companies in the GSC. These interdependencies drive companies to seek linkages that utilize structure, process, and technology coordination mechanisms to achieve CTR across their organizational boundaries (Prakash, 1996). Structure coordination mechanisms between companies include availability of multiple communication and coordination channels, as well as intensity and frequency of coordinating tasks, such as email and group meetings. Process coordination mechanisms refer to the sociopolitical processes characterized by such things as conflict, cooperation, and commitment between firms in the supply chain. Technology coordination mechanisms represent the use of information systems technology such as EDI, distributed databases, and CAD to establish an interorganizational linkage in order to achieve CTR.

Based on a study of the relationships between 14 leading apparel manufacturers and nine retailers in the U.S., various high-performing interorganizational linkages were identified that utilize a combination of structure, process, and technology mechanisms to achieve CTR in their GSCs.

Pure Linkage

Simple apparel products, such as men's briefs, are typically based on a mature technology and require very little engineering effort and a low level of customization. In addition, no major innovations in functionality, manufacturing, or price/performance are likely to occur in the near future. Executives in the companies studied indicated that the volume requirements for these items are typically predictable, and that the volume forecasts established by their firms are reliable. Purchasing and sales managers estimate that the work they do with the manufacturer/retailer in question is well structured, and tend to follow a clear approach to task execution, as specified in the job description order. Hence, negotiation of the contract, regulation of delivery, inventory, and monitoring of quality for these standard apparel items follow established procedures.

The retailer perceives little risk from, and interdependency on the manufacturer supplying these items. Neither member of the dyad has made any investments specifically for this relationship. The retailer (and the manufacturer) could easily switch to an alternative source of supply, if necessary. However, they describe their relationship as a highly trusting one and expect the business relationship to last a long time. Thus, in this setting, where the apparel items are standard, well understood and controlled on both sides, large investments are made by the retailer in process mechanisms. This linkage is characterized by the synergy created by low relationship interdependency and investment in process coordination mechanisms and is labeled "pure-linkage."

CTR performance measures for this type of linkage strongly point to the presence of a close and nurtured partnership. The relationship is perceived as productive and worthwhile, and the executives are satisfied with the level and quality of the information exchange, resulting in highly satisfied customers. Buffer levels, measured as inventory levels at the retailer and manufacturer sites, are maintained at an extremely low level.

Integral Linkage

The apparel items involved in an integral linkage are typically the ones close to the fast-moving, flagship products of the retailer. Their level of complexity arises from the design process, through the development and manufacturing process at the manufacturer's design plant, to the harmonization of production and delivery schedules. These integrated subsystems require high levels of technology and engineering capabilities that manufacturers usually keep proprietary, and frequently undergo major innovations.

The rapid change in the technology and product design of these items renders the task of structuring and programming delivery schedules difficult for both purchasing managers and sales managers. Demand forecasting and pre-planning for these items is not only a high interdependency task, but the results and recommendations can quickly become obsolete because of the time-sensitive nature of the products.

The sales and purchasing executives function in a world of high confusion and uncertainty. The dyad members (i.e., retailers and manufacturers) are highly interdependent. The retailer's specific investments and assets tied to this relationship represent potential risk to the retailer if the manufacturer becomes opportunistic and exits the relationship, moves to a competitor, or simply starts making such threats. Manufacturers governed through integral linkage are internal or allied divisions completely owned by the retailers. Additional measures of manufacturer size, the number of products supplied, and the degree of internal sourcing support this conclusion. These relationships are the product of a long history of doing business together and of mutual trust.

This linkage is unique because it reflects no implicit trade-off among the structure, process, and technology coordination mechanisms. The extensive reliance of impersonal media, such as written mail, suggests an exchange of large amounts of data and information, while the amount of time key informants reported spending in visits and team meetings reflects the use of rich media to deal with ambiguity and lack of mutual understanding.

The use of interorganizational technologies, such as EDI, represents an effective use of technology to efficiently and effectively coordinate tasks between members of the dyad. These technologies are implemented across multiple functional areas including purchasing, engineering, quality, payment, delivery, and order processing. In addition, purchasing managers at the retailer's end reported consistent use of EDI. While purchasing managers at retailers emphasize the electronic exchange of purchase order related documents (i.e., purchase orders, acknowledgments, order changes, and change acknowledgments), manufacturers

concentrate their use around negotiation related documents and quotation documentation (i.e., request for quotes, response for requests for quotes, etc.). The high level of process integration implies that there is little or no need to manually reenter the data into the manufacturers' internal information systems, and in some instances, data is automatically and directly used by the manufacturer's systems.

In addition to use of technological mechanisms to enhance interorganizational coordination between the members of the dyad, process coordination is typically high. However, there are areas of disagreement between retailer and manufacturer. For instance, item pricing, cost structure, design, quality levels, inventory levels, and delivery policies all con-

Interorganizational linkages that specifically leverage structure, process, and information technology mechanisms can achieve and help sustain continuous cycle time improvements and high customer satisfaction.

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stitute areas for disagreement. Due to the high process coordination mechanisms in place, these disagreements are invariably resolved in a collaborative and constructive way based upon problem-solving and negotiation rather than on confrontation. The retailer also involves the manufacturer in the early stages of apparel customization and forecasting, and engages in joint action and cooperation in long-range planning, advanced research, training, and education. Thus, these processes and actions induce greater information exchange between the individuals involved in a structure-based (i.e., during a visit or meetings), or technology-mediated (e.g., EDI), coordination effort.

CTR measures point to the high performance of an integral linkage configuration existing between retailers and manufacturers. Key executives in retail and manufacturer firms indicate they are highly satisfied with the relationship itself and the level of information exchange with the manufacturer. The manufacturer ratings conducted by the retailer also show short development times (i.e., reduced cycle times), strong technology and engineering capabilities, and high quality equipment. Delivery of apparel items is typically done on a just-in-time basis, with minimal inventory levels at the retailer site. The average proportion of apparel items scrapped or returned to the manufacturer is low, attesting to high quality standards.

Intensive Linkage

This linkage displays the highest level of joint action. Mutual cooperation between the firms in the dyad extends beyond joint delivery scheduling of apparel items and includes long-range planning, training/education, and technical assistance. The level of technical complexity and product customization involved in the apparel items transacted through intensive linkage is typically moderate. A high level of mutual interdependency between the retailer and the manufacturer determines the selection of the manufacturer in the retailer's sourcing decisions. Given the high level investments that both the retailer and manufacturer have made

in one another, neither of them can switch to another business partner. This perception of sharing a mutual fate is also associated with a positive climate and low levels of anxiety about any possible shirking of contractual obligations or other opportunistic behavior. In this kind of relationship, trust and readiness to share sensitive information is strong. Executives who were interviewed felt that the relationship is likely to last a long time.

Purchasing managers and sales managers reported a high frequency of visits of personnel from both the manufacturer and retailer. Multiple channels in the relationship reveal that purchasing managers work together with multiple functions from the manufacturer such as sales, apparel designers, and manufacturing or quality personnel. Information exchange through interpersonal media (i.e., low use of snail mail) is significantly lower in this linkage than in others. Information technology is not widely applied in a range of functional areas, as in the case of integral linkage, but rather concentrated in and focused on certain key functions such as purchasing (for the retailer) and production control (for the manufacturer). However, the intensity of use of interorganizational technologies in these targeted functional areas is high. For instance, a large number of the purchasing related documents such as requests for quotes, purchase orders, and shipment schedules are sent over EDI networks.

These intensive linkage relationships between the members of the dyad exhibit the highest level of CTR performance across all the linkages discovered in this study. Retailers' manufacturer ratings assess the relationship very highly in terms of the time required to manufacture the item, the timeliness of delivery of ordered items to the retailer's store, and the quality of the items supplied. The participants in the study also expressed the highest satisfaction with these relationships.

Control Linkage

This linkage stands out primarily due to its high investment in information technology applications across the two firms' boundaries. The apparel items

involved are standard, low technology products and are unlikely to experience any major technical innovations in the next five years. To manage the interface with the manufacturer, retailers typically rely on a set of rules and standard procedures around which they structure their daily activities.

Mutual trust between the retailer and the manufacturer is high, and the executives strongly believe that their relationship will last a long time. The retailer is not required to order customized apparel items from the manufacturer in these relationships. Though the retailer has not made substantial investments in developing and nurturing a close relationship with the manufacturer, the retailer is aware of the high level of specificity of the manufacturer facilities, skills, and assets to this relationship. This awareness results in a strong perception of mutual interdependency on each other's business and the belief that it would be difficult for either firm to look for another partner.

Information technology (IT) is important not only in its wide scope of use across multiple functions, but also in the intensity of its use by the various participants in the study (i.e., purchasing and sales executives). For instance, functions such as purchasing and engineering exhibit greater frequency of use of technology for exchanging data electronically with the other member of the dyad. The context surrounding technology-mediated control is characterized by a supportive set of processes and actions. In these relationships, conflict or disagreements about fundamental terms and conditions of the transaction remain low. Whenever such tension emerges in the relationship, it is dealt with in a collaborative and constructive manner. These processes are also consistent with the reported strong commitment by the retailer to the relationship, in the form of sharing burdens, benefits and risks with the manufacturer.

CTR performance arising out of this linkage is consistently high. Retailers reported the highest levels of the linkages in the research sample. Key executives were satisfied with the relationship, and the nature of the information exchange with the manufacturer was rated the highest for this linkage.

Conclusions and Recommendations

This article presents the theory that organizations involved in a supply chain relationship should establish a variety of interorganizational linkages that leverage specific structure, process, and information technology mechanisms to achieve and sustain cycle time improvements over time. Interdependency was presented not only as a "desirable" element in achieving CTR, but also as a tool to be leveraged to realize cycle time improvements. The field study involving apparel retailers and manufacturers in the U.S. was presented to highlight how organizations can foster and leverage GSC relationships to improve cycle time and organizational performance.

For practitioners charged with improving cycle time performance and/or increasing customer satisfaction, we offer the following specific recommendations.

Promote Positive Interdependence. Given the interdependence between processes, people, and technology that exists in supply chain partnerships, it is important for executives to encourage and promote interaction at all levels. In addition, identifying areas of interdependence also facilitates applying cycle time principles of *automating* and *eliminating* in the supply chain (Wetherbe, 1995). *Automating* is the use of technology to improve or eliminate manual

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processes. *Eliminating* is abolishing or removing operational functions, processes, or groups which do not add value or which are nonessential to the operation of the organizations. For example, J. C. Penney's just-in-time inventory management system both automates inventory management and eliminates the need to have warehouses and carry large inventories.

Facilitate Use of IT and Telecommunications. Information technology such as EDI and CAD and an advanced telecommunications infrastructure enhance the efficiency and effectiveness of the GSC. Reliance on information technology to deliver products and services is becoming critical for the smooth operation of a GSC.

Develop a Global Supply Chain Perspective. Because of the increasing globalization and economies of doing business in foreign markets, it is essential that executives in the apparel industry assume a global perspective of the supply chain. Developing the right perspective also promotes consideration of quick response capabilities, cycle time reduction opportunities, and advanced IT and telecommunications applications as critical GSC characteristics.

Establish Interorganizational Linkages. Interorganizational linkages that specifically leverage structure, process, and information technology mechanisms can achieve and help sustain continuous cycle time improvements and high customer satisfaction. As demonstrated by this study, companies in the GSC have to constantly strive to identify and promote interorganizational linkages.

Establish Clear Cycle Time Reduction Goals. To achieve and sustain continuous cycle time improvements in the GSC, companies have to mutually agree on the specifics and the strategy. Given the level of interdependence, lack of agreement on CTR approaches may disrupt the smooth functioning of the GSC.

Further research is needed on the role of interorganizational linkages on CTR in other GSCs in different industrial contexts (such as automobile, grocery, and process) to strengthen the theory of

interdependence and cycle time reduction proposed here. It is hoped, however, that these recommendations will help foster improvements in CTR and the development of a GSC perspective which will assist organizations in achieving a high degree of organizational performance.

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