

STRATEGIC SUPPLY

ABSTRACT:

Considered in the context of an industry study, “Strategic Supply” relates to any business or industry that has the potential to capitalize on more efficient and effective management of their respective supply chains. Supply Chain Management (SCM) is the integration and optimization of business process and information flows from the purchase of raw materials to the delivery, consumption, and when appropriate, return of finished goods. Savvy application of technology, process innovation, and leadership in the SCM realm have created unrivaled competitive advantage for companies like Wal-Mart, International Paper, FedEx, Dell, The Limited and Caterpillar. Similarly, Department of Defense (DoD) transformation efforts have the potential to create a more agile, flexible and resilient supply chain that is responsive to Commanders and sensitive to taxpayer concerns.

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Report Documentation Page				Form Approved OMB No. 0704-0188	
Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.					
1. REPORT DATE 2005		2. REPORT TYPE		3. DATES COVERED 00-00-2005 to 00-00-2005	
4. TITLE AND SUBTITLE Strategic Supply				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) National Defense University, The Industrial College of the Armed Forces, Washington, DC, 20319				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution unlimited					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT Same as Report (SAR)	18. NUMBER OF PAGES 27	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified			

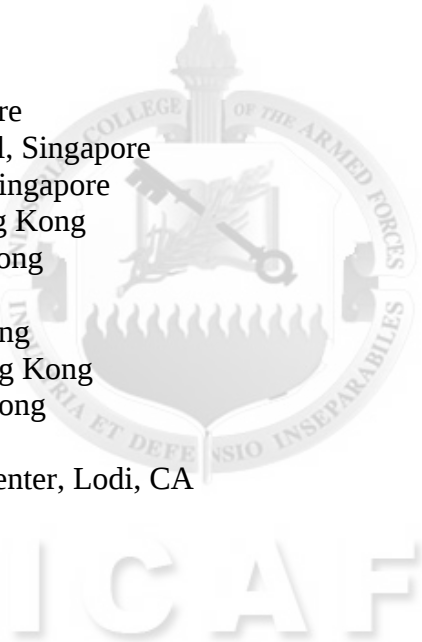
PLACES VISITED:

Domestic:

Defense Logistics Agency, Fort Belvoir, VA
SAP, Washington, DC
Defense Distribution Supply Point, New Cumberland, PA
GENCO, Fogelsville, PA
FEDEX, Memphis, TN
International Paper, Memphis, TN
Canadian Tire Company, Toronto, Canada
United Parcel Service, Chicago, IL
SAP, Chicago, IL
Caterpillar, Peoria, IL
OSD, Pentagon, VA
Wal-Mart, Petersburg, VA

International:

Menlo Worldwide, Singapore
Jurong Island Petrochemical, Singapore
Singapore Port Authority, Singapore
United Parcel Service, Hong Kong
Invest Hong Kong, Hong Kong
The Limited, Hong Kong
MAST Industries, Hong Kong
The Maersk Company, Hong Kong
Modern Terminals, Hong Kong
Tradeport, Hong Kong
Woodbridge Distribution Center, Lodi, CA



INTRODUCTION

Global markets and the introduction of low cost, high quality products from overseas have forced U.S. manufacturers to concentrate on improving quality by optimizing their supply chain to remain viable and create competitive advantage. Supply Chain Management (SCM) is grounded in the field of logistics and is concerned with the flow of materials and supplies through production and distribution to the customer. By definition, supply chains are the set of systems and processes comprising manufacturing, warehousing, inventory control, planning, shipping and transportation.¹ SCM may involve enhanced relationships with suppliers, partners and customers. Companies that have implemented and sustained an appropriate mix of new technology, improved processes and visionary leadership will dominate their respective business sectors, and less effective competitors will struggle for survival.

This paper examines the current state of SCM based on academic research and site visits to industry leaders that have successfully implemented SCM initiatives. We commence with an examination of technological innovations that are impacting the industry and then assess process related developments and their impact on SCM. Based on this work, the paper concludes with recommendations applicable to the DoD.

SUPPLY CHAIN MANAGEMENT – THE COMPETITIVE ADVANTAGE

The common threads of SCM are process or technology related. The technology realm includes the use of software to automate, instrument and innovate the movement and management of goods from raw material to end user. We visited the retail giant, Wal-Mart, who has established itself at the top of the retail sales market in large part by leveraging Information Technology (IT) into its operations and creating a symbiotic relationship between SCM and the application of IT. In the realm of process innovation, Caterpillar (CAT) demonstrated their initiative to provide logistics support as a third party vendor to automotive and IT industry partners. Additionally, CAT employed a highly structured management methodology called Six Sigma aimed at achieving near-perfect quality results and trained over 28,000 employees to use Six Sigma techniques. The potential of technology often lures companies into a sense of security that makes them believe they can achieve competitive advantage through the use of technology alone. The results of our study and visits to industry indicate that a well thought out, strategic view that considers both process and technology innovation usually yields the best results. Additionally, these efforts must be fully endorsed and led by top management.

From the beginning of the industrial age, executives have sought to produce the best product or service and thereby capture the highest returns for its shareholders. These goals remain today. What has changed is the degree of variability and spontaneity in customer demands, the number and speed of new entries into a given market, and the desire of many businesses to capture market share not just in their geographic area, but also across the globe. In the past, manufacturing, marketing, and research were the primary sources of competitive advantage. Today, as manufacturers and retailers strive to meet customer's expectations, CEO's and their executive teams look at all aspects of

their business in their search for steps to maintain or establish competitive advantage. SCM has become an extremely lucrative source for both harvesting cost savings and establishing product or service differentiation.

Wal-Mart is the largest company and retailer in the world with a reported \$256 billion in 2004 sales. If its sales were ranked against other countries' GDP, it would place 23rd in the world, between Austria and Saudi Arabia. Wal-Mart is the largest private employer in North America, employing between 1.4 and 1.6 million people. It recruits over half a million workers every year, more than the output of the U.S. military's total annual recruiting effort.² Wal-Mart paid over \$4 billion in federal taxes in 2004³ - about the procurement cost of an improved Nimitz class aircraft carrier.

Wal-Mart's phenomenal success is the result of aggressive management, sound business practices, and technological innovation. "Wal-Mart's innovations include large scale (big box) stores, economies of scale in warehouse logistics and purchasing, electronic data interchange, and wireless bar code scanning. These gave Wal-Mart 48 percent productivity advantage over its competitors, forcing those firms to innovate as well, thereby pushing up their productivity."⁴ Increases in productivity such as these are a key contributor to the overall economic health and growth on which the U.S. has become dependent to maintain its current high standard of living. A leading economic study has reinforced this point: "The (McKinsey) study found productivity improvements in wholesale and retail trade alone accounted for more than half of the increased national productivity between 1995 and 1999".⁵

Wal-Mart's SCM operations are based on timely response to consumer demand. Instead of more traditional retailing models of offering products to consumers who then buy them (or not), Wal-Mart depends on consumer purchases to trigger its supply chain to deliver replacement goods. When an item is purchased, Wal-Mart's supply chain is able to replace it quickly and cheaply. To this end, it has developed a highly efficient and effective supply chain.

Supplier base management is a hallmark of Wal-Mart SCM operations. Suppliers are told what the Wal-Mart purchase price will be and are expected to meet this price or risk the possibility of being dropped from Wal-Mart shelves. "Wal-Mart always emphasized the need to reduce its purchasing costs and offer the best price to its customers. The company procured goods directly from manufacturers, bypassing all intermediaries. Wal-Mart was a tough negotiator on prices and finalized a purchase deal only when it was fully confident that the products being bought were not available elsewhere at a lower price."⁶ Wal-Mart's supplier management provides a foundation for its competitive price advantage and enhanced bottom line.

TECHNOLOGY INNOVATION

Wal-Mart's ability to efficiently manage its supply chain operations relies on total asset visibility of its products. Wal-Mart provides relevant data in real-time to its key suppliers to improve response times and reduce stock outages. IT advances such as barcodes for each stock-keeping unit (SKU) in Wal-Mart's supply chain spurred the establishment of its massive product database and in turn helped fuel its highly efficient and effective distribution network. Wal-Mart has characteristically been at the forefront

of IT advances including Electronic Data Interchange (EDI), Electronic Product Code (EPC), and Radio Frequency Identification (RFID).

Radio Frequency Identification (RFID)

RFID is an enabling technology used to identify an object using radio frequency transmissions. It is part of a suite of automatic identification technologies that is wireless and applied to tags and labels that capture a host of characteristics of objects. Within the supply chain, RFID enhances the logistics processes that track and trace assets in transit and at rest. A paper clip size computer chip with product information, attached to a carton or box, responds to radio requests or queries. The data gathered is fed into a database for real-time decision-making. RFID is the next generation of Universal Product Code (UPC) or bar code that can record a greater level of detail regarding transactions and consumer behavior, leading to faster processing and improved productivity.

RFID technology can authenticate objects and monitor environmental characteristics like temperature and humidity. Although RFID tags show great promise in a host of public and private ventures, concerns over industry standards, implementation costs, and privacy issues remain to be addressed. The DoD has been an early adopter of RFID technologies, along with retail giant Wal-Mart, to transform their supply chain capabilities to become more agile, flexible, and responsive to customer needs.

The significant costs associated with the widespread implementation of RFID are the infrastructure to read, capture, and turn the data into useable information, and the change management required to go from a labor-intensive bar code scanning process to a technology intensive RFID process. At this time, the costs associated with RFID adoption and the inability of companies' to identify a return-on-investment have slowed the adoption of this new technology in the SCM industry.

Enterprise Resource Planning (ERP)

ERP is an information system that can manage all aspects of an organization including production planning, purchasing, manufacturing, sales, distribution, accounting, and customer service. Through the integration provided by ERP, organizations are able to share common data and activities throughout the enterprise.

Before ERP, each functional area or business department within an organization had its own software, processes, and functions and it was difficult to quickly share information between separate departments. One part of the organization had little insight on activities in other parts of the organization, leading to inefficiency and waste. ERP links the different functional areas of an organization to a central database, and integrates information from all areas across the entire organization. With ERP, data flows throughout the organization and provides managers with real-time data on operations.⁷

Today, most large businesses use some form of ERP to remain competitive in their industry. Since 2000, market saturation, complex ERP implementation, and a sluggish economy have resulted in more cautious buyers and poor growth in ERP sales. However, ERP software revenues were almost \$5 billion for 2002 and as the economy improves, ERP sales growth is expected to improve. SAP remains the industry leader in ERP software with a 25.1% market share in 2002.⁸

ERP provides many benefits to corporations. The most significant is the efficiency increase from integrated business processes and the effortless movement of vital data between business units. Efficiencies include reduced manpower requirements by eliminating redundant and paper-based processes, eliminating data errors during data transfer to different systems, reducing cycle times for closing financials, and eliminating warehouse space for supplies and finished products due to real time vendor and supply chain visibility. ERPs improve enterprise effectiveness by providing decision-makers with accurate and timely information. This improves the ability of senior leaders to identify trends and forecast future requirements and is instrumental to improving the decision making process.

ERP In Action

With ERP, when a sales person enters an order, the transaction data becomes visible to the entire supply chain, including suppliers' information systems. The system automatically updates the inventory of parts and supplies, changes the production schedules of manufacturing facilities, and updates the balance sheets at company headquarters. Employees and managers in different departments and different geographic locations have the real time information on every order to complete their jobs. From this information the sales person can inform the customer of updated delivery dates and managers can receive accurate order, financial, production, inventory, and shipment status immediately.⁹

All units are provided better information that can be shared across the organization. Shortly after implementing ERP, Knowles, a manufacturer of hearing aid components, learned that one of their production facilities was working overtime to complete an order that had been canceled several weeks earlier.¹⁰ Without ERP they may not have learned of the error until after the completed items had been shipped.

ERP systems can also have a dramatic effect on costs and efficiency. IBM Storage Systems states it can now change prices on product inventory in five minutes rather than five days. After adopting ERP business practices, CSR Wood Panels was able to reduce total inventory by \$37 million annually. For large companies the savings can be immense. Nestle USA spent \$210 million on ERP, and in 2002 they state they had achieved \$325 million in savings thus far.¹¹

ERP Implementation

Although ERP clearly has been a success for U.S. industry, it does create challenges. ERP systems require significant investment and can be a challenge to implement on schedule. A recent survey of companies showed the average cost of owning an ERP system was \$15 million. The highest ERP cost among the surveyed companies was \$300 million. An ERP implementation requires one to three years.¹²

ERP systems are not easily customized. It is expensive to accomplish and can make the software more unstable and harder to maintain after implementation. In the 1990s, many companies made big mistakes trying to customize ERP software systems to their business processes when they would have been better off changing their processes to fit the software.¹³ Business experts now realize that ERP is not simply software but a set of best practices for performing different functions within a company. If a company wants to achieve the best results from an ERP system, it must change its business process

to match the ERP system. Changing to match an ERP system can also cause a company to lose its competitive advantage by adopting ERP processes that do not fit their business strategies.¹⁴

Change initiatives can be disruptive and ERP requires employees to change how they do their jobs. A business must get leadership, management, and employee support very early in the ERP implementation process. If people in the different departments don't agree that the new work methods embedded in the software are better than the ones they currently use, they will resist using it or will want to change the software to match the ways they currently do things. This is where most ERP projects break down. If a company is resistant to change then an ERP project is more likely to fail than succeed.¹⁵

A survey by the Conference Board in 2001 found that 40% of companies implementing ERP failed to achieve their business case even one year after implementation. When benefits were achieved, it took six months longer than expected. More significantly, 75% of all businesses surveyed experienced a moderate to severe productivity decline after installing ERP. Fortunately, most productivity declines lasted less than six months.¹⁶ Companies planning to implement ERP would do well to carefully study previous industry examples of ERP implementation, both good and bad.

ERP Middleware

ERP is evolving with the business environment. New software technology, known as middleware, eliminates the need for all ERP systems within an organization and outside the organization to share the same database. Middleware allows different software applications to communicate through standardized data exchanges, thus simplifying communications.¹⁷ This frees a company from the need to buy all ERP elements from a single vendor. Companies can now shop around for ERP software elements available from many software providers and use middleware to manage the integration.

Middleware can also connect a company to customer and vendor software systems, via the Internet, providing even more business efficiencies. The capability to connect software systems with middleware is very attractive to fast moving companies where alliances, mergers, and acquisitions are common.¹⁸ During our site visit to Menlo Worldwide we witnessed an excellent example of this concept. Menlo defined a suite of "best of breed" tools from different vendors, all of which had strengths in different disciplines of the supply chain (e.g. warehouse management, transportation scheduling). They used middleware and process teams to integrate the tools into a fully interoperable ERP system customized specifically for Menlo's use.

New ERP products and services are also targeting small to midsize businesses. Application service providers (ASPs) can now offer companies ERP services, on a pay-per-use basis, running on vendor-owned and maintained computer systems. ASP services are very attractive for start up companies that can't reliably predict their future volume, can't afford large ERP implementation costs, or don't want the cost and hassle of replacing or upgrading an ERP system as their company grows.

ERP primarily evolved from a manufacturing and distribution environment. But ERP firms are now moving to support the needs of service industries such as insurance, financial services, and healthcare with products that primarily focus on managing people and resources.¹⁹ The development of successful products for this sector could allow the

ERP industry to tap into the potentially lucrative and largely untouched government sector.

PROCESS INNOVATION

As much as the application of technological innovation has affected the performance of the supply chain, process innovation has also had a significant affect on business operations. For example, despite fierce competition from over 35 major heavy equipment manufacturers, Caterpillar retains the title of the world's largest manufacturer of construction and mining equipment, diesel and gas engines, and industrial gas turbines. Caterpillar sales revenues reached \$30.25 billion in 2004; a company record and a 33% increase over 2003.

The \$67 billion heavy construction equipment industry witnessed a 5% increase in demand for products every year since 2001, according to the Construction Equipment Association. As one of more than 37 key heavy equipment companies, Caterpillar recently grappled with both the surge in demand generated by increased construction, mining, and highway work, and a frustrating shortage of strategic materials. Orders for many products poured in faster in 2003 than Caterpillar could produce, while steel prices rose 50%.

To meet demand, the company made a strategic decision "to satisfy unprecedented customer demand even though it resulted in increased operating costs"²⁰ by raising headcount by over 10%, turning to suppliers to help fill customer orders, and speeding up production lines by paying unprecedented amounts of overtime. Had Caterpillar been highly centralized and functionally organized it may have taken more than a year to respond to market demands. Instead, Caterpillar was positioned to react quickly to dramatic market demands.

Six Sigma

By the millennium, Caterpillar was poised for a management revolution. At a strategic management conference in 2000, top corporate leaders adopted Six Sigma. Six Sigma is a management methodology designed to increase profits through a highly structured approach to achieving near-perfect quality and results. By 2002, Caterpillar claimed to be the first corporation to introduce Six Sigma worldwide, and to deliver first year benefits exceeding their implementation costs. By the end of 2003, Caterpillar Vice President Jerry Palmer stated: "If you look at year-over-year improvements for the second quarter, we were about \$200 million better in terms of profitability, and we think \$138 million of that came from Six Sigma methods."

Caterpillar is now extending the Six Sigma methodology for use by their suppliers and dealers to drive continuous improvement. By 2004, Caterpillar had 56 dealers and 140 suppliers using Six Sigma when working on problems. Michael Schmidt and Steven Aschkenase, authors of the article: "The Building Blocks of Service Excellence", published in July 2004 issue of "Supply Chain Management" listed Caterpillar's impressive results, as well as how other organizations can learn from Caterpillar's experience with "good places to start" SCM improvements. Dealers and suppliers are not the only beneficiaries of Caterpillar's passion for Six Sigma. Growth of Caterpillar

Logistics has also spread benefits to logistics clients. By applying Six Sigma and enlisting Caterpillar Logistics, Bombardier Aerospace succeeded in reengineering their supply chain to enhance service, lower distribution costs, and minimize assets.

Building on its global distribution experience, Caterpillar launched Caterpillar Logistics Services in 1987 to lower distribution costs while improving customer service and brand loyalty. During our visit to Caterpillar they illustrated how over the past 17 years they have developed one of the most efficient and effective supply chain networks in the world. To achieve these levels, Caterpillar hired experts in engineering, mathematics, statistics, and operations with experience in supply chains. The team of experts combined theory with practical know-how to produce a supply chain that reduces inventory levels without impacting quality, while increasing supply chain productivity. Caterpillar exploited their expertise by creating a business unit to offer SCM to other global corporations.

Today Caterpillar Logistics provides integrated and technology-based consulting and component services on all facets of SCM including transportation, inventory, warehousing, distribution, information management, and forecasting to 50 third party clients including Ford, Honeywell, and Daimler-Chrysler. To handle expansion, Caterpillar proceeded with major upgrades to their information systems, developing a single global platform called Caterpillar Modernized Systems that integrated business and operational components. Caterpillar Logistics ships over 10 billion pounds of freight and maintains over 20 million square feet of warehouse space for over 50 global customers using a network of 90 parts distribution facilities, bonded warehouses, and transit support facilities in 25 countries.

Outsourcing Elements of the Supply Chain

Much the same way Caterpillar Logistics has generated revenue by providing value added service to third party customers, the practice commonly known as third party logistics (3PL) has seen other companies choose to specialize in one or many aspects of SCM. The most common activities that are outsourced are warehousing, in and out-bound transportation, customs brokerage and clearance, and freight management. In a sense, virtually all organizations contract out some aspect of their logistics operations – although it may be as limited as the use of FedEx for the delivery of documents. To clarify terminology used within the industry, the contracting out of a specific activity such as the management of a warehouse is considered second party logistics (2PL), while 3PL is the contracting out of several activities with the expectation that the contractor provides some management and integration expertise. Fourth party logistics (4PL) is a relatively new term that refers to the contracting out of the complete supply chain activity, including procurement and customer relations.²¹ Companies that specialize in 3PL and 4PL promote the idea that they can create the most value for their clients when they are empowered to manage and integrate the many disparate activities within the supply chain. We witnessed an excellent illustration of this concept in practice when we visited UPS Supply Chain Solutions and Menlo Worldwide in Hong Kong and Singapore, respectively. Both 3PL companies provided value for their clients (3Com and AMD) by executing quality control, temporary storage, and final kit assembly of millions of dollars of equipment.

The underlying philosophy of the industry is based on the premise that through specialization,²² a company develops a competitive advantage over those companies that are not specialists in the industry. In the SCM industry, 3PL companies can make significant investment in IT and develop management expertise in logistics operations that create efficiencies that are beyond the ability of companies whose expertise lies in other areas. In a press release announcing the awarding of a 3PL contract, Suzanne Nall, Controller for ph Beauty Labs outlines the rationale the company used to outsource its supply chain management to a 3PL company. "Because we are a new company experiencing rapid growth, we have gained a lot of efficiencies by using a 3PL, our mass-market customers have very specific package and labeling requirements, as well as EDI requirements that make it difficult and expensive for a company just getting started. We found by using a 3PL we could meet all of the requirements without having to make a large capital outlay."²³

In both the public and private sectors today, there is an increased emphasis on improving service delivery and controlling costs. Within many organizations, the management of the supply chain is perceived to be an overhead cost and represents an activity that is rarely considered to be core to an organization's mission. As a result, there is strong demand for 3PL companies that offer enhanced service while controlling cost.

The 3PL industry is relatively easy to enter and exit and consists of several different kinds of 3PL firms. Some companies such as FedEx and UPS entered the 3PL industry to exploit their in-house developed expertise to a broader marketplace. Other 3PL companies are the result of partnerships that bring together disparate areas of expertise. An example is Lockheed Martin using its expertise in the defense industry, in partnership with an IT company like Hewlett-Packard, to offer 3PL solutions for the defense industry. Given the lack of maturity in the 3PL industry, one can expect consolidation in the future and that some companies will evolve into the dominant players.

Approximately 60% of the Fortune 500 companies surveyed in a 1996 report for the Journal of Business Logistics divested themselves of at least one logistics operation and now manage that function through a contractual vehicle.²⁴ Companies can outsource entire segments of their value chain or simply the planning, management and oversight of logistics. Common reasons for entering into outsourcing arrangements are to reduce cost, leverage best-class capabilities of others, or at least to permit a focus on the company's core competency. A 3PL provider executes and manages complete segments of a value chain. Warehousing is a common logistic activity turned over to a 3PL. These partnerships can support either a company's cost or differentiation strategy. However, a rule of thumb is that a 3PL must provide a 40-50% savings if cost is the target.²⁵

In the 2001 annual Cap Gemini Ernst & Young 3PL Study,²⁶ it was reported that 90% of customers in 1996 rated their 3PL services as successful, but this fell to 54% by 2001. There remains a significant gap between customers' expectations and the product delivered by 3PL companies. Customer dissatisfaction is reflected by less than 40% of 3PL contracts being renewed. The issues most frequently cited in the report were:

- Service level commitment not met;
- Cost creep and indirect cost savings not achieved; and
- Unsatisfactory transition during implementation stage.

3PL companies contribute to their customers' expectations by establishing unrealistic goals for cost avoidance and savings in an effort to attract business. While specialization is a sound method to establish competitive advantage, anything can be improved upon when it is micro-managed, but one can't afford to micro-manage everything. It remains to be determined whether 3PL firms can generate sufficient savings to merit the investment in specialization.

3PL and the Military

3PL in the military sphere has had a variety of applications ranging from the contracted logistics support of specific weapons and equipment systems, to freight delivery and IT partnerships to streamline communication flow. In the late 1990s, the Canadian Forces (CF) considered contracting out its entire supply chain activity. After a competition amongst an initial seven companies that expressed interest, Tibbett and Britten Group Canada (TBCG) was selected to partner with the CF and was funded to develop and submit a comprehensive proposal. After one year of project development and the expenditure of five million dollars, the Minister of National Defence announced that the decision had been made to not proceed with implementation. The option to not proceed had been part of the original contract terms and the rationale for not proceeding was not publicly released.²⁷

3PL companies have the ability to support and enhance the logistics activities associated with military operations. However, given the lack of satisfaction with 3PL performance in the private sector and the potential life-threatening consequences of poor logistics performance, the use of 3PL companies in supporting military operations should be closely monitored. Contractual arrangements that may be well suited to peaceful low-threat environments may not be easily transitioned to a high threat environment. As well, reliance on contractors in peacetime may rob the military of the expertise to provide for its own support. Despite this, partnerships should be managed between 3PL companies and the DoD to exploit industry advances and enhance the effectiveness of military logisticians. Contractors can be extremely effective in meeting the surge requirements of military operations and backfilling in static units to free up military personnel for deployment.

Reverse Logistics

Some 3PL firms have developed technical expertise in a particular segment of the industry that results in it being more effective to partner with than to recreate the expertise in the military. One specific example is the firm GENCO²⁸ that has developed and exploited its in-house expertise in the reverse logistics segment of the industry. GENCO manages the return of merchandise for large market retailers such as Target, K Mart and Sears. During our visit to GENCO they demonstrated the benefit of specialization and how they leverage their investment in IT across the spectrum their client base. This is more efficient than each client developing their own IT system and reflects the potential benefit of 3PL firms. GENCO's operation allow retailers to focus their energy and attention on selling and delivering merchandise while GENCO uses its expertise to minimize the cost of the merchandise return process. DoD's Defense Logistics Agency (DLA) is considering a proposal submitted by GENCO that would have GENCO take over management of DLA's reverse logistics management.

DoD has made tremendous progress in improving the traditional link of the supply chain that deals with forward logistics or distribution. This link involves managing the suppliers that feed the DoD distribution and maintenance systems, which ultimately gets serviceable items and components to the end user, the warfighter. In the last 15 years, the DLA's wholesale distribution centers significantly reduced the order fulfillment processing time. In the early 1990s, DLA's distribution centers averaged three days to process high priority requisitions and eight days for routine requisitions. This processing time includes printing, picking, packing, and shipping the items to the customer. Today, the average processing time for all DLA distribution centers is approximately one day. This reduction in processing time proves that DoD has made and continues to make significant progress in moving materiel forward through the supply chain. In the spirit of progress and efficiency, DoD now needs to move backward through its supply chain to continue to make progress. With recent industry emphasis on reverse logistics, the time is right for DoD to streamline the management of its returns. These returns can be in the form of excess, obsolete, unserviceable, or repairable items.

Before getting too deep into the discussion of reverse logistics, it is important to have a general understanding of several reverse logistics definitions. Industry uses a broader term than DoD when discussing reverse logistics. The term reverse logistics can be very limiting, since it only refers to the movement of goods or materials "backwards" through the supply chain.²⁹ GENCO, the sixth largest 3PL provider and industry leader in return management defines reverse logistics as the management of return products to distributors, manufacturers or retailers.³⁰ Others in industry define reverse logistics as "the process of planning, implementing, and controlling the efficient, cost-effective flow of raw materials, in-process inventory, finished goods, and related information from the point of consumption to the point of origin for the purpose of recapturing value or proper disposal."³¹ The Army defines reverse logistics as the process by which a product is returned to some point in the distribution system for credit, reworking, recouping, restocking, or disposal.³²

Reverse logistics is a sub-process of the broader return management process. Return management is the SCM process by which activities associated with returns, reverse logistics, gate keeping, and cost avoidance are managed within the firm and across key members of the supply chain.³³ Gate keeping involves managing and limiting the flow of returns entering the reverse pipeline. The basic concept of avoidance deals with having retailers and manufacturers reduce commonly known reasons for why consumers or retailers return products. These reasons can be product defects, shipping damages, difficult operating or assembly instructions, miss picks, or shipping errors.

As you can see by the different definitions above, defining reverse logistics is not an easy task. Even industry is having difficulties in agreeing with a commonly accepted definition for reverse logistics. However, for the purpose of this paper let us use the key points of the definitions above and refer to DoD's reverse logistics as the management of return items and associated information from the point-of-use (the warfighter) to the point of final resolution; this can be restocking, external reutilization, refurbishment, or disposal. Restocking is the function of returning serviceable items to retail and wholesale activities for future use by other DoD users. External reutilization is the function of returning serviceable items to wholesale activities for sales to non-DoD customers. This includes local and state governments, civilian, and foreign military sale (FMS) customers.

Refurbishment is the return of unserviceable items to maintenance facilities for repair and return to the wholesale activities for resale. Finally, disposal is the destruction or demilitarization, recycling, or discarding of both serviceable and unserviceable items.

A Part of the Value Chain

Manufacturers, distributors, and retailers have recognized the value of reverse supply management and have become more aggressive in determining the best way to address this challenge. One of the first things that many companies do in addressing this challenge is to analyze their capabilities to engage in reverse logistics operations. Is it a core competency? If it is not, do they want it to be one? For the exception of a few major retailers, many retailers as well as manufacturers use the services of 3PL companies to run their reverse logistics operations. For example, Sears, Kmart, Ikea, Best Buy, J.C. Penney, Unilever, Hewlett Packard, and Playtex all use the services of GENCO to run their central return centers (CRC). Allowing GENCO to run their CRC, focuses companies on their core competencies while avoiding the total value loss of returned products. The following are the value recovery rates of some of GENCO's top customers: Unilever, 34.4%; Target, 35.0%; Sears, 20.2%; Circuit City, 20.0%; Kmart, 17.1%; and J. C. Penney, 17.9%.³⁴

So how does GENCO do it? They have developed a reverse logistics software package they call R-LOG and offer tailored software solutions to their customers. They have also made a conscious decision to make return management one of their core competencies. Aside from GENCO's experience and expertise in reverse logistics and software capability, they operate their customer CRCs independently from their customer's distribution centers (DCs). They process all customer returns in one central facility, keeping the clutter out of the customer's DCs and forward logistics operations. Also, GENCO leverages the lessons learned from the more than 80 CRCs and DCs they operate in the U.S., Canada, United Kingdom, and Australia.

Reverse Logistics and DoD

Although Industry and DoD policies and goals may be different, they share many similarities. Both are concerned with reducing operating cost (labor, facility, and transportation), inventory levels, and being more responsive to their customers. So let us look at industry reverse logistics strategic policies. Industry may use strategic return policies to increase sales, improve customer loyalty, and enhance the brand or the firm's public image.³⁵ Companies need strategic policies like these because of competition. In pursuing these policies, companies may make it "hassle-free" for customers to return items in order to draw them into the their stores. Although this may put a strain on the reverse pipeline and increase cost, the retailer can offset the cost from additional sales generated from these same customers. In this case, a manufacturer or retailer may choose to burden the reverse pipeline to enhance the financial growth of the company and its shareholders. As for DoD, it would never employ a strategy that would intentionally increase the burden on the reverse pipeline and increase cost.

One of the major advantages that industry has over DoD is that it can choose the commodity and the type of return business it wants to pursue. For example, GENCO does not handle hazardous material nor oversized or extremely heavy return items. Nor does GENCO or other 3PL companies take ownership of the return inventory they

manage. These advantages reduce 3PL companies' financial risk and allow them to develop a niche in processing returns by type, size, and weight.

Logistics Management

Logistics providers are a growing segment of the business world. But not all companies choose outsourcing as a strategy. Some companies create performance-based contracts with suppliers and customers (i.e., wholesalers and retailers) that define expectations and responsibilities in logistics management. Information is the currency sustaining many of these partnerships.

The computer company Dell is an excellent example of a company that reaped huge benefits by establishing information-based partnerships within its supply chain. Almost from the beginning, Dell decided to be an asset-light company. Early on, they decided to move away from a proprietary business model to one based on standards. This meant that it would rely on the market to drive standards and production of computer components. Dell would form partnerships to supply commodity components, integrate them with a few indigenous components and then package the final product for the consumer. They focused on innovative process-driven change to establish a competitive advantage and this strategy allowed them to gain a significant share of the worldwide market and eventually drive the standards on which it relies. Dell reduced assets and inventory and gained speed to market. They also refocused research and development away from trying to develop proprietary components, which were quickly imitated, to more lucrative and innovative technologies. Dell completely embraced the notion of collaborative planning and forecasting, by setting a policy that "everyone sees everyone else's data".³⁶ Dell provides valuable information to its suppliers on the type of product features that are important to customers. While such information in the hands of the supplier also benefits Dell competitors, Dell believes that if it can make its suppliers successful (by selling more components to its competitors), the cost of the components will come down and ultimately Dell benefits too. Employees within the value chain are totally empowered to act on data that could improve customer satisfaction or profit. For instance, people in the consumer department can decide to run a web-based promotion after assessing that daily sale volumes are not meeting expectations. Dell, like many others, has begun to shift its critical asset emphasis away from equipment to its people, information and partnerships.

Other companies choose to control all or most information and processes. Zara, a clothing company in Spain is one such company. Zara produces clothes that resemble the latest couture creations, but they beat the designers to market. Because they use less expensive fabrics, they can also provide the product at a lower price. To achieve this type of competitive advantage Zara controls most of its supply chain, by managing all design, warehousing, distribution and logistics functions. Just as with Dell, there is a constant exchange of information throughout every part of Zara's supply chain. They design their organization, operational procedures, performance measures and even office configurations to make information transfer easy. Designers sit in the middle of the production process, next to procurement and production planners and market specialists. This increases the speed and quality of the design process. Retailers even participate in information exchange by receiving and providing a constant flow of data, which allows them to adjust their orders by 40-50% rather than the industry standard of 20%.³⁷ While

Zara's initial size was a limiting factor in their ability to negotiate with value system partners, ultimately their control strategy made it possible for them to grow their company fourteen-fold.³⁸

An interesting trend in logistics management is evident in both the Dell and Zara examples. By using information as either an anchor (in the case of Zara) or as leverage with partners (as with Dell), logistics performance can be improved to the point at which it becomes not only marketable, but also capable of influencing customer behavior. Because Zara's merchandise is produced in small quantities, provided on predictable schedules, and displayed in the stores for only a short amount of time, customers visit Zara stores more frequently. This has an added advantage of helping Zara avoid the cost of advertising. Likewise, Dell, rather than customers, controls the components that can be used in configuring end products. This allows them to manage inventory at acceptable levels, thereby avoiding additional cost to Dell or its partners.

Lean Logistics

As industries shift their production from a supply driven to a demand driven business model, many companies are finding that their factories and supply chains are not flexible or responsive enough to react to the rapidly shifting demand of today's marketplace. Demand Driven Manufacturing (DDM) is a strategy for matching production to actual demand through the entire supply chain, while maximizing customer value and eliminating waste. As James Womack writes in his book, *Lean Thinking*, "it provides a way to specify value, line up value creating actions in the best sequence, conduct these activities without interruption whenever someone requests them, and perform them more and more effectively."³⁹ When production schedules and material orders are driven by customer demand, the need for excessive inventories is greatly diminished, thus providing efficiencies and cost savings throughout the entire value chain. A basic element of this process and the key contributor to capturing these achievements is lead-time.

Understanding lead-time reduces inventory levels, while increasing customer service and satisfaction. DDM provides a methodology for streamlining production so that order lead-time can be dramatically reduced. The less time it takes to fulfill a new order, the lower the inventory that must be maintained to protect against fluctuations in demand. An example of the integration of lean techniques and demand driven manufacturing is Dell's build-to-order manufacturing process.

To illustrate, a Dell customer initiates the process by placing their order either by telephone or by way of the Internet. Dell then confirms the order, verifies and receives payment, and places the order with manufacturing. On average, the factory receives the order and begins manufacturing within hours of the order being placed. Next, each computer is built to the customer's specifications, put through a series of hardware and software tests, and completed within 24 hours. Once final inspection is complete, the computer is boxed, sent to a distribution center where it is shipped by a carrier who marries it with its associated monitor – built ahead of time by a separate supplier – and delivered to the customer. Thus, customer orders are satisfied by a lean, execution-based, demand driven business operation without any finished inventory. This demand driven integration of its value chain has allowed Dell to reduce costs, keep inventories to a minimum and gain the competitive advantage in the personal computer (PC) market.

Communication is a key enabler to Dell's supply chain. Dell's success comes from the collaborative partnerships they share with their suppliers. With fewer than 40 vendors providing 90 percent of Dell's external requirements, close working relationships with their suppliers help reduce costs and speeds up products to market.⁴⁰ Monitors, for example, are relatively standardized and built by a partner who has incorporated the same DDM techniques into their supply chain. As Dell's demand for monitors varies, they too are capable to react and respond to ever-changing market demand, match the required monitor with PC, and the next day deliver the completed order to the customer.

Lean inventories, globally extended supply chains, smaller and more frequent vendor deliveries, and rapid inventory turns have raised the complexity of today's supply chains. Collaboration among supply chain parties has become an essential element, perhaps even a strategic priority for modern enterprises. But, if "collaboration is the cornerstone of high-performance businesses," then one must recognize that it is also the potential Achilles heel.⁴¹ Today's supply chain managers absolutely rely on parties external to the firm for business continuity. This reliance elevates risk since any supply chain disruption could bring production to a halt and may have severe consequences for customer relations. The risks are real but they can be managed through close attention to supply chain relationships and through strategies that seek to reduce risk and manage consequences.

Mitigating Effects of Supply Chain Interruptions

Collaborations are mutually accepted sets of processes that companies use to strengthen ties with suppliers and customers. Collaborative efforts have helped reduce inventories by 30 percent, cut transportation costs by 10 percent, lowered warehousing costs by 13 percent, and shortened manufacturing lead times by as much as 50 percent.⁴² The relationships run the range from tactical to strategic. Tactical relationships are typically based on transactional events such as inventory planning, transportation, and retail stock replenishment. Strategic relationships are evolving to shared responsibility for research and development, product design and promotion, and capital investment decisions. Strategic relationships are gaining prominence, especially among large firms, prompting an assessment that "the significance of collaboration overshadows even the past watersheds of Henry Ford's mass production and lean manufacturing."⁴³

Natural disasters, terrorist attacks, labor disputes, and SARS are examples of forces that could result in a supply chain disruption. The globally out-sourced enterprise, one involved in multiple collaborative efforts, is especially vulnerable to disruptions. A study conducted by the Council of Logistics Management, revealed that approximately 60 percent of surveyed firms acknowledged that they had a formal business continuity plan in place but that they did not change it following the catastrophic events of 9/11.⁴⁴ These firms may have considered the terrorist attacks a statistical improbability but the shocks that went through the global economy should be considered in a broader context. The study also suggested that there is an upswing in the number of supply chain disruptions. This could be a statistical anomaly related to hypersensitivity to disruptions. More likely, this upswing is a direct consequence of increased vulnerability related to the lean methods rigorously adopted by most enterprises. The bottom line is that companies today are simply more vulnerable. The following case studies illustrate some of these vulnerabilities. The companies that successfully coped with adverse conditions were the

ones that had developed strategies for reducing their exposure to these risks and for mitigating the consequences when they occurred.

Firms seeking to cut supply chain costs can rarely resist the urge to select suppliers with the lowest product cost but procurement costs are only part of the evaluation criteria. Costs include transportation, warehousing, duties and tariffs, etc. The lowest price supplier may be attractive to purchasing but the high costs of transportation may reduce that savings, especially for less-than-truck-load (LTL) volumes. Other factors can lead to unexpected erosion on projected procurement savings, including fuel surcharges, fluctuations in currency exchange rates, and transportation demand. Buyers using offshore suppliers are particularly vulnerable to unexpected costs.

Buyers need effective decision support tools for modeling various options in order to maintain control over their cost process. The problem is that most firms lack the resources to perform a comprehensive analysis of sourcing options. One solution is new software that is intended to help purchasers predict landed costs more accurately. One vendor of this niche software, Xporta, examines the total cost of ownership across the firm's functional stovepipes: logistics, marketing, sales, etc. A cost-benefit analysis then determines where tradeoffs should occur in order to identify the best mix of suppliers for plants worldwide. The application examines the sourcing problem from a number of angles, including transportation modes, rates, plant locations, etc. to arrive at an optimum order fulfillment plan.⁴⁵ Typically, this examination is based on a single product line but the information can be shared across the enterprise in order to multiply savings.

Collaborative relationships often help the firm gain competitive advantage by negotiating preferred rates and premium services. The prudent firm will carefully tend to those relationships but should also consider alternative suppliers as a hedge against disruptions. This does not necessarily imply contractual relationships, though high volume channels may be appropriate for multi-sourcing. A cross-functional team should conduct an assessment of alternative suppliers, markets, and shippers. Buyers should stay on top of the supplier's industry. They should know what the trends are, who the potential alternative suppliers might be, and know who might be competing for those alternative sources during a contingency.

In November 1998, Hurricane Mitch struck the Caribbean coastline with devastating winds and torrential downpours. The winds and flooding destroyed nearly the entire Central American banana crop, which represented ten percent of global supply. Dole lost 70 percent of their acreage in the region, about one-quarter of their global supply. The company had no alternative sources for procuring bananas. As a result of this supply chain interruption, Dole lost four percent of market share and over \$100 million in the fourth quarter of 1998. It took the company more than a year to recover their lost production.⁴⁶

Chaquita Brands gained the same market share that Dole lost as a result of this supply chain disruption. Chaquita's supply in the area was similarly destroyed by the hurricane but the company had contingency plans for this situation. By switching to alternative suppliers and increasing production elsewhere, Chaquita met customer demand and gained market share. Their contingency planning foresight created a competitive advantage for the firm.

The supply chain generally achieves savings by lowering inventory levels throughout the chain. Buyers have an incentive to minimize shipping delays, especially

for imports that typically have long transit times. Competing with the desire to expedite cargo movement is the increased emphasis on cargo security. Ninety-five percent of all U.S. imports arrive by maritime cargo and the overwhelming majority arrives via containers. The Department of Homeland Security's concern is that a cargo container may be used as a delivery device for a terrorist attack, perhaps even a WMD. Concerns were recently elevated when 32 Chinese illegal immigrants were discovered inside two containers in the Port of Los Angeles.⁴⁷

Federal officials see shippers as the conduit for reaching into the supply chain to improve security. Container security is a function of visibility. The more that is known about a container, its contents, and who has handled it, the less likely it will be considered a threat and subjected to lengthy inspection delays. The Bureau of Customs and Border Protection (CBP) has developed an incentive program to encourage traders to enhance security at the point of origin so that cargo inbound to the U.S. is screened before shipment. The Customs-Trader Partnership Against Terrorism (C-TPAT) program proposes an inspection-free "Green Lane" for cargo that meets certain security standards.⁴⁸ The expedited clearance will help accelerate goods through border security, resulting in supply chain savings. Shippers are joining C-TPAT at the rate of 3000 per year with 8,300 already on the books.⁴⁹ In terms of supply chain relationships, shippers that participate in C-TPAT offer a competitive advantage. C-TPAT compliant shippers are six times less likely to have their freight delayed for customs inspection.⁵⁰ During our visits to the Ports of Hong Kong and Singapore we discussed the implementation of the program and discussed the challenges associated with the sheer number of containers and the possible expectation that all containers are searched. In reality only about 1% of all containers that traverse U.S. ports have been physically scanned or searched.

Small volume traders can also benefit from the program by leveraging a 3PL firm's ability to satisfy customs requirements. DHL's innovative Trade Automation Service lets shippers compare costs of different suppliers in as many as five countries and alerts buyers if a supplier appears on a government watch list.⁵¹ The DHL product contains a 72-nation database encompassing 99 percent of the world's trade. Customized services include streamlined shipping, a duties/tariffs/charges estimator, a reference to import/export regulations, and online access to trade documents.⁵²

The terrorist attacks on September 11, 2001 brought cross-border shipping to a standstill. Few managers had considered a scenario with the consequences of this attack but some companies were far better prepared to deal with the after-effects than others. One of those companies was Continental Teves, a large auto parts supplier for DaimlerChrysler. On the morning of the attacks Teves stood up a multi-functional crisis response team. The team examined their key customers and associated supply channels to see where the impact of closed borders would be most significant. "By the afternoon of September 11, they knew which North American shipments required immediate action and expedited many of these by land."⁵³ Teves was able to leverage their contingency relationships with shippers to meet their customer's expectations with little disruption. On the other hand, Ford Motors did not execute contingency plans and was ultimately forced to close five production facilities for several days. The foresight of the Teves team gave them a significant competitive advantage over their rival automaker.

Supply chain managers should avoid supply channels that are likely to create cargo chokepoints. Several strategies can increase supply chain agility and flexibility.

For example, the shortage of truck service at some major U.S. ports is exacerbating port congestion.⁵⁴ The result is increased in-transit time, which drives up costs through unproductive inventory. Supply chain managers should consider directing shipments through less congested ports and create incentives to shift freight movements to off-peak periods, which reduce congestion in ports and on public infrastructure in the vicinity of ports. Dixie Jet Service was attractive to Proctor and Gamble for their airfreight requirements because Dixie used off-the-beaten-path hubs. These airports tend not to get clogged with traffic and can facilitate expedited shipments.⁵⁵

Another successful strategy for reducing risk is to take a regional approach to supply chain integration. In this strategy, suppliers are aligned to production, assembly, or market regions. This allows the buyer to shift supply channels in response to, or in anticipation of, higher transportation costs or disruptions. Factors that should be included in this construct are promotions, market events, seasonal trends, etc.

Manugistics has developed software that allows shippers to negotiate with carriers in a time-sensitive capacity. Real-time solutions help facilitate and accelerate the bid-management process. The software provides carriers and shippers the ability to reduce time and costs, improve asset utilization and demand forecasting, ensure carrier compliance, and improve agility and flexibility to respond to unforeseen circumstances.⁵⁶ This software also provides low volume shippers with the same market opportunity as larger volume shippers in terms of negotiating favorable shipping terms.

Lean inventory is a primary focus of supply chain managers. The simple reason is that production savings can be recognized almost immediately, so the manager has a simple case for justifying investment. Lean strategies are not necessarily appropriate for every commodity in the chain. Trimming costs by reducing safety stocks has to be balanced against the risk of a stock-out situation. Stock-outs have the potentially catastrophic result of halting production, as in the Ford case above. It simply does not make sense to unnecessarily lower safety stocks of low cost items that are critical to production.

The 2001 outbreak of Mad Cow disease in England illustrates the point. Producers were forced to destroy hundreds of thousands of cattle in an effort to contain the disease. This resulted in a major shortage of cowhides for European shoe manufacturers. Several manufacturers had large quantities of hides on hand. By combining their safety stocks with guaranteed supply contracts, these manufacturers were able to continue their operations without interruption. Other manufacturers shifted to alternative suppliers and paid a price premium for their hides.⁵⁷ In this example, the cost-benefit analysis between marginally higher inventory carrying costs was weighed against the high cost of a commodity in short supply and the increased transportation costs as the commodity was sourced from distant alternatives.

A 1999 earthquake in Taiwan resulted in major power outages and equipment failure that halted production of a number of electronic components. These components were supplied to U.S. personal computer manufacturers. The supply chain interruptions lasted for two weeks. The effects were felt throughout the personal computer industry but some companies were in a better posture to compensate for the supply chain interruptions. Apple Computers was forced to delay production of its just introduced Power G4 model. The company made the strategic decision to ship older models until the very predictable customer backlash forced them to halt deliveries until production of

the newer model could be restarted. In this case, the customer dedication to the product line probably would not have led to significant losses in sales, but the disruption and the company's response severely affected customer satisfaction.

Dell fared much better despite their direct sales business model that generally limited component inventory to only a five-day supply. Dell's model included the strategic decision to add redundancy to their product lines by using common components and interfaces. Dell was able to meet customer demand by offering incentives and promotions intended to influence customers to select the products and configurations they had inventory to produce. Dell achieved a significant competitive advantage over rival Apple and earnings for the third quarter of 1999 were 41 percent greater than the previous year's results.⁵⁸

Reliance on parties external to the firm does not imply a loss of control over processes or acceptance of outcomes. Risks are a real part of the complex business environment but they can be managed. The prudent supply chain manager will look at disruptions as a matter of "when", not a matter of "if" they will occur. Managers should ensure suppliers give the same level of consideration to their business continuity plan. Reducing risk may not require a substantial capital investment. The strategies presented here offer relatively low cost solutions for risk reduction and consequence management. The most important point, and a consistent theme in each of the strategies presented, is that reducing supply chain risks and developing consequence management contingency plans can create a substantial competitive advantage for the firm.

RECOMMENDATIONS

The pathways to achieve competitive advantage are many and varied. Based on our research, the common threads appear to be focused on organizational strengths, in operations, information management, and strategic partnerships with other businesses. The best solution sets are process innovations that are strategically conceived and led by committed leadership that are enabled or empowered by the implementation of technology. Dependent upon environment and circumstances, the application of technology can be used to solve problems in different ways. In North America, we saw technology deployed to reduce labor costs, while in the Far East we saw technology deployed to optimize the use of land.

Leadership

DoD's vision is to fully integrate the supply chain to the war-fighting commanders and has tasked the Defense Logistics Executive with taking the lead. In our industry study, the key to successful implementation of supply chain management is strong, unequivocal support by the organization's senior leaders. We recommend that the Defense Logistics Agency be tasked as the Executive Agent for OSD supply chain integration and that DLA be given the tools and authority to effectively integrate DoD's supply chain.

Technology Only Part of the Solution

Several other powerful dynamics come into play that facilitates the optimization of the Supply Chain. There are no substitutes for good data, sound processes, robust supply chain design and mutually beneficial partnerships to create value and structure a efficient and effective supply chain. Our examination of the supply chain industry revealed that technology can serve as an enabler, but it is not a replacement for sound process and effective leadership.

3PLs

One DoD area for consideration is the use of 3PLs. 3PLs in the military cover a variety of applications from contracted logistics support of specific weapons and equipment systems, to freight delivery and IT partnerships that streamline information flow. While 3PLs offer a needed capability for the DOD, private sector industries have raised concerns in 3PL performance. Given the potential life threatening consequences in the DoD, the use of 3PL companies in support of military supply chain operations should be closely monitored. USTRANSCOM was recently made the DoD distribution process owner. This allows a single unified commander to set policy and create joint doctrine for transportation issues and practices. Contractual arrangements that may be well suited to peacetime low-threat environments may not easily transition to a high threat environment. We recommend that USTRANSCOM use best practices from industry leaders as the model for its 3PL process baseline metric.

Information Sharing

Open systems information technology initiatives can accommodate information sharing between shippers and carriers or suppliers and buyers and have demonstrated the ability to facilitate an efficient bid-management process that provides better options for low volume shippers and logistics managers. The end result is more flexibility for customers and more cost efficient operations for transportation service providers. Understanding lead times reduces inventory levels throughout the chain and ultimately generates savings in terms of warehouse space, shipping costs and sourcing options.

Return Management

The DoD return process is a multi-step process that involves many players. During the final step, DRMO is required to recycle the items, sell them to non-DoD customers, sell as scrap, or must demilitarize the item and arrange for its proper disposal. Due to the high cost for demilitarization, item managers would rather pay the depot for storage then pay the demilitarization cost; which drives up cost and inefficiencies at the distribution depot level. To capitalize on return management opportunities, DoD should designate DLA as the process owner and consolidate its return management with its forward distribution depots functions. Based on our visits to industry we further recommend that DLA look at GENCO's concept of operations in order to glean out specific "best of breed" processes that could be applied to the DoD problem space. To mitigate the high cost for demilitarization, DoD must find a balance among storage costs, the costs of maintenance for items in storage, and demilitarization costs. It is imperative that DoD recognizes return management as a key supply chain core competency.

ERP

OSD needs to aggressively manage supply chain integration through its Executive Agent and the Service Components. As we witnessed during our visits to various companies, it is unrealistic to expect one ERP software vendor to offer a product that would satisfy the needs of an organization as large and complex as the DoD. Companies like Menlo Worldwide and CAT established integration teams that selected best-of-breed ERP software tools and built a suite of fully interoperable tools to satisfy the full potential of ERP systems. OSD should charter a team with the mission of establishing interoperability across and within Service stovepipes.

RFID

Recommend OSD appoint DLA the Executive Agent for RFID, working with the Deputy Under Secretary of Defense for Logistics and Material Readiness they should continue to work closely with industry leaders, like Wal-Mart, to adopt best practices, and emerging technologies like RFID to position the DoD supply chain for the future.

DoD RFID policy is diverging from commercial practices by using active tags for manifesting and tracking versus commercial industry use of passive tags for warehousing and sales. The DoD's use of RFID in austere and immature theater is clearly beneficial, but needs to develop a business model for complete supply chain implementation.

CONCLUSION

The Department of Defense is engaged around the world and our environment is often unique. We operate in remote, austere locations and response times can be very short, with little warning. Our supply chains are extremely complex, are extended over long distances, and the cost of supply chain exceptions are measured in lives and strategic success. Today, the complexity of the supply chain increasingly influences strategic decisions.

Best commercial practices offer excellent starting points for developing strategies for implementing a fully integrated supply chain. Organizations are rewarded for end-to-end performance on the customer side, and for cost containment on the stakeholder side. Competitive advantage is achieved through effective supply chain management - delivering high service levels at the lowest operational cost. In DoD, this drives better support for the warfighter.

BIBLIOGRAPHY

Albright, Brian A. "Assessing ERP Software." *Frontline Solutions*, Vol 5, No. 8 (2004):18-23.

Anonymous. "Enterprise Resource Implementation Still Tough." *IIE Solutions*, Vol 33, No. 8 (2001): 19-20.

Army Regulation 711-7. Supply Chain Management, 19 November 2004. p.18.

Bachelor, Beth. "Supply Chain Economics". Information Week website.
<http://www.informationweek.com/story/showArticle.jhtml?articleID=18300058>

Bartlett, Bruce. "A Distorted Lens on Wal-Mart". Washington Times website.
<http://www.washtimes.com/commentary/20041121-105707-5851r.htm>.

Bernstein, Mark and Lara L. Sowinski. "World-Class Partners Keep the Proctor and Gamble Supply Chain In Top Form." *World Trade*. May 2004, Volume 17, Issue 5, Page 28.

Caterpillar 2004 Annual Report

The Chief Executive, "Logistics as a competitive weapon – includes related articles – CE Roundtable – Panel Discussion." Chief Executive Publishing (Nov.-Dec. 1994).

Coleman, Alan, and Marks, John. "GENCO Reverse Logistics Overview Brief," March 4, 2005.

Daga, Ashish. "Collaboration in Reverse Logistics" White Paper. Wipro Technologies. p.3.

Data Monitor, "Wal-Mart Stores, Inc." Company Profile. Datamonitor USA, New York, NY. Nov. 2004 Weber Distribution. <http://www.weberdistribution.com/news.asp>. 2005

Dell, M., Fredman, C., Direct From Dell: Strategies That Revolutionized An Industry

Edmonson, R. G. "Green Lane In Sight." *Journal of Commerce*. January 24, 2005, Page 1

Eschinger, Chad, Pranav Kumar, Dean Lombardo, and Thomas Topolinski. "ERP Market 2003-2007: Adjusting in Lean Times." *Gartner Dataquest*, 22 September 2003: 1-5.

Ferdows, Kasra, Michael A. Lewis and Jose A.D. Machuca. "Rapid-Fire Fulfillment." *Harvard Business Review* November 2004. Business Source Elite 17 Mar. 2005
<http://ezproxy6.ndu.edu/login?url=http://search.epnet.com/login.aspx?dir>.

Forces, "MA&S Optimization",
http://www.forces.gc.ca/site/newsroom/view_news_e.asp?id=483

GENCO, <http://www.genco.com/2004/>

Genovese, Y. T. Humphries, K. Steenstrup, and B. Zrimsek. "Operations ERP Client Issues for 2004." Gartner Dataquest. No. K-20-9014, 26 September 2003: 1-6.

Global Logistics and Supply Chain Strategies. Newsletter. 12 July 2004. Online.
<http://www.supplychainbrain.com/news/m07.12.04.newsletter.htm>.

Griffy-Brown, Charla. "Just-in-Time to Just-in-Case: Managing A Supply Chain in Uncertain Times." Graziadio Business Report. 2003, Volume 6, Issue 2.

Hannon, David. "Shippers Combine Technology, Strategy in Overseas Sourcing." Purchasing. October 21, 2004, Volume 133, Issue 17, Page 53.

Keane, Angela Greiling (a). "Security in the Green Lane." Traffic World. January 24, 2005, Page 1.

Keane, Angela Greiling (b). "Receiving Mixed Signals." Traffic World. January 31, 2005, Page 1.

Koch, Christopher. "The ABCs of ERP." 12 March 2002. Online at CIO.COM
(<http://www.cio.com/research/erp/edit/erpbasics.html>). Retrieved on 12 November 2004.

Krumwiede, Dennis W., Chwen Sheu, and Hsiuju Rebecca Yen. "The Effect of National Differences on Multinational ERP Implementation: an Exploratory Study." *TQM & Business Excellence*, VOL 14, No. 6 (2003): 641-657.

Lambert, Douglas M. Supply Chain Management: Processes, Partnerships, Performance. Supply Chain Management Institute 2004.

Langley, C.J., Dr. Jr et al. Third-Party Logistics Study: Results and Findings of the 2001 Sixth Annual Study, Cap Gemini Ernst & Young and Ryder System, Inc. 2001, p.14.

Lieb, R.C. and H.L. Randall, "A Comparison of the use of third-party logistics services by large American manufacturers, 1991, 1994 and 1995" Journal of Business Logistics 17, 1 (1996), 305-320.

Manugistics. "Manugistics to Unveil New Logistics Procurement Solutions." Press Release. November 17, 2004. Online.
http://www.manugistics.com/news/press_detail.aspx?Id=548.

Matchette, John, Andy Seikel. "How to Win Friends and Influence Supply Chain Partners." Transportation and Distribution. December 2004, Volume 45, Issue 12, Page 40.

Millman, Gregory J. "What Did You Get From ERP and What Can You Get?" *Financial Executive*, Vol 20 No. 3 (2004): 38-42.

PWS – DRMS, "Performance Work Statement (PWS) For The Defense Reutilization and Marketing Service (DRMS)," Solicitation SP0700-03-R-7011, www.supply.dla.mil/A-76. P.2.

Schmidt, Michael, Aschenase, "The Building Blocks of Service Excellence," "Supply Chain Management Review," July/August 2004, page 35.

Smith, Adam. Originally posited by Adam Smith in An Inquiry into the Nature and Causes of the Wealth of Nations. Published in 1776, see: http://highered.mcgraw-hill.com/sites/0072875577/student_view0/chapter4/origin_of_the_idea.html

Stewart, Thomas A. and Louise O'Brien. "Execution without Excuses." Harvard Business Review 83.3 Mar. 2005.
Business Source Elite 17 Mar. 2005
<http://ezproxy6.ndu.edu/login?url=http://search.epnet.com/login.aspx?dir>.

Stone, Kenneth. "How Do You Deal With the Entry of a New Wal-Mart Supercenter Into Your Town?" Public Management. March 2005. pp. 10-13.

Teresko, John. "The Tough Get Going." Industry Week. March 2005, Volume 254, Issue 3, Page 26.

Tirschwell, Peter. "New Trucker Crisis Brewing." Journal of Commerce. January 17, 2005. Page 1.

The Chief Executive. "Logistics as a competitive weapon." CE Roundtable – Panel Discussion Nov.-Dec. 1994. 23 Feb. 2005
http://www.findarticles.com/p/articles/mi_m4070/is_n99/ai_16458908.

Wal-Mart Facts website, <http://www.walmartfacts.com/>, 2005

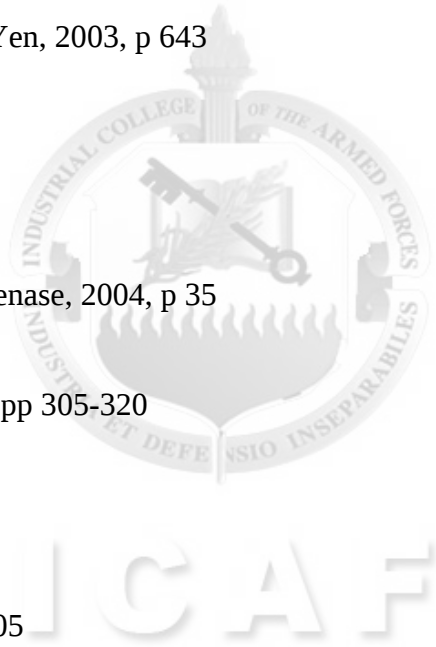
"Wal-Mart". Wikipedia online encyclopedia website. <http://en.wikipedia.org/wiki/Wal-Mart>. 2005.

Womack, J. P., Jones, D. T., Roos, D. (1990). *The Machine that Changed the World: The Story of Lean Production*.

Worthen, Ben. "Nestle's ERP Odyssey." *CIO Magazine*, 15 May 2002. Online at www.cio.com/archive/051502/nestle.html?printversion=yes. Accessed on 12 Nov 2004.

ENDNOTES

- ¹ Bachelor, 2004
- ² Wal-Mart Facts, 2005 and Wikipedia, 2005
- ³ Data Monitor, 2004
- ⁴ Bartlett, 2004
- ⁵ Ibid
- ⁶ Data Monitor, 2004
- ⁷ Krumwiede, Sheu, and Yen, 2003, pp 641-2
- ⁸ Eschinger, Kumar, Lombardo, and Topolinski, 2003, pp 1-4
- ⁹ Krumwiede, Sheu, and Yen 2003, p 642
- ¹⁰ Albright, 2004, p 21
- ¹¹ Worthen, 2002, p 1
- ¹² Koch, 2002, pp 2-3
- ¹³ Millman, 2004, p 41
- ¹⁴ Krumwiede, Sheu, and Yen, 2003, p 643
- ¹⁵ Koch, 2002, pp 2, 6
- ¹⁶ Anonymous, 2001, p 19
- ¹⁷ James, 2000, p 107
- ¹⁸ Ibid
- ¹⁹ Genovese, 2003, p 6
- ²⁰ Caterpillar, 2004
- ²¹ Schmidt, Michael, Aschenase, 2004, p 35
- ²² Smith, 1776
- ²³ Data Monitor, 2004
- ²⁴ Lieb and Randall, 1996, pp 305-320
- ²⁵ Chief Executive, 1994
- ²⁶ Langley, 2004, p 14.
- ²⁷ Forces, 2002
- ²⁸ GENCO, 2004
- ²⁹ Lambert, p 151
- ³⁰ Coleman and Marks, 2005
- ³¹ Daga, p 3
- ³² Army Regulation, 2004. p18
- ³³ Lambert. p147
- ³⁴ GENCO
- ³⁵ Lambert, p 153
- ³⁶ Stewart and O'Brien, 2005, p 107
- ³⁷ Ferdows, Lewis and Machuca, 2004, p 108
- ³⁸ Ibid, p 104
- ³⁹ Womack, Jones, and Roos, 1990
- ⁴⁰ Dell and Fredman
- ⁴¹ Matchette, 2004, p 40
- ⁴² Ibid
- ⁴³ Teresko, 2005, p 26
- ⁴⁴ Griffy-Brown, 2003



-
- ⁴⁵ Hannon, 2004, p 53
⁴⁶ Griffy-Brown, 2003
⁴⁷ Keane (b), 2005, p 1
⁴⁸ Keane (a), 2005, p 1
⁴⁹ Edmonson, 2005, p 1
⁵⁰ Keane (a), 2005, p 1
⁵¹ Hannon, 2004, p 53
⁵² Global Logistics and Supply Chain Strategies, 2004
⁵³ Griffy-Brown, 2003, p 3
⁵⁴ Tirschwell, 2005, p 1
⁵⁵ Bernstein, 2004, p 28
⁵⁶ Manugistics, 2004
⁵⁷ Griffy-Brown, 2003, p 3
⁵⁸ Griffy-Brown, 2003, p 3

