

AY 2003-2004

A Fully Integrated Global Strategic Supply Network -

A Critical Enabler of DoD Transformation

Strategic Supply Industry Study

Colonel Tom Hauser, Colonel Jim Graham, Colonel Penny Koerner

Dr Faye Davis

Group Paper

SEMINAR 18 (Strategic Supply)

The Industrial College of the Armed Forces

National Defense University

Fort McNair, Washington, D.C. 20319-5062

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 2004		2. REPORT TYPE N/A		3. DATES COVERED -	
4. TITLE AND SUBTITLE A Fully Integrated Global Strategic Supply Network - A Critical Enabler of DoD Transformation				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) The Industrial College of the Armed Forces National Defense University Fort McNair, Washington, DC 20319-5062				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 The original document contains color images.					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT UU	18. NUMBER OF PAGES 37	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified			

Contents

1	ABSTRACT	3
2	INTRODUCTION	4
3	BACKGROUND.....	4
3.1	SUPPLY CHAIN MANAGEMENT DEFINED.....	4
3.2	STRATEGIC CONTEXT	5
3.3	WHERE IS DoD TODAY?.....	5
3.4	STATEMENT OF REQUIREMENT.....	6
4	PAPER OBJECTIVE AND SCOPE.....	6
5	ENTERPRISE RESOURCE PLANNING	6
5.1	WHAT IS ERP?	7
5.2	INDUSTRY LESSONS LEARNED	8
5.3	WHERE DoD IS TODAY?.....	13
5.4	BUSINESS ENTERPRISE ARCHITECTURE (BEA).....	13
5.5	CONCLUSIONS.....	14
5.6	RECOMMENDATIONS	15
6	RADIO FREQUENCY IDENTIFICATION DEVICES (RFID)	15
6.1	WHAT IS RFID?	16
6.2	KEY INDUSTRY FINDINGS.....	17
6.3	RFID WITHIN DoD	19
6.4	CONCLUSIONS.....	20
7	SUPPLY CHAIN SECURITY.....	21
7.1	BACKGROUND	21
7.2	PHYSICAL SECURITY CHALLENGES.....	22
7.3	FREIGHT SECURITY.....	23
7.4	INFORMATION SECURITY.....	24
7.5	SUPPLY CHAIN SECURITY CONCLUSIONS.....	25
9	SYNTHESIS AND CONCLUSIONS.....	26
9	RECOMMENDATIONS	26
10	BIBLIOGRAPHY.....	28
10	ENDNOTES	36

1 Abstract

Our Strategic Supply team focused its effort on transformational change in the Department of Defense (DoD) logistics enterprise, leveraging key technologies and best practices from the commercial sector to provide the visibility, agility, persistence and interoperability required by America's expeditionary forces and those of her allies.

To meet the challenge of those requirements we focused on three areas of change: Enterprise Resource Planning (ERP), Radio Frequency Identification (RFID), and security across a broad variety of leading industries. Further, we discussed various governance models capable of fostering the cultural changes required to best implement these concepts. For each of these areas we will discuss what they are, the potential they hold, and what we believe their relevance to be; as well as lessons learned from industry and the current status of these initiatives in the DoD, before concluding with some policy recommendations and their implications for resourcing the National Security Strategy.

These recommendations are not driven by short term cost savings. In fact, the magnitude of change we are recommending is enormous. While each of the services could have independent ERP systems; where those systems touch the DoD's Global Logistics System, they must be compliant with data discipline and procedural standardization. Based on our research and industry analysis, the vision set out by the DoD's defining documents (such as Focused Logistics and JV 2020) cannot be achieved to any substantial degree any other way.

Our analysis concludes that if the DoD continues on the current logistics implementation path there is a high likelihood of failure. In order to overcome these challenges we must embrace transformational change that will consist of numerous actions.

First, we must correctly define the organizational structure. This effort alone may involve changes in Title X and other statutory guidance that was outside the purview of our analysis and expertise. However, we are confident that there is a compelling case for these changes, in both efficiency and effectiveness. Second, we must continue with current RFID initiatives and align them with common supply systems. Finally, we must enhance supply chain security through improved information sharing and integrated governance.

Following a logical sequence, our recommendations are to:

- Gain commitment from senior government and industry leadership, at the Secretary of Defense level and above – this is a critical and essential component of national security strategy
- Align the business environment (governance, processes, reporting and structures) as a top priority
- Force the integration of the existing ERP programs against the Defense standards and processes, while aligning, rationalizing, integrating and improving existing systems
- Adopt an implementation approach that is incremental, but focused and completed to a "credible" timetable
- Expect program completion will take in the order of 10 years
- Provide feedback mechanisms and continually monitor risks.

The overarching governance mechanisms and program office must monitor, endorse, fund and adjust the plan as required.

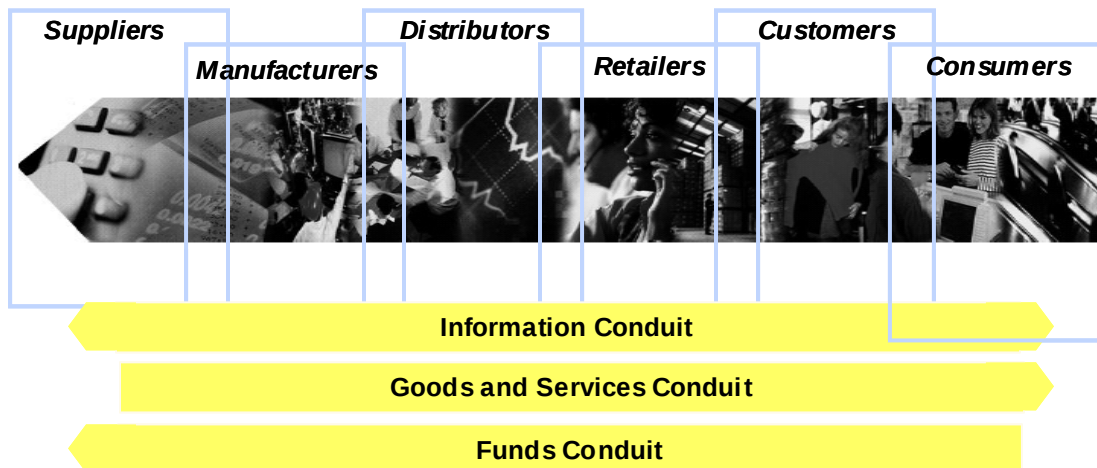
2 Introduction

This document is the third in a series of reports produced by students of the Industrial College of the Armed Forces (ICAF). The sixteen students of the FY2004 Strategic Supply Industry Group dedicated over 180 days of comprehensive study to gaining insight into the interaction between Global Supply Chain Management and our National Security Strategy. The specified mission of our seminar was to analyze a diverse cross-section of US and international businesses looking for enabling technologies and management techniques that improve the effectiveness of DOD supply chain management. Supporting this mission, we studied over 30 US companies and some 25 international businesses. (Appendix A)

3 Background

3.1 Supply Chain Management Defined

The Council of Logistics Management (CLM) defines Supply Chain Management (SCM) as “the process of **planning, implementing and controlling** the efficient and effective **flow and storage** of goods, services, funds and related information from **point of origin to point of consumption** for the purpose of conforming to **customers requirements**. “¹



Effective SCM has become a core organizational competency that spans all industries and sectors, and is a key enabler of a viable business or government strategy. Global corporate leaders are expecting SCM to provide them improved methods of integrating their businesses with both suppliers and customers, while driving ever higher and more sustainable levels of corporate earnings.

Today's competitive supply chain depends on an information infrastructure that can facilitate agile real time decisions to change the flow of goods in support of the customer's requirements. The sequenced, one dimensional logistics flow of the past is no longer effective in dealing with the uncertain, unpredictable environment the world demands we operate in.

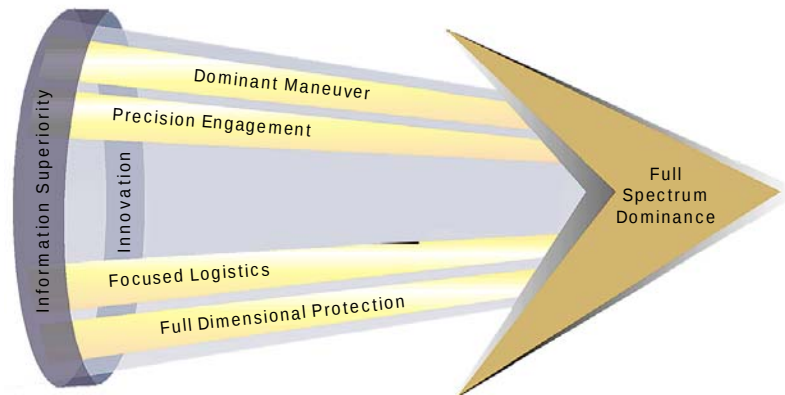
Adaptive supply networks are the goal of every competitive organization and have especially compelling benefits for those organizations like the DoD that operate in environments with changing distribution requirements.

3.2 *Strategic Context*

Effective SCM is one of the fundamental elements of all successful business or government organizations and is seamlessly aligned with broader corporate strategy.

The US Department of Defense has set itself the ambitious vision² of transforming from a largely static and highly mechanistic military strike force into an agile, flexible and adaptive Defense force capable of achieving full spectrum dominance through:

- Dominant Maneuver,
- Precision Engagement,
- Focused Logistics,
- Full Dimensional Protection
- Information Superiority.



In order to enable this vision DoD requires an integrated, cross-functional strategy that aligns its people, process, technology and infrastructure. The missions, tasks and requirements of the individual services are properly seen in context of their contribution to joint capability now and in the future. This in turn implies that each element of the DoD supply chain should be understood in the context of the department as a whole and contribute to its effectiveness in delivering national security outcomes.

3.3 *Where is DoD Today?*

The US Department of Defense in 2004 is an extremely effective conventional fighting force with world leading capabilities in the air, land, sea and expeditionary warfare. However, DoD is not always an integrated, efficient fighting force in these conventional operations and is seeking to improve its capabilities to fight lower level conflicts and operations other than war. This has led the Secretary of Defense to ask the DoD to embark upon transformation while concurrently conducting two major operations and numerous other global security obligations, as witnessed in the following key strategic documents:

- National Security Strategy
- National Military Strategy
- Joint Vision 2020
- Transformation Plan
- J4 Focused Logistics Transformation Campaign Plan
- GAO report on OIF / Desert Shield / Desert Storm

Effective, efficient supply chains have always been a goal of the DoD. The enormous logistics challenges that occurred during Operation Desert Shield / Desert Storm presented a compelling case for supply chain reform. Unfortunately, many of those same challenges remain today. In Operation Iraqi Freedom platoons were unable to locate the nearest MRE's (Meals Ready to Eat), spare parts were difficult to obtain driving multiple re-orders and unidentified supplies were stockpiled at significant cost without contributing to warfighter effectiveness. In summary the current system lacks the visibility, trust, and unified effort required to provide agile, persistent, and robust support through the last tactical mile. Imagine a single unified distribution pipe drawing from over five different logistic support systems without common architecture or processes and you have today's operating environment.

In addition, the DoD is facing a period of increased economic pressure to deliver these critical capabilities more efficiently. Increasing US budget deficits coupled with growing health care and social security demands are likely to impose greater economic constraints on the DoD during the next five years.

3.4 Statement of Requirement

Optimizing the DoD supply chain has become an imperative if America is to adequately resource its National Security Strategy. Our Strategic Supply team focused its effort on transformational change in the DoD logistics enterprise, leveraging key technologies and best practices from the commercial sector to provide the visibility, agility, persistence and interoperability required by America's expeditionary forces and those of her allies.

4 Paper Objective and Scope

Objective. Analyze a diverse cross-section of US and international businesses looking for enabling technologies and management techniques that improve the effectiveness of DOD supply chain management.

Scope. To meet the challenge of these requirements we focused on three areas: Enterprise Resource Planning (ERP), Radio Frequency Identification (RFID), and security in a broad variety of leading industries. In each of these areas we define the scope of the concept, identify the potential it holds for DoD, as well as areas of immediate relevance, list the lessons learned from industry, examine the current status of these initiatives in the DoD, and conclude with policy recommendations and their implications for resourcing the National Security Strategy.

5 Enterprise Resource Planning

Enterprise Resource Planning systems provide the information backbone of the world's leading businesses. By connecting all aspects of the enterprise through a central integrated database, ERP's provide visibility, accountability, knowledge, and build trust among various constituents of the system. The architecture, infrastructure and processes that supported the successful implementation of an ERP system were a central aspect of our study.

"Our internal tools have two goals; to use software to handle routine tasks, eliminating wasted time and energy for our knowledge workers; and to free people up to do more difficult work and handle exceptions"

Bill Gates answering, "Why build SAP-based web applications" from [Business@the](#) Speed of thought

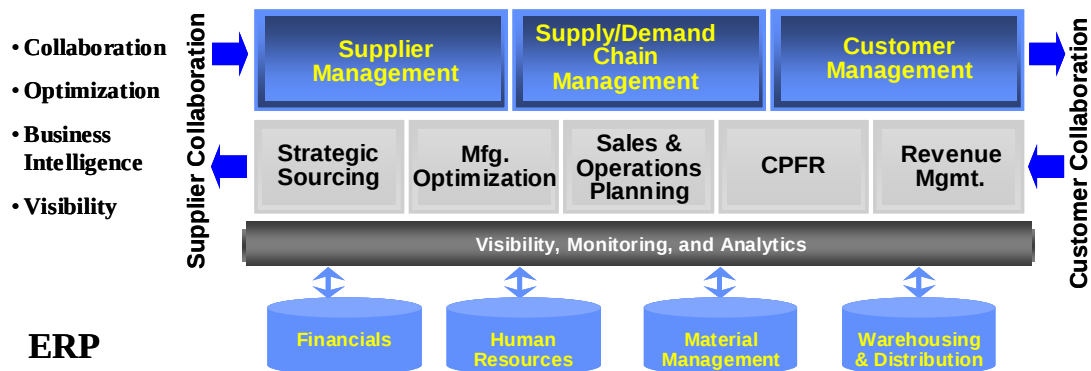
5.1 What is ERP?

Enterprise Resource Planning Systems or ERP's are "software modules for different business functions that are linked by a common database to produce an integrated enterprise-wide system."³

ERP systems are the central nervous system of today's best-run companies, providing the information backbone of the world's leading businesses. ERP systems provide an integrated information database that synchronizes the flow of information, goods and transactions across an enterprise. By connecting all aspects of the enterprise through a central integrated database, ERP's provide visibility, accountability, knowledge and build trust among various constituents of the system. It is exactly what has been missing in the DoD joint logistics environment.

Historically, the major ERP providers operated under proprietary architectures and customization of their software required complex integration efforts. Businesses, frustrated with the need to "recustomize" after every new ERP release, began to look for open architecture standard solutions that supported their vision for the future. This drove ERP vendors to provide flexible infrastructure that allows easy integration both of ERP vendor specific and non-ERP vendor specific applications (i.e. SAP NetWeaver). Applications are now easier to manipulate without changing the underlying code base.

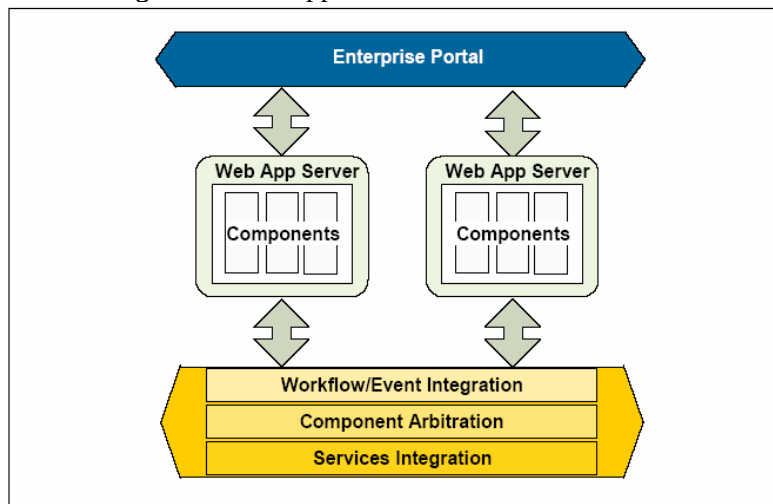
Today, ERP systems are evolving to stay relevant and competitive. ERP systems that traditionally dealt with manufacturing, finance, suppliers, customers, products and inventory,⁴ are now incorporating a more holistic approach to managing resources.⁵ As Gartner Research, a technology research firm, explains: "ERP vendors are expanding their software offerings to include extended enterprise functionality, including Customer Relationship Management (CRM), supply chain execution (SCE), supply chain planning (SCP), supplier relationship management (SRM) and product life cycle management (PLM)"⁶. ERP systems have been moving towards analytical processing to improve business planning and forecasting, well beyond traditional notions of supply chain management. The diagram below from Manugistics⁷ graphically depicts this development and displays some of the tools now being offered by the major vendors:



The ideal application environment for an ERP is an architecture that allows businesses to purchase best-of-breed (BOB) applications without need for custom integration. There are two hurdles however, to attaining this ideal architectural state. The first is technology. Most components of today's ERP systems do not have the necessary characteristics, such as being loosely coupled and highly cohesive, and are hard to break apart and difficult to maintain and change.⁸ Despite the problems in the technology arena, the primary reason for the industry's failure to provide a BOB world is the industry's inability to address the issue of semantics.⁹ The

absence of a body or organization to sort out the semantics issue and establish an industry standard will continue to retard the development of a BOB world. As a result, it is likely that the application environment of the future will be the Suite State Architecture depicted in Figure 3.

Figure 3: The Application Environment for ERP¹⁰



Source: Giga Information Group

In summary, Peter Coleman of Schwab Soundview believes that the ERP market is like a pendulum, swinging back and forth between the suite state offerings of the major vendors and the more specialized offerings of the BOB vendors.¹¹ The economy is the single most important factor influencing the swing of the pendulum. A strong economy enriches the coffers of businesses, enabling them to spend the extra money to obtain the additional capabilities offered by BOB applications. During an economic downturn, businesses are more conservative and seek to satisfy their requirements through a single provider such as a suite vendor.

5.2 Industry Lessons Learned

During the 2004 academic year, the Strategic Supply Industry Study group visited a variety of leading supply chain management companies which included: Wal-Mart, Microsoft, Caterpillar, Sears, UPS, SAP, Dell, PRTM, Scholastic Books, Limited Brands, Manugistics, and Soundview Capital Markets. These industry leaders have developed and/or implemented many supply chain & inventory management tools and techniques in order to become more efficient and effective in their daily operations. In addition we reviewed many documented case studies, reviews and critiques of ERP implementations.

Early ERP applications were financial or human resource based. In the 1990s, customers experienced more costly and complex ERP implementations than they expected.¹² One research group found that the average ERP implementation took 232 months, had a total cost of ownership of \$15M, and rewarded the business with an average negative net present value of \$1.5M.¹³ There are numerous examples of firms struggling with their ERP implementations. K-Mart, for instance, had to write off a \$130M ERP investment.¹⁴ To prevent a complete collapse, Nestlé halted its \$200M ERP project in mid-stream to re-organize and re-focus it.¹⁵ Even after successful implementation, issues such as vendor maintenance fees, which can amount to 17%-22% of the price of the installation, can become an irritant between customers and vendors.¹⁶

But there are also examples of the rewards that await those businesses that persevere. The same Nestlé Corporation that came so close to the precipice with its ERP implementation now claims that ERP has saved it \$325M.¹⁷ This set of experiences has had a profound effect on customers' expectations and will influence customers' buying decisions for the foreseeable future.

A major challenge that became crystallized during our industry study was that companies that allowed multiple domains and legacy systems to remain intact had a much more difficult time realizing the benefit of their ERP system and had a much higher overall failure rate. This debate over single instance versus multiple domains is essentially a trade off between completeness of integration with single instance versus greater and more specialized functionality with multiple systems. We note that despite the rhetoric of the ERP vendors, there are very few successful single instance -- implementations operating today. The promise of adaptive systems seems best represented by a well-defined enterprise operating on a single integrated information infrastructure.

The DOD has many similarities with the leading industry companies who are also in many different stages of organizational transformation. As senior leadership strive to find optimal business solutions, many have turned to Enterprise Resource Planning Systems to help to achieve their companies long-term goals and objectives.

A key element throughout industry and the DoD is the need to have real time information and asset visibility. With readily available information, management is able to establish and maintain lean inventory and supply chain controls. The Strategic Supply Study identified several key approaches used by corporations that have developed supply chains that have visibility, agility, flexibility, and responsiveness: Focus on Processes, not Technology; Define the Enterprise; Lead by being Committed and Engaged; Extend the Enterprise; and Obtain Conceptual Unity.

5.2.1 *Focus on the Process*

In terms of the benefits an ERP system can provide, one powerful lesson we found written throughout industry was that the change in process through standardization, analysis, and waste reduction yielded the greatest benefits. An ERP system acted as a force multiplier for those process changes allowing every aspect of the company to gain from process improvement in one sector. Roughly speaking 75% of the benefits came because the company was willing to make the changes in process necessary to enable an integrated approach and 25% came because of the technology that facilitated that integration. This is a different position than the one that is marketed by the ERP companies. Indeed, process improvement methodologies such as six sigma often deliver significant dividends for businesses without the complexity of a complete systems implementation. When coupled with ERP this is a very powerful approach.

The corporations that the Industry Study visited communicated several important lessons concerning ERP implementation. One of the most oft repeated was that successful ERP implementation is about ***process change*** and ***not technology insertion***. Focusing on implementing ERP as a technology solution without first examining and revising processes leads to very little if any productivity gains; and given the complexity and cost of an ERP implementation this will negatively impact ROI. Inherent to the change in processes is change management.

For example, we visited the Tradeport Logistics Center at Hong Kong International Airport which provides an integrated environment dedicated to the compression of time in the supply chain. This has been achieved through the adoption of a sophisticated information technology system

including an ERP which provides custom-designed logistics solutions to customers to reduce cycle time, inventory holding costs, and processing time while improving on-time deliveries. Managing Director David Oldridge of Tradeport Logistics made clear to the Study Team that technology was not in and of itself the answer. He compared an ERP system to a Stradivarius violin – just like the violin, you can have the best ERP system in the world but if you do not know how to effectively use it - all you will make is noise. The lesson is clear – successful ERP implementation requires a comprehensive examination of the processes that it will automate.

5.2.2 *Define the Enterprise*

Secondly and allied with the process observation, we noted the need to appropriately define the enterprise for ERP to be effective. That is, companies who defined their organization by division or did not include their extended enterprise partners (suppliers and customer) were not able to realize the full benefit of an integrated ERP and often experienced major frustration and delay during the implementation.

Dell Inc. is a premier provider of computer products and services. They required customers worldwide to build information technology and Internet infrastructures to establish a direct business model incorporating design, build and customization of products and services to satisfy a range of customer computing requirements.

Dell's approach to implementing an ERP software solution can be described as a "Best-of-Breed" approach evidenced by its multi-vendor plan, which targets specific functionality from a variety of software packages instead of relying on one all-encompassing product. Dell's CIO of manufacturing, Terry Kelley comments on this multi-vendor approach, "We keep carving out pieces of the puzzle and delivering quicker value than if we were putting in one huge ERP system".¹⁸

This move to a multi-vendor approach followed an unsuccessful attempt in 1994 when Dell purchased SAP's R/3 enterprise software suite to run its manufacturing operations. Over the next two years, the computer maker tried to implement the software across its multiple operations, but pulled back at the end of 1996. Terry Kelley (CIO) justified the pullback by stating the business model changed from a worldwide focus to a segmented regional focus. Dell spent two years customizing SAP to its needs only to find the nature of its business has changed radically.

Dell's decision to re-define its enterprise salvaged its ERP implementation. Key was the concept of "planning big, but thinking small." That is, attempting to plan a massive ERP implementation across all a corporation's business units may be a good idea in the long-term, but in the short-term a business needs to focus on investments that will enable it to obtain the quickest return on investment. Defining an enterprise correctly is critical to defining the level of effort that will be required in implementing an ERP and the chances for its success.

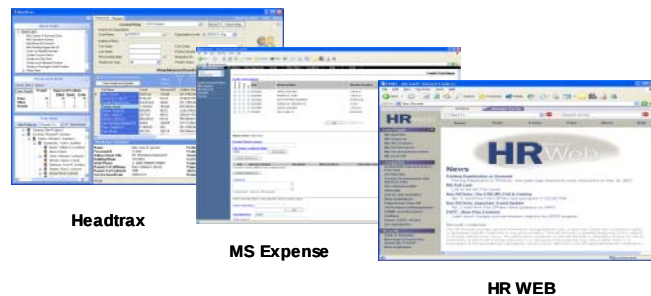
5.2.3 *Leadership and Change Management*

The importance of leadership, in particular, change management was also a critical factor in how well a company adapted to the new procedures and process demanded by ERP. In fact, often this single element accounted for the difference between a successful ERP implementation and that of a legacy environment with multiple disaggregated business processes and data sources.

A leading example in this element was the Microsoft Corporation. Founded in 1975, Microsoft is the worldwide leader in software, services, and Internet technologies for personal and business computing. The company offers a wide range of products and services designed to empower people through great software. Microsoft employs more than 55,000 people and had annual revenues in excess of \$25 billion as of June 2001.

Microsoft's growth rate was straining its financial, operations, and human resources support systems. Microsoft looked to SAP R/3 (Release 3) for an effective ERP solution to increase efficiency and reduce operating costs. Within seven months, the Microsoft team went live with the procurement and payable aspects of SAP R/3 Materials Management (MM) and Financial (FI) modules.

During this same timeframe, Microsoft also implemented MS Market to enable employees to create and submit requisitions online for purchasing materials and services (see example "web extension" pages right)



Within 19 months of the initial team planning meetings, the financial system was in place in 15 subsidiaries worldwide. Microsoft had moved off many of its legacy financial systems, and managers were reaping the benefits of access to real-time data in a single database. As the success of the SAP financial module became apparent, Microsoft managers running the order management systems were eager to move their systems into the SAP environment. Success bred success. All original equipment manufacturer (OEM) hardware, packaged product, retail licensing, and programs systems were moved to SAP. Microsoft replaced legacy systems with the SAP Sales and Distribution (SD) and Materials Management (MM) modules. It also ensured a more configurable, tightly integrated system for the entire organization.¹⁹

Critical to the success of the Microsoft initiative was the commitment of senior leadership and effective change management. Microsoft did not leave their ERP implementation to a middle manager, who would have to struggle against and across organizational boundaries. While day-to-day responsibility went to a special – but permanent – team at Microsoft, ultimate responsibility rested with the Chief Operating Officer, who was actively engaged in ensuring that the corporation as a whole understood the importance that senior management attached to the project. This effective governance model supported by big picture planning and a targeted, progressive implementation schedule was most effective.

5.2.4 *Extend the Enterprise*

The businesses that we visited knew that in order to be agile and responsive they need to have visibility not only into their own supply chain, but also into that of suppliers, partners and customers. The most striking example of this approach was at Wal-Mart. Their recent decision to require their top suppliers to use RFID technology represents just the latest effort on the part of the retailer to maximize the visibility and connectivity of its ERP system to its extended supply chain. Wal-Mart recognize that this improved visibility and control will enhance its already robust supply chain, which today enables them to collate and analyze purchases from the point of sale around the country and execute automatic replenishment direct to store.

Another clear example was the UPS Corporation's CACH (Chicago Area Consolidation Hub) facility, which is a multi-modal hub (road/rail) for its shipping operations. The CACH handles over 1.4M packages a day with 45% shipped via road system and 55% shipped via rail. UPS's business is built on being able to deliver customer packages on time, anywhere in the world. The use of intermodal and third party transport adds a level of complexity and risk to UPS's operations because the corporation's reputation is just as reliant on the third party providers as it is on its own employees. UPS has reduced this risk by investing heavily in its information technology infrastructure, providing visibility of package location when handled by all its extended supply chain partners.

Caterpillar, a \$22.8B+ corporation, manufactures a wide range of construction and other heavy equipment. Central to the business is the ability to ship millions of parts each day throughout the world to support both manufacturing and repair operations. Caterpillar has set a standard of being able to deliver a part to a customer in the US within 24 hours and the rest of the world within 48 hours. To achieve this the corporation has invested in a Dealer Terminal System, which provides complete global inventory records in stores, manufacturing plants and key suppliers. The result is a global back order rate of only 0.2% and an on-time delivery rate of 98.0%.²⁰

Finally, Port of Singapore Authority (PSA) further highlights the importance of this approach. Singapore's dockyards are a critical hub in the transportation of goods throughout Asia. The very prosperity of the country of Singapore is critically based on the ability of these dockyards to efficiently and effectively "cross-dock" millions of containers.

To manage this incredibly complex operation the PSA developed PortNet. PortNet enables the PSA's ERP to interface with customers' ERP systems, providing visibility into customer requirements and enabling the PSA to plan the offloading and loading of containers in the most efficient way possible. Because PSA has insight into its customers' systems, it is able to load on average 40,000 containers onto 16 ships per day. The maximum time a container will remain at the dockyard is three days. This kind of dockyard efficiency, enabled by an ERP backbone, allows for it to be 3 days quicker to ship a container from Australia to Japan via Singapore rather than directly from Australia to Japan.²¹

5.2.5 Conceptual Unity

Our final lesson is that of importance of conceptual unity of effort in adopting and using an ERP system to full effect. The best corporations we visited were able to identify the importance of an ERP system to their core business operations and their future growth potential, and align their efforts to effectively realize their goals of both effectiveness and efficiency.

The entire nation of Singapore operates in this fashion. When discussing Singapore and the relationship between the government and industry, it is not an exaggeration to use the label "Singapore, Inc." Singapore is a model of conceptual unity among the public and private sectors. No matter where members of the Industry Study visited, it was clear that the Singaporeans as a whole understood the vision and mission of Singapore. This degree of conceptual unity enables the whole country to focus on enhancing key areas of comparative advantage to keep Singapore competitive into the future.

A tangible example of this is Singapore's five levels of connectivity that include air and sea transport, cyber links, free trade agreements, information flow and people networks.²² The extent of this connectivity led Daimler Chrysler to select Singapore as the location of its Regional

Logistics Center. From this location Daimler Chrysler has complete visibility over the entire supply chain, linking more than 20 countries in Southeast Asia, Northeast Asia, Australia, New Zealand, the Pacific Islands and Japan²³, using an ERP system to hold and maintain the core data.

5.3 *Where DoD is Today?*

We reviewed the capstone visioning documents for Defense logistics including Joint Vision 2020 and the J4 Focused Logistics Campaign Plan and they all recognize the importance of the benefits of Enterprise Resource Planning systems. However, one weakness discovered is that without a central nervous system that provides visibility into the logistical systems of the supporting agencies the Unified Commander has virtually no control over the flow of resources into the Area of Responsibility.

Sub-optimized service and joint agency logistics systems have created numerous applications, which do not communicate well and in many cases are not interoperable. The United States Air Force alone has over 712 different applications operating in its logistics system, which are not effectively integrated with each other or with the systems of other services.

In response to this environment, the DoD has launched a number of initiatives to improve the level of integration, flexibility and responsiveness of its supply chain.

5.4 *Business Enterprise Architecture (BEA)*

As a part of the Business Management Modernization Program (BMMP), the Business Enterprise Architecture project "...serves as the blueprint that enables streamlined processes and integrated systems to transform the way the Department conducts its business."²⁴ Enterprise Architectures (EA's) are strategic enablers, assisting organizations in accomplishing their missions by documenting significant characteristics of an enterprise – its business functions, its processes, and supporting technologies or tools. EA's can assist in providing a course to follow as emerging technologies are employed, or processes and/or missions in an organization evolve. Implementation of an EA encourages streamlined and seamless organization structures designed to provide more efficient business processes.

Key BEA Findings:

- Because of timeframe of its development, the BEA has not been used as a reference for the development of service specific systems improvement programs including the logistics domain at present.
- This program has the potential to define common business practices for the future and with proper governance arrangements supporting an agreed future enterprise definition.

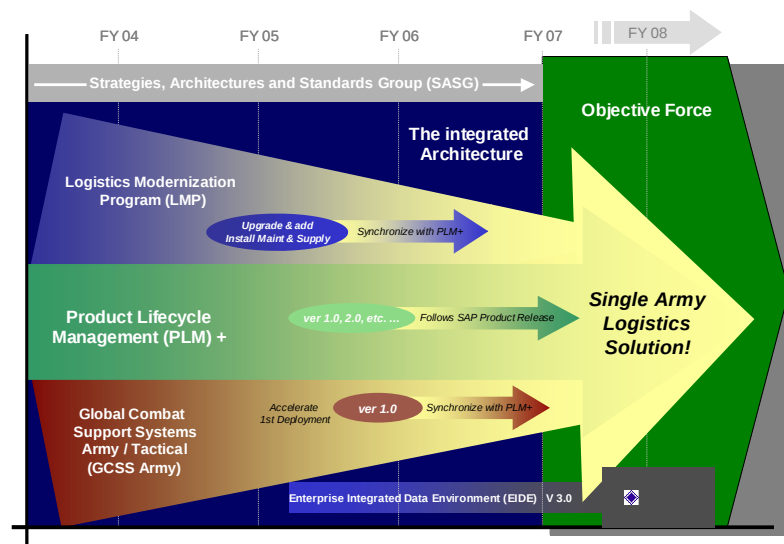
5.4.1 *Current DoD ERP Programs*

Currently there are initiatives in place for implementing an ERP solution for elements of logistics provision within the Army and Navy, as well as within the Defense Logistics Agency (DLA). All the programs are using SAP as the prime vendor for the implementation, while the Air Force and Marines have yet to commit to a specific vendor.

Navy ERP. The Navy is conducting four separate pilot programs (SIGMA, CABRILLO, SMART, and NEMAIS) with four separate integrators (Bearing Point, Pricewaterhouse Coopers, EDS, and IBM). Navy also is in the process of planning and converging the four Navy ERP

programs. The objectives of the convergence plan is to normalize data using SIGMA's data template, document common and unique business processes, and maximize reuse and integration of existing Navy related ERP documentation and resources. This single Navy ERP system is planned for production and deployment in FY2014.²⁵

Army ERP. The Army's Logistics Modernization Program (LMP) and the Global Combat Service Support (GCSS) program are also both adopting ERP systems. While initiatives are being made to standardize data, GCSS is currently **not integrated** with the wholesale logistics system, albeit they share a common software platform in SAP. In addition, the Army has recognized the need to have these two systems operate from commonly defined data elements and has thus established a Product Lifecycle Manager Plus (PLM+) program to achieve this integration. Army has selected SAP as the packaged software to deliver all of these solutions, and now describes the future architecture according to the following diagram:



Key DOD ERP Program Findings:

DoD is essentially adopting a strategy of spiral development of its ERP systems across the operational and tactical domains of discrete services.

- The Army's ERP efforts are not integrated with any of the current Navy ERP programs, nor with the DLA Business Modernization Program (BMP).

5.5 Conclusions

An ERP system designed for the supply chain of the Department of Defense as opposed to individual services has the potential to provide enterprise-wide visibility, help planning and forecasting, and enable sense and respond logistics. By system we mean system in the broadest sense consisting of people, process, technology and infrastructure – this is not a simple technology solution. Such a system extends to both supplier and end user (warfighter) the required access to data and asset visibility to promote confidence in the system, improved and measurable service performance and greatly enhanced efficiency. Our industry analysis suggests that creating a single logistics tail during expeditionary deployments is the key to achieving transformation agility and persistence.

To adopt such an enterprise approach to DoD supply networks, we believe a carefully phased approach is required due to the size and complexity of the organization. This is not to suggest that benefits and improvements cannot be achieved in the short term, which can assist in funding the investments needed for the future.

Some key lessons for DoD from the business sector ERP case studies are:

- Do not attempt an ERP implementation without a thorough review of your business aimed at improving and aligning end-to-end business processes. Technology adoption in and of itself is not the answer.
- Leadership needs to remain committed and engaged to the ERP implementation, with an effective governance system to ensure successful adoption. There must be strategic focus and unity of effort for such a system to be successful.
- Define the future logistics architecture and identify and plan for the elimination of legacy systems that require data redundancy. It is naïve to think that large organizations will migrate to a single instance of an ERP system.
- Develop and communicate a comprehensive strategic plan for the logistics information environment.
- Review, align and where appropriate rationalize all discrete logistics projects to ensure the integrity of the future system.

5.6 Recommendations

- The DoD should define its supply chain across all the services as a single enterprise so that processes and information systems can be standardized and data can be maintained by both the service and the Joint Logistics System that will take our forces to war. This will assist the transformation of DoD logistics from loosely connected logistics processes to network-centric, fully integrated logistics and ultimately a collaborative logistics planning and execution process.
- Adopt an effective, centralized governance structure for the DoD supply chain to drive the development of such an enterprise. This should include consideration of all elements of funding and authority that may inhibit the adoption of such a system. The appropriate model may imply a logistics commander joining the component commanders in a unified command in wartime at the operational level or OSD taking ownership of an ERP system that has visibility into each of the services logistics systems.
- Implement a common supply chain architecture and rationalize the infrastructure to ensure the critical elements are positioned to support warfighter requirements.
- Force the integration of existing ERP programs into this new joint logistics system and architecture and begin the process of rationalizing existing processes, systems and programs.
- Prioritize and plan for a graduated program of adoption, which includes early capability and efficiency enhancements to win support for the program, prove the benefits and build the momentum necessary for large-scale transformation.
- Allocate ten years for such an approach.

6 Radio Frequency Identification Devices (RFID)

RFID is not new technology – indeed anyone who has used a Mobil Speedpass to purchase gas or used a toll way speed pass has been privy to RFID technology. Today it has developed into a key enabler of improved supply chain visibility, driving superior tracking and monitoring of the flow goods and products. Large companies like Wal-Mart see the benefits of RFID in taking vendor

managed inventory to a new level of sophistication, tracking goods as they move off the shelves to the point of sale and automatically generating the re-order from suppliers. For DoD the need is being driven by the recent experience in Operation Iraqi Freedom where containers and pallets were piling up at the ports and not moving forward to where they were needed to support operations. While RFID certainly will not fix that problem independently, it has the potential to assist a great deal if the process for moving supplies from the port to the warfighter is improved.

6.1 What is RFID?

RFID is simply a tag or electronic device that stores and transmits information on the item to which it is attached. Passive RFID tags require an interrogation to provide information because their battery capacity is small, while active RFID tags broadcast without interrogation and as a result are more easily networked. As one would expect, active RFID tagging is more expensive and has some limitations. While many argue RFID is simply the next evolution of the bar code, our analysis indicates that in fact it could be much more.

6.1.1 Passive RFID Tags

Passive tags consist of a microchip with data and a coiled antenna. The microchip normally contains 64-128 bytes of data. That small amount of data storage allows for only a unique identification number. The relevant data is stored in a separate database then linked to the ID number. Capturing and storing the radio signal from the reader powers the tag, and then utilizes that stored energy to respond to the reader out to three to nine meters.³² Hundreds of tags can be simultaneously read and unlike bar codes, line of sight is not required to read the tags.

In commercial industry, passive tags can come in many forms and uses. They can be woven into a garment, incorporated into a large denomination monetary instrument,³³ or even be placed in discrete product items. Current industry uses for passive tags include pallets and warehousing, herd animal tracking, high value item security and airline luggage.³⁴

Active RFID Tags – allow a very low-level signal to be received by the tag (because the reader does not need to power the tag), and the tag can generate high-level signals back to the reader, driven from its internal power source. Passive RFID uses RF energy transferred from the reader to the tag to power the tag.³⁵ Active RFID is more expensive than passive RFID and is normally used for tracking high value goods such as container shipments.

A good example of active RFID is within a dock or logistics depot. Active RFID can scan large areas within this environment and retrieve data on the contents of shipping containers, pallets, or crates, etc. Used in conjunction with passive RFID, an active RFID reader can retrieve data from the entire contents of a standard shipping container, sometimes thousands of tags in seconds when passive tags are used on the items within the container. For example, active RFID technology can be used for the security of shipped goods by monitoring freight activity in containers, trucks and pallets.

Semi- Passive Tags - These are similar to active tags in that they have a small power source for monitoring environmental conditions. The internal power source is sufficient to provide power to its onboard sensor but requires transmitted energy from the reader to gain sufficient power to respond back to the reader. These tags are commonly used to monitor a refrigeration container where it will transmit data when the temperature of the container goes outside of permissible tolerances. Semi-active tags can also be used to monitor shock to an item and certain conditions in a security environment, and then report the incident and the time when the variance occurred.³⁶

The US Army has completed a successful eighteen-month test of semi-passive tags on pallets containing cases of Meals Ready-to-Eat (MRE) combat rations. The test monitored the temperature sensing capability of the tags as well as tracking the rations from vendor to the using unit. Passive tags were placed on each case and associated with the semi-passive tags in the test.³⁷

Readers - RFID tags contain information about an item that can be retrieved using a “reader.” The reader then retrieves and decodes the data on the tag and passes the information to a host computer for processing.³⁹ “RFID has been used extensively in toll collection, inventory control, building security, and library systems, not to mention Exxon/Mobil’s “Speed-Pass” that allows fast, easy transactions for its customers.”⁴⁰ Retail businesses and industry are using RFID more extensively to help a variety of issues and problems related to managing inventory.

6.2 Key Industry Findings

RFID is growing rapidly and many believe it is on the brink of large-scale adoption and implementation. Providing visibility of items throughout a supply chain, RFID technology allows automated data collection and identification of items previously difficult to track. Without question, RFID technology has great promise for the future. The Department of Defense (DoD) and Wal-Mart, the nation’s largest retailer, are banking on it.⁴¹

RFID is already having a tremendous impact on supply chain management given the impetus provided by the world’s largest retailer Wal-Mart. As developments occur and technology moves forward, RFID tags will become more cost effective and address today’s concern that small players cannot compete unless RFID implementation costs are reduced. Much of this depends on increased RFID use driving down tag prices.

With the growing RFID requirement and still developing technology, many suppliers face infrastructure challenges that might hinder them from being competitive. Active RFID is too expensive right now for many companies. Larger competitors could edge smaller companies lacking the resources out of a burgeoning market.

The impact of the speed, versatility, and accountability that RFID technology will provide in today’s global business environment is tremendous. Industry analysts indicate RFID spending in 2003 was \$91.5 million. By 2008 these same analysts predict that RFID investment should rise to \$1.3 billion a year.

6.2.1 RFID Development

Much of industry seems to be waiting for the price to fall before embracing a technology that will primarily benefit those companies managing complex supply chains. In the current environment it is very difficult to achieve a return on investment for RFID tagging if your product is simply entering someone else’s supply chain. Wal-Mart for example, knowing that very few vendors would come to the RFID standard voluntarily, is simply demanding that its vendors provide RFID tagging at vendor cost before their product can enter Wal-Mart’s supply chain.

Major research and development efforts are underway that if successful should drive down the cost of the technology and allow its use to be widespread. The two most significant tests are at Wal-Mart and at the Department of Defense. Wal-Mart’s effort is to require its top 100 suppliers to tag shipping crates and pallets by January 2005. This effort is to assist the company with inventory management and its supply chain. Massachusetts Institute of Technology’s Auto ID Lab is spearheading a global effort to provide RFID standardization. Auto ID Labs effort is in

conjunction with the Uniform Code Council Inc. (UCC) of the United States and EAN International in Belgium. Microsoft Corporation has agreed to support the effort by joining AutoID Inc., a joint venture established by UCC and EAN, a non-profit organization working to provide standardization in this technology.⁴²

New technologies beyond RFID are being concurrently developed and these have the potential to further enhance business operations. These include:

Smart Dust – these are emerging technologies that may have potential to both commercial and military sectors. Smart dust is a micro electromechanical sensor also known as MEMS⁴³, which is a self-contained, millimeter scale sensing and communication device. A single unit of smart dust is known as a mote, which includes a microprocessor that performs sensing, memory and communication tasks while managing its power source to conserve energy. A mote will be the size of a grain of sand and may come in active or passive forms. The cost of motes range from \$50 to \$100 today, but Gary Fedder of Carnegie Mellon's MEMS Laboratory anticipates that the price will fall to \$1 in five years.

This technology has the capacity to provide distributed sensing capacity for every item in daily life. Direct applications for smart dust are being developed in medicine, land and space communication, defense-related sensor networks, inventory control and product quality control within the University of California⁴⁴ today.

Artificial Intelligence in Smart Machines and Software - software vendors are building software systems that are more flexible and adaptable using artificial intelligence and these systems learn. In the future, software will have this intelligence and analysis capability and will require less and less intervention in order to effectively operate business systems.

According to Department of Energy's Sandia laboratories, smart machines can use a human cognitive process and human knowledge to help people solve problems and make decisions. Companies such as, I2 Technologies, IBM, Manugistics and SAP are developing supply-chain-management tools with artificial intelligence (AI). The program's artificial intelligence, compares current business conditions with historical ones and forecasts what's likely to happen next. The program can compare its forecast against actual outcomes, learning along the way. Commercial versions should be available within five years.”⁴⁵

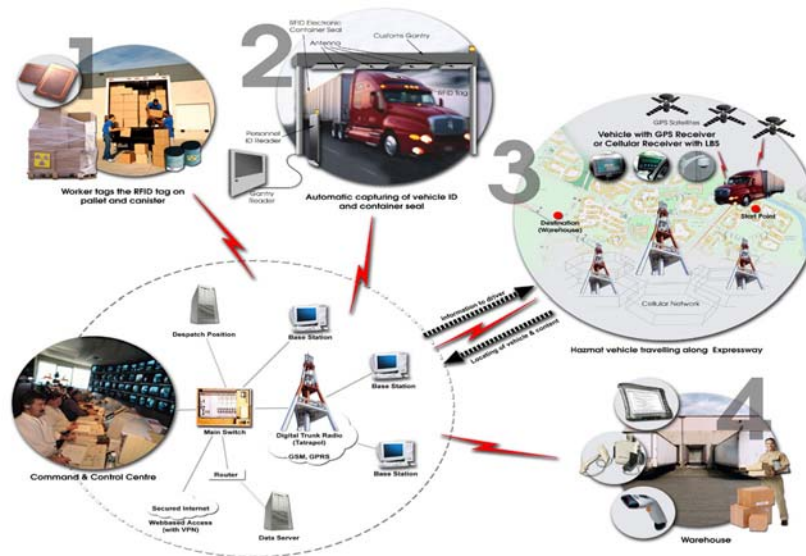
6.2.2 RFID Improving Supply Chain Management

In terms of its applicability to improved supply chain management, RFID has the potential to streamline physical material handling and seamlessly integrate this information without error into core information systems throughout the supply chain. Singapore Technologies provided the following example:⁴⁶

1. RFID tags are attached to pallets and boxes either by Suppliers at the point of Manufacture/Assembly or at Distribution Centers later during the distribution process. These items, boxes and pallets will then be recorded automatically in transactions systems.
2. These tags will be aggregated to form vehicle manifest data, again linked to core transport management systems to allow for vehicle load optimization. The truck pallet and box can then be tracked by gantries positioned in the distribution chain.

3. Transit information is then tracked and consolidated for use by all parties to the supply network.

4. At the warehouse / end delivery node the pallets and or boxes will be scanned into inventory, recording precise put away data and storage requirements. Finally, the boxes will be forwarded to the point of consumption again entered into inventory and then linked to point of sale software.



Key Findings:

- RFID coupled with the right infrastructure, business processes will provide real time information to feed future adaptive supply networks.
- RFID has significant potential to reduce handling costs, improve information accuracy and visibility, and improve the planning of inventory required to support both business and defense requirements.
- RFID has significant security applications to aid current and future initiatives in tracking the handling of freight and cargo.
- As RFID costs reduce with volume of usage it will be progressively extended from supply chain containers and packages, to high value / secure items and eventually to low value items.
- Devices will be generational and develop toward the emerging technologies of smart dust and intelligent devices over the next 5 to 10 years.

6.3 RFID within DoD

On October 20, 2003, The Under Secretary of Defense for Acquisition, Technology, and Logistics, USD(AT&L) published a policy on the use of RFID within the Department of Defense⁵⁸. The Policy directs the use of active RFID currently in use within DOD and further directs that DOD will be an “early adopter” of passive RFID technology.⁵⁹ It directs that passive RFID be used on the lowest possible piece part / case / pallet packaging and that all suppliers are to begin installing tags no later than January 2005.⁶⁰ Further, RFID will be used on all DOD materiel except bulk commodities (i.e. bulk liquids, sand, gravel etc.)⁶¹, and it will be used on all

types of cargo such as sustainment cargo, unit movement equipment and cargo, ammunition shipments and prepositioned stocks.⁶² RFID will also be the transaction of record within maintenance and supply information systems⁶³.

The policy envisions that DOD components will establish an initial capability to read passive tags at key sites in preparation for the January 2005 implementation. DOD will publish business rules for the of RFID based on initial RFID projects to be completed and analyzed no later than May 2004, and will issue a final version of this policy in July 2004.⁶⁴

The Assistant Deputy Under Secretary of Defense (Supply Chain Integration) and the RFID Implementation Integrated Product Team have a demanding task through to January 2005. The policy requires that in excess of 23,000⁶⁵ DOD suppliers comply within the next nine months. Steve Baker, service director, supply chain management, for ARC Advisory Group does not believe that all suppliers will be compliant : “I think there will be a fair number of people contacting the military and saying ‘please bear with us, we’re working toward this but we’re just not there yet’”.⁶⁶ The Pentagon will likely prioritize its effort to get at least its top 100 suppliers on board by January 2005, add another 400 by the middle of next year, with all suppliers using the devices by January 2006.⁶⁷

Jeff Woods, a principal analyst at the Gartner Group cautions all parties to set realistic delivery expectations. He believes that “it will take about five years to fully implement a ubiquitous tagging infrastructure throughout the supply chain”.⁶⁸

6.4 Conclusions

RFID is here today as a proven technology with working applications in a number of industries. The future prospects for RFID technology look extremely promising. Global acceptance and use will come with the development of unified standards and the progressive lowering RFID tags and infrastructure costs. The future will likely see a shift from “closed-loop systems” to “open systems architectures” and RFID will likely become a primary enabling technology for supply visibility and integration.

RFID is a powerful tool, its real effect comes when effectively integrated into an information network and organization in which there are standardized end-to-end procedures and process. Industries and enterprises will utilize these developing RFID applications to create new business processes and change business strategies.⁷⁰ Spiral development should be considered with this now proven but still emerging technology – it is not necessary to wait for the perfect solution. Emerging developments such as smart dust and smart machines are tools that may enhance supply chain management if processes are adapted to capture critical information and people act based on that data.

Specifically for DoD:

- RFID has the ability to respond to a number of the issues raised in the GAO report on OIF if it is effectively linked to core information systems and supports robust and integrated processes.
- RFID technology can assist in supply chain security through the networking of smart seals, chemical, biological and radiological sensors and an integrated secure information network required in the DoD’s complex global supply chain.

- DoD is correct in sensing the need to move to RFID technologies and more fundamental issues of organization, structure, and process need to be addressed before the real benefit of this technology can be realized.

Simply put, RFID investment is an imperative if we are to achieve the goals laid out in the DoD's vision for an integrated logistics environment. In concert with the right information network RFID technology can be a force multiplier. Beyond the visibility that RFID provides are many second and third order consequences, such as accountability and accessibility.

6.4.1

- DOD should continue with its aggressive and leading adoption of RFID technology according to its current schedule.
- RFID must be integrated into the broader DoD supply chain enterprise and linked to information systems supporting end-to-end business processes to be effective.
- Adopt a policy of spiral development.

7 Supply Chain Security

As in every endeavor to effect change, security remains a paramount concern. Supply Chain Security as the DoD pursues its focused logistics campaign plan and adopts "sense and respond" logistics capabilities is no different. This implies a series of preventative measures to secure supply chain operations from three different perspectives: physical security, information security and freight security. In this section we will examine all three elements, identify critical vulnerabilities and draw conclusions as to required improvements to support the US logistics system's goals of continuity, reliability, trust, persistence, agility and decisiveness.

7.1 Background

The events of September 11, 2001 changed the focus of and approaches to supply chain security. In that instant, security shifted from concerns over protection against theft and smuggling to the threat of terrorism and weapons of mass destruction. Homeland security became the highest priority issue. The initial reaction of national and global supply chains to the September 11 attacks was to increase stock levels to mitigate the possibility of further and sustained supply interruptions. This rapidly developed into additional initiatives and measures to secure the supply chain, constrained by the sheer size and scope of global operations faced by many American companies.

We consider that supply chain operations represent an enormous asymmetric threat to the US with in excess of 200 million cargo containers moving around the world each year; 12 million containers entering US ports annually, of which only 3-5% can be physically inspected under current arrangements. In response, industry has increased security in the supply chain as a critical guarantee of continuity of operations, which also prevents theft and aids in accountability. For the DoD, supply chain security is equally important as it represents a clear vulnerability and target to US enemies and one that could affect military persistence and agility.

7.2 *Physical Security Challenges*

7.2.1 What is Physical Security?

Physical security refers to the provision of physical asset protection for organizational infrastructure and facilities. In terms of the infrastructure security, we identified various security measures including: access control, badges, cameras, guards and employee checks, and the testing of security by an external firm. Facilities security is provided by these measures and also focuses on perimeters, policy, procedures and personnel.

7.2.2 Industry Trends

Integrated supply chain security is the backbone of industrial globalization. Many of the leading companies now take security as seriously in a non-combat environment as the Department of Defense. Wal-Mart, Dell and UPS are three examples of companies that provide several tiers of physical and informational security to their operations. They have built in systems and software redundancy into their integrated supply chain information networks and adopted an integrated and unified organizational structure allowing progress to be monitored.

At Dell Computers for example, these security systems are extended to members of the Dell vendor supply team. Companies like Dell with the most integrated approach to security had the least disruptions and incidents, while adding to overall supply chain flexibility. For example, a labor strike shut down West Coast Ports, Dell was able to re-route the critical goods in its supply chain to air shipments within hours.

7.2.3 Security within DoD and US Government

Generally speaking, there are few organizations in the world that take security as seriously as the DoD. Excellent written guidance exists on almost every issue, including information assurance. The challenge is that the DoD's supply chain is not managed as a single enterprise. So no single information network monitors the security or flow of goods across the DoD supply chain. There are several organizations and agencies involved in the provision of supply chain services, which do not routinely integrate and share core movement data, threat information or physical security arrangements.

Because of today's increased concern about bio-terrorism and sabotage, public institutions are paying increased attention to the physical security of facility sites, storage areas, and research processes. All Federal institutions, large and small, have adopted some measure of site security to minimize crime and to protect research assets. This is especially true for facilities that handle extremely hazardous substances. The Department of Homeland Security, in its continued effort to make the US homeland more secure have developed an advisory system to deter, detect, prevent and respond to terrorist threats to minimize disruption to the supply chain.

7.2.4 Physical Security Key Findings

- It was not clear that all elements of the private and public supply chain had developed current contingency plans and implemented procedures for receiving and acting on threat information, alert notification procedures, terrorist incident response procedures and chemical, biological, radiological and nuclear (CBRN) procedures.
- While much work has been undertaken by DHS on assessing critical infrastructure vulnerability, there is still work to be done to build a comprehensive threat matrix from a physical security perspective. This would be used to drive resource allocation to further efforts at improved physical security arrangements.

- There are no clear and recognized industry standards for the provision of physical security arrangements that provide consistent standards across the US.

7.3 *Freight Security*

7.3.1 **What is Freight Security?**

Freight refers to the packages, pallets and containers, which ship goods and products around the world by land, sea and air. Security in the international supply chain for freight has become one of the highest priorities for the US government. After September 11, the highest-order definition of freight security changed from theft-proof to tamper-proof.

7.3.2 **Freight Security Initiatives**

Two primary U.S. customs service programs provide a regulatory blueprint for the future of global supply chain security efforts. The Customs – Trade Partnership Against Terrorism (C-TPAT) and the Container Security Initiative (CSI) work to tighten security without compromising supply-chain efficiency and the flow of global trade. These two programs and the Low Risk Importer program provide the most aggressive and comprehensive supply chain security initiatives in the history of the shipping industry. The philosophies is to identify and resolve security problems at the origin destination and use the 3 to 5% of inspections at US ports to target high risk freight.

Customs-Trade Partnership Against Terrorism (C-TPAT) is a voluntary joint government-business initiative designed to build cooperative relationships that strengthen overall supply chain and boarder security. “C-TPAT recognizes that customs can provide the highest level of security only through close cooperation with the ultimate owners of the supply chain, importers, carriers, brokers, warehouse operators and manufacturers. Through this initiative, Customs is asking business to ensure the integrity of their security practices and communicate their security guidelines to their business partners within the supply chain”⁷¹. C-TPAT is open to all importers and carriers (air, rail, and sea) and mutually benefits all members of the supply chain. Emphasis is placed on industry self-policing itself rather than customs inspections.

Container Security Initiative (CSI) is a multi-national program established to prevent global containerized cargo from being exploited by terrorists and smugglers. The CSI focuses on the 20 ports that originate the most containers bound for the US mega-ports. The intent of the initiative is to extend our security zone outward as far as possible, so that the US borders become the last line of defense. Containers that pose a risk can be identified and examined at the point of origin before they are loaded for shipment to the US.

CSI consist of four core elements; using intelligence and automated information to identify and target containers that pose a risk for terrorism, pre-screening those containers at the port of departure before they arrive at US ports, using technology to quickly pre-screen containers, and utilizing smart, tamper-evident containers.⁷²

Low Risk Importer (LRI) is a program that identifies companies that have built a reputation of trust and cooperation with the customs service as low risk importers. This trust allows companies to expedite product shipments through customs with increased efficiency. The self-policing action fulfills the objective of many of these programs enhancing a verifiable and secure supply chain.⁷³

Container loading and documentation has become the key to a successful system. The shipper now takes on the obligations and responsibility of properly loading the container and providing accurate and traceable records of what is inside. This process provides total transparency from packing, loading, in transit, through handling facilities to unloading at the final destination.⁷⁴

7.3.3 Freight Security Key Findings

- DoD has not required C-TPAT and CSI certification for all international commercial carriers – the system should be extended to as many shippers as possible to facilitate rapid secure movement of critical freight.
- DoD needs a governance model providing adequate authority and visibility into the joint supply chain to more effectively identify security issues, set and monitor security standards and ensure integration of all security information.

7.4 Information Security

7.4.1 What is Information Security?

There is great concern for information security since the events of 9/11 and because of the Global War on terrorism. The supply chain industry and DoD are attempting to take proactive measures to protect both Information Security (IS) and Information Assurance (IA), which includes the products, procedures and policies that allow the timely transfer of information in an accurate and secure way among all parties.

7.4.2 Vulnerabilities: SCM Information Security/Assurance Challenges

Software. Current software applications have not all been designed with security in mind and present significant vulnerabilities for both internal and external supply chain environments. Specifically these applications are susceptible to trojans, worms and viruses as demonstrated most recently by the MS Blaster Worm and have the potential to seriously interrupt operations or take down total systems.

Hackers. Hackers may gain access to the core systems' main servers and obtain access to very sensitive information, disrupt operations, engage in fraudulent practices or take down entire systems. With terrorism on the rise, hackers may engage in what is being termed cyber-terrorism imposing significant cost, interruption or ineffectiveness on the US economy and/or military command and control systems.

The risk to both the enterprise and national information infrastructure is very significant.

7.4.3 Industry Challenges and Trends for Information Security

Michael Rasmussen provides the following observations of challenges and trends in Information security from his December 18, 2004 article entitled, "IT Trends 2004: Operating Systems Security":

- **Integrated Security:** Vendors are driving toward increased integration of security in development of operating systems.
- **Increased Assessment:** Organizations are moving beyond perimeter security assessments to assessments of internal systems and applications. The threat of liability (e.g., Federal Trade Commission vs. Guess, California Senate Bill 1386) has organizations concerned about making sure their systems are secure. Increased interest is also being paid to pre-production security quality assurance testing.
- **Hardening and Maintaining Secure Systems:** Organizations are beginning to define their technical security architectures that set forth technology standards as well as security configuration and maintenance procedures for operating systems. In the past, hardening efforts were mainly done on Internet-exposed systems. The trend is showing that organizations are beginning to adopt these measures internally.
- **Cost Containment/Leverage Resources:** Facing increased pressure to secure systems, organizations are doing so under budget constraints. With such challenges, organizations are adopting technologies that have strong centralized management features whereby they can leverage existing resources.

7.4.4 Information Security Key Findings

- Establish IA and IS requirements as a priority in the DoD in the ERP/EA programs for joint logistics integration and interoperability.
- As we attempt to transform DoD to integrated supply chain logistics, we must validate strict enforcement of IA plans, policies and procedures as outlined in the Department of Defense Directive (8500.1, October 2002), Information Assurance. In addition, establish measures of performance and accountability to ensure IA risks are mitigated.
- Application components should include manual processes and procedures in the event of IT security compromise and failure. Manual processes and procedures will help to ensure Continuity of Operations Plans (COOP) for key components of the business processes for the enterprise architecture.

7.5 Supply Chain Security Conclusions

Close cooperation between and within the government and private sectors is vital to tightening security without compromising supply-chain efficiency and the flow of global trade. From a supply chain and business perspective, the question is not only how to prevent another attack, but also to keep global trade operating in the national security interests of the US.

In the area of physical security:

- It was not clear that all elements of the private and public supply chain had developed current contingency plans and implemented procedures.
- There is still work to be done to build a comprehensive threat matrix from a physical security perspective.

Freight security has made significant progress under C-TPAT and CSI but there are still opportunities for DoD to:

- Require C-TPAT and CSI certification for all international commercial carriers – the system should be extended to as many shippers as possible to facilitate rapid secure movement of critical freight.
- Adopt a governance model providing adequate authority and visibility into the joint supply chain to more effectively identify security issues, set and monitor security standards and ensure integration of all security information.

In relation to information security DoD should ensure that IA and IS requirements are established as a priority in the ERP/EA programs for joint logistics integration and interoperability.

SCM physical, freight and information security must be made a priority to ensure the continuous flow of materiel for both DoD and industry.

9 Synthesis and Conclusions

The United States is a trading nation and much of our global power, reach and influence is dependant on the Global Strategic Supply System as a critical enabler of the National Security Strategy. Strategic Supply touches every instrument of our national power and affects our ability to leverage supremacy through utilization of Diplomatic, Informational, Economic and Military means.

The future demands that the Department of Defense embrace major cultural changes in order to implement an integrated strategic supply system capable of providing the visibility, agility, persistence and interoperability it so clearly needs. Our research calls for a unified, DoD wide global supply network, defining the data discipline and procedural standardization framework for the future. The existing implementation efforts lack the vision and conceptual unity to foster success. A single, focused and fully empowered organization is required to cut across all the silos of the DoD to provide the essential supply accountability, visibility, tracking, security and timely product delivery to the warfighter.

Gaining commitment from senior leadership is vital to establish the sense of urgency and vision needed to build a governance model with the requisite authority to make change of this magnitude. Therefore, the top priority must be aligning the business environment through establishment of the processes, reporting procedures and functional organizational structure.

We recognize that this integrated logistics initiative is bigger than DoD. The macro view indicates that the U.S. has a window of opportunity to define a new frontier for integrated supply networks. The global supply chain can transition into a fully integrated global strategic supply network. Properly establishing the foundation within DoD will provide common standards, rules, regulations and operating procedures producing naturally forming alliances which are mutually beneficial for industry and our international partners.

10 Recommendations

Our analysis concludes that the following recommendations are necessary to establish a DoD wide logistics supply network:

- Adopt an overarching organizational structure at the DoD level to drive the creation of a fully integrated global strategic supply network. This is critical to our national security strategy. Conceptual unity within the senior leadership of DoD is essential.

- Establish a clear vision of the global integrated supply system, which defines the alignment of the business environment including governance, processes, reporting and structures.
- Having defined the business environment, DoD must then force the integration of the existing ERP programs against the defense standards and processes, while aligning, rationalizing, integrating and improving existing systems.
- Adopt an incremental implementation approach, leveraging all existing technology and processes (ERP, RFID and Security), while remaining focused on the long-term vision and completed to a credible timetable.
- Expect that program completion will take on the order of 10 years. Innovative acquisition implementation processes are required to adequately fund and support a program of this magnitude.
- Continually monitor risks and adjust the plan appropriately.
- The overarching governance mechanisms and program office must monitor, endorse and adjust the plan as required.
- Remain globally focused. This logistics enterprise goes far beyond the DoD, affecting US and international industry and governments.

9 Bibliography

- Accenture. "Accenture - Enterprise Solutions – Increase Process Efficiency and Workforce Productivity by Implementing Enterprise Solutions." Website (http://www.accenture.com/xd/xd.asp?it=enweb&xd=services\enterprise\enterprise_home.xml).
- , "Accenture: Branching Out For Growth." Undated.
- Albright, Brian. Wal-Mart. "DoD Clarify RFID Plans." *Frontline Solutions*. Jan 2004.
- AMSAA. "RFID tag Business Case Analysis Briefing," 9 February 2004.
- Anonymous, *Logistics Management* (2002). Nov 2003.
- Anonymous. "Fact Sheet: Secure Trade in the APEC Region (STAR)." 26 October 2002.
- ARC Advisory Group. "Trade Security: A Wildcard in Supply Chain Management." September 2002. Website (http://www.gtnexus.com/pdf/arc_security_sept2002.pdf).
- Army Regulation 25-2. "Information Assurance." 14 November 2003.
- Banham, Russ. Enterprise Suites. CFO-IT, Winter 2003.
- Bartholomew, Doug. "ERP Learning to be Llean." *Industry Week*, July 2003, Vol 252, No. 7.
- Beauchamp, Roy E., LTG. "AMC: The Army's Logistics Center – Essential in Peace, Indispensable in War." *Army Magazine*, May 2002.
- Bearing Point. "Enterprise Resource Planning." Website (http://www.bearingpoint.com/solutions/enterprise_solutions/erp_solutions.html).
- Bednarz, Ann. "Defense Department Goes on the Offensive with RFID." *Network World*, Framingham. 3 November 2001.
- Bragg, Simon. "Who's Better: SCM Best of Breed or Suites?" *ARC Insights*. ARC Advisory Group. Insight #2003-25E. 25 June 2003.
- Brewin, Bob. "RFID Users Differ on Standards." *Computerworld*. Framingham. 27 October 2003.
- , "Corporate RFID Backers Seek Standard," *Computerworld*, Framingham. 8 December 2003.
- , "UPS Ramps Up Supply Chain RFID to Meet Wal-Mart, Defense Plans." *Computerworld*. Website (<http://www.computerworld.com/mobiletopics/mobile/story/0,10801,88424,00.html>).
- Broughall, Colonel. "ERP Overview and Implementation Strategy Brief." Presented to Col Gary Bliss, Assistant Deputy PEO Aviation. 14 March 2003.
- Cap Gemini Ernst & Young. "Enterprise Application Packages." Website (<http://www.cgey.com/technology/eap/index.shtml>).
- Chief Information Officer (CIO) Council. Version 1.0. "A Practical Guide to Federal Enterprise Architecture." February 2001.
- CIO.COM. "Enterprise Resource Planning." Retrieved on 29 February 29 2004 from (<http://www.cio.com/research/erp/edit/erpbasics.html>)

-----, "Nestle's ERP Odyssey." Retrieved on March 24, 2003 from
<http://www.cio.com/archive/051502/nestle.html?printversion=yes>)

Clinger –Cohen Act of 1996 (formerly, Information technology Management Reform Act [ITMRA]),
 Public Law 104-106. 10 February 1996.

Coker, David, Colonel. "Acquisition Mgmt – A Reality Check." Slide Presentation to ICAF, 12 March 2004.

CSC. "Logistics Modernization Program Brief." Provided By Col (Ret) Sam Chappell. Charts 1-34. 20 March 2003.

-----, "Transform Your Vision into Reality." Website (<http://www.csc.com>) : 4.

Deighton, N. "M2M Sheds Light on the Information Shadows in the Supply Chain." Gartner Research, Inc., Com-19-5172. 16 April 2003.

Deloitte Consulting. Website (http://www.dc.com/Expertise/Services/ent_apps/index.asp).

-----, "Enterprise Applications: A Closer Look." Website
http://www.dc.com/Expertise/Services/ent_apps/closerlook.asp).

Department of Defense. Architecture Framework Working Group. DOD AF. Version 1.0, Volume I. Definitions and Guidelines. 30 August 2003.

Department of Defense. "Business Enterprise Architecture – Logistics (BEA-Log)." Overview and Summary Information. 9 October 2003. Website (<http://www.bea-log.com/av1.cfm>). Note: Web site requires a login.

-----, "Overview and Summary Information AV-1." Version 2. 18 October 2003.

Department of Defense. Business Management Modernization Program. Website
http://www.dod.mil/comptroller/bmmp/pages/govern_org.html).

Department of Defense. C4ISR Architecture Working Group, "DOD C4ISR Architecture Framework, Version 2.0." 18 December 1997.

Department of Defense Directive 8500.1, "Information Assurance." October 2002.

Department of Homeland Security. "Customs and Border Protection." 16 December 2003. Website
<http://www.gao.gov/cgi-bin/getrpt?GAO-04-325T>).

DoD Architecture Working Group. "DoD Architecture Framework, Version 1.0 Volume I: Definitions and Guidelines." Washington, DC: USD(A&T), ASD(NII) and JS/J6. 30 August 2003.

DoD Architecture Working Group. "DoD Architecture Framework, Version 1.0 Volume II: Product Descriptions." Washington, DC: USD(A&T), ASD(NII) and JS/J6. 30 August 2003.

DoD RFID Policy. 2 October 2003.

DoD RFID Policy Update. 20 February 2004.

Drover, K. ICAF Guest speaker from KPMG on May 2003.

EDS. "UGS PLM Solutions." Website
[\(http://www.eds.com/products/plm/teamcenter/engineering/solutions/erp_sap.shtml\)](http://www.eds.com/products/plm/teamcenter/engineering/solutions/erp_sap.shtml) .

"EII LMP Overview Brief." Provided by Col (Ret) Sam Chappell. Charts 1-90. 20 March 2003.

Enterprise Integration Inc. "Single Army Logistics Enterprise." Draft Midterm Report. 14 March 2003.

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

Ewalt, D. "Put the 'AI' in the Supply Chain." *Information Week*. Manhasset. 20 April 2002, Iss. 886.

GAO Report. "Defense Logistics: Preliminary Observations on the Effectiveness of Logistics Activities during Operation Iraqi Freedom." Washington DC. 18 December 2003.

Gartner Research, Inc. "Government Infrastructures and Applications." Research note, 6 October 2003.

-----, "Business Intelligence Infrastructure." *Gartner Research Commentary*. 4 December 2003.

-----, "ERP Market 2003-2007: Adjusting in lean times." 22 September 03.

-----, "Operations ERP Client Issues for 2004." 26 September 2003.

-----, "Predicts 2004:ERP Technology, Functionality, Licensing." SPA-21-5712, 25 November 03.

General Accounting Office. "Defense Logistics: Preliminary Observations on the Effectiveness of Logistics Activities during Operation Iraqi Freedom." Washington DC. 18 December 2003.

Gonsalves, Antone. "Recommendations Come Hard." *Informationweek.com*, 19 January 2004.

Gould, Lawrence S. "Mid-Market Automotive ERP Grows Up." *Bell and Howell Information and Learning*. Ref no. PRD-2085-19. January 2003.

Gupta, Puneet. "Page II: RFID Seems Set to Change the Future of the Supply Chain, Once Privacy and Pricing Issues Are Addressed." *ZDNet Australia*. Website [\(http://www.zdnet.com.au/insight/hardware/0,39023759,39116015,00.htm\)](http://www.zdnet.com.au/insight/hardware/0,39023759,39116015,00.htm) .

Hammonds, T. "EPC No Longer a Fantasy." *Chain Store Age*, Vol. 79: Issue 5. May 2003.

Harris, K. and S. Nelson, "Emerging Technologies Reshape Business Applications," Gartner Research, Inc., SPA-21-6374. 03 December 2003.

Hau L. Lee and Michael Wolfe, "Supply Chain Management Review." 1 January 2003. Website [\(http://www.manufacturing.net\)](http://www.manufacturing.net) .

Hayes. "Hershey's Biggest Treat: No Tricks." *Information Week*: 29 October 2002. Retrieved on 16 March 2004 from Website [\(http://www.informationweek.com/story/TWK20021029S0005\)](http://www.informationweek.com/story/TWK20021029S0005) .

Hitt, Lorin M., D.J. Wu, and Xiaoge Zhou. "Investment in Enterprise Resource Planning: Business Impact and Productivity Measures." *Journal of Management Information Systems*. Summer 2002. Vol. 19, No. 1.

Hoelscher, Roland. "Business intelligence platforms boost ERP." *Financial Executive*. March/April 2002, Vol 18, Issue 2.

Holder, Vice Admiral. J-4, Director of Logistics. "Focused Logistics Campaign Plan." 2003

Holmes, Jeff. President, Government, Aerospace, and Defense, Manugistics Company, Lecture to Industrial College of the Armed Forces, National Defense University. 7 April 2004.

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

IBM Corporation. "IBM ERP Experience: Capabilities and Practices." Undated.

Jacobs & Whybark. "Why ERP? A Primer on SAP Implementation." Irwin McGraw-Hill Boston.

Kern, Paul J., General. "GCSS Acquisition Strategy."

Kilcarr, Sean. "Securing the Supply Chain." 1 August 2002.

Kinikin, Erin and Andrew Bartels. "Enterprise Applications: Even New Architectures May Not Bring Market Back to Life." Giga Research, 26 September 2003.

Kreisher, Otto. "The Key to the Navy's Future." *Seapower*, April 2002.

Limitedbrands, Logistics Services Briefing to Industrial College of the Armed Forces. 19 March 2004.

LMP Team. "Briefing to the Army Logistics Enterprise Integration Advisory Board." 17 November 2004.

Lockheed Martin Systems Integration. "Lockheed Martin to Support Anderson Consulting Defense Supply Chain Modernization Effort." Website (<http://www.lockheedmartin.com/wms>).

Logistics Data Strategy Working Group. "Business Enterprise Architecture – Logistics (BEA-Log) Data Strategy CONOPS." 18 November 2003.

Logistics Modernization Program Pamphlet. "The Future of Objective Force Logistics." 14 March 2003.

Long, Cheu Ruey and K Raguraman. "Security of Air Cargo & Air Supply Chain in the Asia Pacific." Website (http://www.isye.gatech.edu/setra/reports/Cheu_Ragu_7sep03.pdf).

Luire, L. "10 Years Later: A Prognostication Scoreboard Tells Tale." *Automatic I.D. News*, Cleveland: December 1999. Vol. 15, Iss. 13.

McCarthy, J. "Six Technologies That Will Drive Productivity" presentation, Group Director, Forrester Research. Website (<http://www.forrester.com>).

McLaughlin, L. "A Computer That Puts on Your Thinking Cap", *IEEE Intelligent Systems*, Los Alamitos: Nov/Dec 2003, Vol. 18, Iss. 6.

Microsoft. Microsoft SAP case study released June 2002. Retrieved 8 April 2004 from Website (www.Microsoft-sap.com/docs/MSSAPBDMCaseStudy.doc).

Miller, Byron. "The Future States of ERP and its Technology." Giga Information Group, 27 June 2002.

MIT Center for Transportation and Logistics. "Supply Chain Response to Terrorism: Creating Resilient and Secure Supply Chains." *Interim Report of Progress and Learnings*, 8 August 2003.

Murphy, Boren, and Schlarman. "Enterprise Security Architecture." CRC Press: Information Security.

NAVSUP/NAVAIR. "SMART ERP pilot continues." Newsletter – United States Navy Supply Corps, Vol. 65, Washington January/February 2002.

Navy Enterprise Resource Planning (ERP) briefing, dated 22 March 2004.

Newman, Mike. Chartered Institute of Management Accountants. "Perpetrators." *Financial Management*, February 2003.

-----, "Perpetrators." *International Journal of Computer Applications in Technology*, 31 May 03, Vol 17, No 3.

Northrup Grumman Information Technology. "Optimizing Processes, Improving Services." Website (<http://www.it.northrupgrumman.com/home.asp?bid=1662>).

Office of Management and Budget. "Circular A-130: Management of Federal Information Resources." 30 November 2000.

OMB Circular A-130, Management of Federal Information Resources. Revised 30 November 2000.

"Operational Requirements Document (ORD)." Joint Requirements Oversight Council (JROC) approved 22 August 2003.

Peterson, K., D Hope-Ross, J. Woods, and A. White. "Hype Cycle for Supply Chain Management," Gartner Research, Inc., R-20-1111. 6 June 2003.

Peterson, K., M. Jimenez, and A. White. "Options Expand in SCP for Process Manufacturers in 1Q03." Gartner Research. No. M-19-2168. 28 February 2003.

-----, "Discrete Manufacturers Demand More-Robust SCP in 1Q03." Gartner Research. No. M-19-2169. 28 February 2003.

Poropudas, Timo. "RFID Speeds Up Processes." *Nordic Wireless Watch*. 13 March 2004. Website (http://www.nordicwirelesswatch.com/wireless/story.html?story_id=3551).

Project Manager Enterprise Logistics Information Systems (PM ELS). "GCSS Acquisition Strategy." Version 6.1, 22 December 2003.

Rasmussen, Michael. "IT Trends 2004: Operating Systems Security." 18 December 2004.

Richardson, H. "Simplifying Complex Software." *World Trade*, Troy. September, 2003, Vol. 16, Iss. 9.

Roberts, Simon. "ERP Market Full of Eastern Promise." *Frontline Solutions*, Vol 12, No. 7.

SAIC. "ERP Systems Functional Solutions." Website (<http://www.saic.com/enterprise-resource-planning/erp-systems-functional-solutions.html>).

Salloum, H. "Best Business Practices for Securing America's Borders." 23 July 2003.

SAP Customer Workshop. "Microsoft Implementation Guide", section 7.

SAP. "SAP Colgate-Palmolive Case Study." Retrieved on 15 March 2004 from Website (<http://www.sap.com/solutions/scm/customersuccess/casestudies.asp>).

Savi Technology. "Active and Passive RFID: Two Distinct, But Complementary, Technologies for Real-Time Supply Chain Visibility." January 2002. Website (http://www.autoid.org/2002_Documents/sc31_wg4/docs_501-520/520_18000-7_WhitePaper.pdf).

-----, Precision Guided Logistics Brief to Industrial College of the Armed Forces. 9 May 2003.

- Schellenberg, Steve. "Security and the Supply Chain: Is C-TPAT for You?" Website (<http://www.eyefortransport.com>).
- Scotti, Ann. RF-ITV Briefing for MG Stevenson, PE-AIT. 13 Jan 2004.
- Siau, Keng. "Enterprise Resource Planning (ERP) Implementation Methodologies." *Journal of Database Management*. 1 January 2004.
- Smith, Kathy. Special Assistant to the Assistant Deputy Undersecretary of Defense (Supply Chain Management). Interview 23 March 2004.
- Streenstrup, K. et al. "Predicts 2004: ERP Markets and Vendors." Gartner Research, Inc., 21 November 2003.
- Stein, T. "Dell Takes Best-Of-Breed Approach in ERP Strategy (Mutlivendor plan targets specific functionality)." *Information Week Online*. Retrieved 8 April from Website (<http://www.informationweek.com/681/81iuerp.htm>).
- Stenbit, John. Assistant Secretary of Defense. Memorandum: "Global Combat Support System Army (GCSS Army) Acquisition Decision Memorandum." 14 October 2003.
- , Memorandum: "Global Combat Support System Army Blueprint (GCSS Army) Acquisition Decision Memorandum." 16 January 2004.
- StorageSearch. Dell Company Profile press released November 13, 2003. Retrieved 9 April 2004 from Website (<http://www.storageserach.com/dell.html>).
- "Survey Questions return on SAP investments", *Chemical Week*, 23 Apr 2003, Vol. 165, No. 15.
- Tarnowski, J. "Data to Dollars: Progressive Grocer." VNU Business Media Inc., 5 February 2004.
- Tarafdas, Monideepa and Rahul K. Roy. "Analyzing the Adaptation of Enterprise Resource Planning Systems in Indiana Organizations: A Process Framework." *Journal of Global Information Technology Management*. Vol. 6, No. 1.
- TRADOC (AMC). "White Paper – Delivering Material Readiness to the Army." December 2003.
- The Yankee Group. "Speeds, Feeds and Technology Prowess Fail to Impress ERP Buyers." 2004
- The White House. "Progress Report GWOT." 10 September 2003. (<http://www.whitehouse.gov/homeland/progress/>)
- Tyler, Geoff. "ERP Redefines Itself." *Management Services*, October 2002.
- Under Secretary of Defense for Acquisition, Technology, and Logistics Website, (WWW.acq.osd.mil/log/rfid). 9 March 2004.
- US Customs Service. "Customs-Trade Partnership Against Terrorism: C-TPAT Guide." Strategic Solutions Partners LLC. 20 June 2003.
- USD (AT&L) Memorandum. "Radio Frequency Identification (RFID) Policy – Update." 20 Feb 2004.
- Vasilash, G. "Supply Chains Get Smart." *Production*, Cincinnati. December 1995. Vol. 107, Iss. 12.

Vijayan, Jaikumar and Brewin, Bob. "Wal-Mart Backs RFID Technology Will Require Suppliers to Use 'Smart' Tags by 2005." *Computerworld*: 1. Website (<http://www.computerworld.com/softwaretopics/erp/story/0,10801,82155,00.html>).

"Weathering the ERP Storm." *Government Executive*, Washington July 2001.

Website. (http://160.147.166.132/G3/major_programs/lmpdesc.htm) LMP Overview Page.

Website. "[Active and Passive RFID: Two Distinct, But Complementary, Technologies for Real-Time Supply Chain Visibility](http://www.savi.com/solutions/whitepapers.html)." January 2002. (<http://www.savi.com/solutions/whitepapers.html>)

Website. "America's Digital Front Line: Container Security Initiative." (<http://www.customs.gov>)

Website. "APL Logistics, Stronger links: Adding security and value to the supply chain." APL Logistics: 1. (<http://www.aplogistics.com>)

Website. (<http://www.bea-log.com/av1.cfm>).

Website. (<http://www.defenselink.mil/comptroller/bmmp/pages/>).

Website. (http://www.defenselink.mil/comptroller/bmmp/pages/arch_home.html).

Website. "DoD Completes Successful Pilot." *RFID Journal*, 12 March 2004. (<http://www.rfidjournal.com/article/articleview/828/1/8/>).

Website. (<http://www.EPA.com>)

Website. (<http://www.fema.gov/library/>)

Website. "Frequently Asked Questions about RFID." DoD (A&T). (http://www.acq.osd.mil/log/logistics_materiel_readiness/organizations/sci/rfid/assets/FAQ/RFID_FAQ_12.22.03.pdf)

Website. "Frequently Asked Questions." *RFID Journal*, Auto ID Labs, Massachusetts Institute of Technology (<http://www.rfidjournal.com/article/articleview/207>)

Website. "Is Big Brother in Your Grocery Cart?" CASPIAN. (<http://www.nocards.org/>)

Website. (www.oracle.com).

Website. (<http://www.osha.com>)

Website. (www.peoplesoft.com).

Website. "Retail Initiative: Branders Self Service Checkout Counters." Trolley Scan (Ptd) Ltd of South Africa (<http://trolleyscan.co.za/branders2.html>)

Website. "RFID FAQs, Not Fiction." (<http://www.rfid.org>)

Website. (www.sap.com).

Website. "Smart Dust: Mighty Motes for Medicine, Manufacturing, the Military and More." (<http://www.computerworld.com/mobiletopics/mobile/story/0,10801,79572,00.html>)

Website. "The Blocker Tag: Selective Blocking of RFID Tags for Consumer Privacy." RSA Security. (<http://www.rsasecurity.com/rsalabs/staff/bios/ajuels/publications/blocker/blocker.pdf>)

- Website. "The Warrior." Natick US Army Soldier Center Newsletter, August, 2003.
(<http://www.Natick.army.mil/about/pao/pubs/warrior/03/julyaug>)
- Website. "Trolleyponder®/EcoTag® Small and Medium Production Systems." Trolley Scan (Ptd) Ltd of South Africa. 4 Dec 2003 (<http://trolleyscan.co.za/isosys.html>)
- Website. "Typical Applications of Trolleyponder Technology." Trolley Scan (Ptd) Ltd of South Africa
(<http://trolleyscan.co.za/applicat.html>)
- Website. "What is Radio Frequency Identification (RFID)?"
(http://www.aimglobal.org/technologies/rfid/what_is_rfid.htm)
- Website. US Customs & Border Patrol. (<http://www.cbp.gov>)
- Werneke. "Smart Dust." Website (<http://wwwwww-bsac.eees.berkely.edu/warneke/SmartDust>).
- White, A., K. Peterson, and B. Lineureux. "New P2P Solutions Will Provide The B2B Supply Chain." Gartner Research, Inc., Com-19-1316. 1 February 2004.
- Wolfe, Michael. North River Consulting Group. "Freight Transportation Security and Productivity: Complete Report." 5th EU/US Forum on Intermodal Freight Transport. Jacksonville, FL. 11 April 2002.
- Wolfe, Michael and Hau Lee. "Supply Chain Security Without Tears." Website
(<http://www.manufacturing.net>).
- Woods, J., K. Patterson, and C. Hirst. "Research Note: Strategic Planning." Gartner Research, Inc. 30 January 2003.
- Woods, J., K. Peterson, A. White, and M. Jimenez. "Predicts 2004: Supply Chain Management." Gartner Research. No. SPA-21-5211. 26 November 2003.
- Yoshida, Junko. "Euro Bank Notes to Embed RFID Chips by 2005." *EE Times*. 19 December 2001
Website (<http://www.eetimes.com/story/OEG20011219S0016>).
- Zachman, John A. "Security and The Zachman Framework." Zachman International. 11 May 2001.
- Zackheim, Dov S. Memorandum: "Comptroller Certification of the Global Combat Support System Army (GCSS-Army)." Office of the Under Secretary of Defense. 22 January 2004.
- Zrimsek, B. "Predicts 2004: The ERP Life Cycle." Gartner Dataquest, November 21, 2003.

■

11 Endnotes

- ² Chairman of the Joint Chiefs of Staff; “Joint Vision 2020”; 2003
- ³ “Perpetrators”, Mike Newman, Chartered Institute of Management Accountants, Financial Management, Feb 2003, pg. 1
- ⁴ “Operations ERP Client Issues for 2004”, Gartner Inc., 26 Sep 2003, pg 1
- ⁵ Ibid, pg. 6
- ⁶ “Predicts 2004:ERP Technology, Functionality, Licensing”, Gartner Research, SPA-21-5712, 25 Nov 03, pg 3
- ⁷ Homes, Jeff, Manugistics Presentation to ICAF, April 2004
- ⁸ Kinikin, Erin, Andrew Bartels (2003). Enterprise Applications: Even New Architectures May Not Bring Market Back to Life. Giga Research, September 26, 2003, p.5.
- ⁹ Miller, Byron (2002). The Future States of ERP and its Technology. Giga Information Group, June 27, 2002, p.5.
- ¹⁰ Ibid, p. 8.
- ¹¹ Meeting with Peter Coleman of Schwab Soundview, April 15, 2004.
- ¹² Eschinger, Chad; Pranov Kumar, Thomas Topolinski, Dean Lombardo (2003). ERP Market 2003-2007: Adjusting in Lean Times. Gartner Dataquest, September 22, 2003, p.1.
- ¹³ CIO.COM. Enterprise Resource Planning. Retrieved on February 29, 2004 from <http://www.cio.com/research/erp/edit/erpbasics.html>, p.4.
- ¹⁴ CIO.COM. Nestle’s ERP Odyssey. Retrieved on March 24, 2003 from <http://www.cio.com/archive/051502/nestle.html?printversion=yes>, p.7.
- ¹⁵ Ibid, p.2.
- ¹⁶ Zrimsek, B. (2003). Predicts 2004: The ERP Life Cycle. Gartner Dataquest, November 21, 2003, p.1.
- ¹⁷ CIO.COM. Nestle’s ERP Odyssey. Retrieved on March 24, 2003 from <http://www.cio.com/archive/051502/nestle.html?printversion=yes>, p.1.
- ¹⁸ Stein, T. “Dell Takes Best-Of-Breed Approach in ERP Strategy (Mutlivendor plan targets specific functionality).” *Information Week Online*. Retrieved 8 April from Website (<http://www.informationweek.com/681/81iuerp.htm>).
- ¹⁹ Microsoft. Microsoft SAP case study released June 2002. Retrieved 8 April 2004 from Website (www.microsoft-sap.com/docs/MSSAPBDMCaseStudy.doc).
- ²⁰ Caterpillar Provided Briefing and Brochure.
- ²¹ Port of Singapore Authority Provided Briefing.
- ²² Singapore Investment News, “The Road to Success,” New York: NY. 2004, p.15.
- ²³ Ibid, p.14.
- ²⁴ http://www.defenselink.mil/comptroller/bmmp/pages/arch_home.html Overview of the BEA page
- ²⁵ Navy Enterprise Resource Planning (ERP) briefing, dated 22 March 2004.
- ³² Website Trolleyponder®/EcoTag® Small and medium production systems Trolley Scan (Ptd) Ltd of South Africa 4 Dec 2003 (<http://trolleyscan.co.za/isosys.html>)
- ³³ Website Junko Yoshida Euro bank notes to embed RFID chips by 2005 EE Times December 19, 2001 (<http://www.eetimes.com/story/OEG20011219S0016>)
- ³⁴ Website Retail Initiative: Branders self service checkout counters Trolley Scan (Ptd) Ltd of South Africa (<http://trolleyscan.co.za/branders2.html>)
- ³⁵ Ibid.
- ³⁶ Website *Frequently Asked Questions about RFID* DoD (A&T) p.1 http://www.acq.osd.mil/log/logistics_materiel_readiness/organizations/sci/rfid/assets/FAQ/RFID_FAQ_12.22.03.pdf
- ³⁷ Website *DOD Completes Successful Pilot RFID* Journal March 12th, 2004 (<http://www.rfidjournal.com/article/articleview/828/1/8/>)
- ³⁹ “What is Radio Frequency Identification (RFID)?” http://www.aimglobal.org/technologies/rfid/what_is_rfid.htm.

⁴⁰ [RFID FAQs, not Fiction http://www.rfid.org](http://www.rfid.org)

⁴¹ Dod has required all suppliers of government goods to use (passive) RFID tags on cases or pallets. Further, the Dod is also instituting a policy that requires all 20 and 40 foot shipping containers (standard containers for large scale shipments of goods) use active RFID tags. Implementation must be effected by January 2005. The policy follows Wal-Mart's decision in June 2003 to implement a similar policy requiring its top 100 suppliers to use RFID technology by the same end date.

⁴² Website Jaikumar Vijayan and Bob Brewin *Wal-Mart Backs RFID Technology Will Require Suppliers to use 'Smart' Tags by 2005* Computerworld pg 1

(<http://www.computerworld.com/softwaretopics/erp/story/0,10801,82155,00.html>)

⁴³ Smart dust: mighty Motes for medicine, manufacturing, the military and more, found at Internet site, [http:// www.computerworld.com/mobiletopics/mobile/story/0,10801,79572,00.html](http://www.computerworld.com/mobiletopics/mobile/story/0,10801,79572,00.html) on 16 March 2003.

⁴⁴ Werneke, Smart Dust, Internet source, <http://www- bsac.eees.berkely.edu/warneke/SmartDust> sited on 16 March 2003.

⁴⁵ D. Ewalt, "Put the 'AI' in the supply Chain", Information Week, Manhasset: Apr 29,2002, Iss. 886, pg 20.

⁴⁶ Singapore Technologies, Asset Track and Trace Application and Solutions Presentation May 2004, Slide 18

⁵⁸ Under Secretary of Defense for Acquisition, Technology, and Logistics Website, WWW.acq.osd.mil/log/rfid 9 March 2004

⁵⁹ DOD RFID Policy dated 2 October 2003 Pg 1

⁶⁰ Ibid pg 1

⁶¹ Ibid, Attachment 1, pg 1

⁶² Ibid, Attachment 2, pg 1

⁶³ Ibid, pg 1

⁶⁴ Ibid

⁶⁵ Bob Brewin, RFID users differ on standards, Computer World Framingham 27 OCT 2003, pg 1

⁶⁶ Anonymous, Logistics Management (2002), Nov 2003, pg 17

⁶⁷ Bob Brewin, DOD, Corporate RFID Backers Seek Standard, Computerworld, Framing ham 8 Dec 2003, pg 10

⁶⁸ Ann Bednarz, Defense department goes on the offensive with RFID, Network world, Framingham, 3 Nov 2003, pg 10

⁷⁰ [Active and Passive RFID: Two Distinct, But Complementary, Technologies for Real-Time Supply Chain Visibility](http://www.savi.com/solutions/whitepapers.html). January 2002. <http://www.savi.com/solutions/whitepapers.html>.

⁷¹ <http://www.customs.gov> .

⁷² Hau L. Lee and Michael Wolfe, 1 January 2003, Supply Chain Management Review, www.manufacturing.net

⁷³ Schellenberg, Steve. Security and the Supply Chain, Is C-TPAT for you? <http://www.eyefortransport.com>

⁷⁴ Stronger Links: Adding Security and Value to the Supply Chain. www.apl.com.