

Transferring Information Technology to the Defense Industry Supply Chains: The Role of Electronic Commerce Resource Centers

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ABSTRACT

Sixteen Electronic Commerce Resource Centers (ECRCs) have been established across the USA to transfer process improving and enabling electronic commerce technologies to small and medium sized businesses and government agencies. Each ECRC is comprised of university and business partners that manage outreach, training, consultation, and technical support of Department of Defense (DoD) supply chains. The goal of the nation-wide network of centers is to facilitate the transition from paperdependent supply chains to fully electronic-based procurement environments. However, in order for small and medium sized enterprises (SMEs) do business with the U.S. government electronically, the mission of the ECRC must grow beyond training and outreach to include technology testing, research and development, implementation in SMEs, and policy analysis. In this paper, the elaboration of the ECRC model provides a detailed view of the collaboration between industry, academia, and government to improve defense industry supply chains. Further, the ECRC concept is evaluated for broader adaptation to non-defense supply chains.

Keywords : Electronic Commerce, Electronic Commerce Resource Centers (ECRCs), Defense Industry Supply Chains.

INTRODUCTION

The role of Electronic Commerce Resource Centers (ECRCs) in transferring information technology to the defense industry supply chain is important and far-reaching. The importance of the role is shown by describing the means and methods by which the US government adopts technology, by introducing the legislative acts that have caused changes to the supply chain, and by introducing the sponsorship of ECRCs by the Defense Logistic Agency (DLA). The paper describes the nation-wide network of training centers created to assist the transfer of information technology to the defense supply chain. The specific tasks of the ECRC, the course structure, and the organization of the national network are described. Furthermore, details of local ECRC and case examples of its educational outreach are provided. The paper concludes with the description of future directions in electronic commerce education for supply chain management.

IT and Defense Industry Supply Chains

The means and methods by which the United States Government adopts information technology are different from and often slower than the American commercial sector (DoD, 1997a). Whereas U.S. businesses realign management practices, corporate knowledge, and information systems as the result of competitive forces (Davenport and Prusak, 1998), the Department of Defense is unique in the way it restructures the organization. Sullivan

(1996) and Kelly, et al. (1998) write that the DoD proceeds for long periods of time without significant change and strives to keep the organization "as-is." Keeping the organization as-is allows for continuous change at the component level (among the services, the joint chiefs, etc.) but maintains a cold war threat oriented strategy. However, a threat oriented strategy is no longer suitably aligned to trends in modern war fighting. The goal for the military of the future is expanding to missions that include peacekeeping, humanitarian relief, and disaster relief, in addition to providing for the common defense.

The impetus to change the organization, particularly defense industry supply chains, tends to come from outside the organization rather than from within. For example, changes in national resource requirements or in national military strategy will lead to top-down directives from senior DoD leadership or Congress, but often these directives are met with arguments and resistance (Graham, 1998). Even though individuals within the organization may recognize a need to migrate toward a mission-oriented strategy, enterprise-wide changes to information systems and communications infrastructures are not only resisted, but are extremely difficult to manage.

The culture of the Department of Defense is paper-driven, with as many as 13 copies of a contract printed and sent to multiple offices. The Defense Reform Initiative Report (DoD, 1997b) notes that in 1996, the Defense Finance and Accounting Service Center processed over 5.6 million contractor invoices, made

payments against 387,000 major contracts, and disbursed over 84 billion dollars. The paper bound system for the Service Center has generated over 15 miles of paper files and operations have become increasingly costly and difficult. Electronic commerce solutions are the means of

choice to reduce paper in procurement, weapon systems programs, and personnel administration. Implementing these solutions has required numerous laws and legislative acts over the last ten years (Table 1).

Table 1. Government related EC laws and regulations.

Legislation	Intent
Chief Financial Officers (CFO) Act of 1990	A bill to improve the financial management of the Federal Government by establishing a Chief Financial Officer of the United States' within the Office of Management and Budget. Establishes a Chief Financial Officer within each executive department and within each major executive agency and requires the development of systems that provide complete, accurate, and timely reporting of financial information (Public Law 101-576, 1990).
President's "Framework for Electronic Commerce"(1993)	The framework calls for the wide-scale deployment of electronic commerce solutions in government, driven by commercial industry with a minimum of government regulation (Bridges, et al, 1997;Clinton, 1993a). President Clinton said EC "will make our antiquated paper-based procurement system accessible to anybody with a personal computer. It will open up a world of possibilities to small businesses in America and drive down costs to taxpayers." (Clinton,1993b).
Government Performance and Results Act	The Government Performance and Results Act provides for the establishment of strategic planning and performance measurement in the Federal Government (Public Law 103-62, 1993).
Federal Acquisition Streamlining Act of 1994	"A bill to revise and streamline the acquisition laws of the Federal Government." The act established the Federal Acquisition Computer Network (FACNET). FACNET will reduce paperwork through the introduction of EDI processes, provide a single electronic face to industry, and increase interoperability between agencies (Public Law 103-355, 1994; Moeller, et al, 1998).

Paperwork Reduction Act (PRA) of 1995	A bill to further the goals of the Paperwork Reduction Act requires Federal agencies to become more responsible and publicly accountable for reducing the burden of Federal paperwork on the public(Public Law 104-13, 1995).
Clinger-Cohen Act of 1996	A bill to establish the position of Chief Information Officer (CIO) in (IT Management each executive agency to coordinate IT purchases, to increase use of Reform Act) modern information technology, and to perform an annual assessment of information resource management (Public Law 104-106, 1996).
Debt Collection Improvement Act of 1996	Requires the use of Electronic Funds Transfer (EFT) by all Federal government agencies by 1999. EFT should be used to pay and reimburse expenses for all federal employees, to handle all interagency payments, to make payments to state and local governments, and to pay for purchases from the private sector (Gore, 1993; Public Law 104-134, 1996).
Defense Reform Initiative of 1997	The reform initiative mandates paperless contracting process throughout DoD. Electronic links between procurement and payment processes will reduce acquisition cycle times, lower costs, and improve operations. The DoD will define policy, process flows, and technical solutions to facilitate an electronic buyer/supplier interface to exchange procurement and payment information and automate these processes DoD, 1997b).

Government EC Related Laws and Regulations

As a result of mandates and public laws, the Department of Defense has implemented electronic commerce solutions to increase the efficiency of the procurement process. Following legislation in 1990 to establish chief financial officers and financial information systems in each branch of government under the Chief Financial Officers Act (Public Law 101-576, 1990), President Clinton mandated

executive branch agencies and departments to begin using EC/EDI in October 1993 (Clinton, 1993a). Government agencies were also required by law (Government Performance and Results Act of 1993) to develop strategic plans and link performance measures to processes (Public Law 103-62, 1993). Subsequently, a law entitled the Federal Acquisition Streamlining Act of 1994, required the entire Government to begin using electronic data interchange via the Federal Acquisition Computer Network (FACNET). Public Law 104-106

(1996), i.e., the Clinger-Cohen Act of 1996, established the position of Chief Information Officer (CIO) in each executive agency to coordinate IT purchases, to increase use of modern information technology, and to perform an annual assessment of information resource management. Finally, the Defense Reform Initiative (DoD, 1997b) mandated that the best business practices of the private sector must be applied to the business of defense. The highlights of the target practices are:

- By January 2000, all aspects of contracting for major weapons systems will be paper free.
- By the fiscal year 2000; 90% of DoD purchases under \$2500 will be made using an IIvVIPAC purchase card (similar to a credit card) and these purchases will account for almost one half of all DoD purchases.
- The DoD will expand the use of Internet-based electronic catalogs and electronic shopping malls.
- The DoD will create paper free systems for weapons support and logistics and will discontinue printing on paper all regulations and instructions.

IT and the Defense Logistics Agency

The Defense Logistics Agency (DLA) was established in 1961 to provide centralized management of consumable items of supply, manage the federal supply catalog, maintain the DoD industrial plant equipment reserve, and operate the surplus disposal program (DoD, 1997b). The DLA has evolved into a logistics combat support agency with broad complex obligations to the DoD and other

government organizations. The DLA is one of the worlds largest logistics operations covering global military operations and emergency relief. The DLA coordinates the purchase and delivery of equipment, weapon systems, services, and supplies whenever needed, anywhere in the world, at the lowest possible cost. Purchasing is handled by the Defense Contract Management Command and the Defense Logistics Support Command is responsible for materiel management. The DLA maintains five supply centers, one distribution center, three service centers in addition to the two administrative centers. DLA must maintain and manage tiers of centers and activities in a complex supply chain structure and to ensure their efficient, accurate and reliable operations among member organizations.

Most government agencies are expected to conduct 75% to 80% of their purchases using Electronic Commerce/Electronic Data Interchange (EC/EDI) within the next two years (DoD, 1997c) and the

DLA's simplified acquisitions (commodities and services valued under \$ 100,000) will be the first to require that suppliers use EC and EDI. Suppliers unable to use ECBDI will not be able to sell to the DLA. As a result, the newly imposed laws, mandates, and schedules have created a tremendous need for education and training across the defense industry supply chain. The Defense Logistics Agency provides related education and training through two national programs called the Procurement Technical Assistance Centers (PTACs) and Electronic Commerce Resource Centers (ECRCs).

The Procurement Technical Assistance (PTA) Program was established by Congress to assist state and local governments and other nonprofit entities to provide procurement education activities and to help business firms market their goods and/or services to Federal, state and local governments. The role of ECRCs is more focused and assists industrial and government organizations to enter the world of electronic commerce.

ELECTRONIC COMMERCE RESOURCE CENTERS

The Electronic Commerce Resource Centers are a network of technology transfer centers that are sponsored by the Defense Logistics Agency of the U. S. government (Gulledge, Sommer, and Tarimcilar, 1998a). Lammers (1992) notes that prior to 1994, the ECRC network was known as the CALS Shared Resource Center Network and was designed, implemented, and managed by the U. S. Air Force. The ECRC network has grown substantially over the last eight years. Currently, the program is managed by the Defense Logistics Agency and is operated through prime contracts with Concurrent Technologies Corporation (CTC) and CAMP, Inc. (ECRC, 1998).

Since the DoD requires suppliers to use electronic commerce, the program

helps to accelerate the cooperative use of electronic commerce throughout government and industry. The primary goal of the program is to electronically enable the supply chain so that the Department of Defense and other federal organizations can procure the lowest-cost yet the highest-quality goods and services. As stated in the ECRC 1997 Annual Brochure, the program targets small and medium size enterprises that may not have sufficient resources to keep pace with evolving technologies (ECRC, 1998).

The ECRC program is structured as a virtual enterprise with 16 local centers. The local ECRCs serve defense industry contractors and government offices in five regions of the United States. Although each region has a unique mix of suppliers and government agencies operating within its boundaries, a regional model is not used for planning and coordination. Rather, the Defense Logistics Agency manages planning at the national level. Regional analysis is best utilized to describe the relative distribution of defense industry contractors and the regional structure of the defense force logistics infrastructure.

Each local office has developed programs suited to the major clients in the area. The specific tasks of each Center are classified into three categories, i.e., outreach, education and technical support.

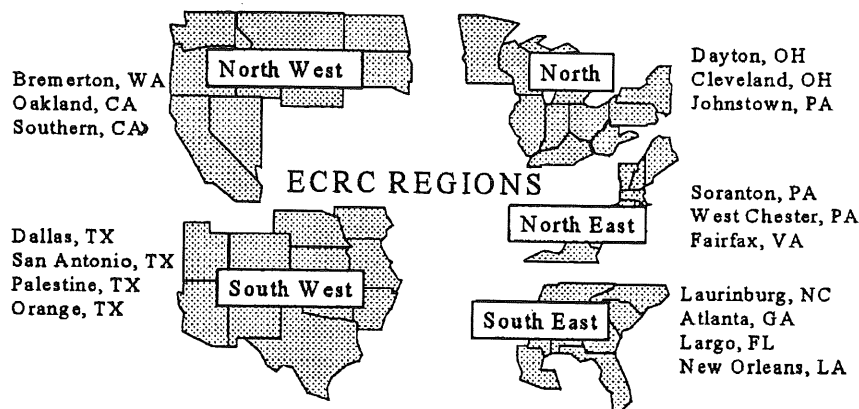


Figure 1. Five ECRC geographical regions and their corresponding centers

Specific ECRC Tasks

An ECRC provides enabling technologies used to improve information technology implementation processes and methods. However, successful technology transfer requires that the clients understand their business, are committed to change, have sufficient leadership, and are financially capable of supporting change. Outreach is a critical step in identifying potential clients that will support fundamental changes in the way they do business. Potential clients are identified at trade shows, regional economic development conferences, and government sponsored events. For each potential client, an initial assessment is made about whether or not to pursue technology transfer. If the assessment is positive, then an initial agreement is signed with the client and training begins. On occasion, clients require more than training and approach the ECRC with specific problem solving requests. The ECRC provides consultation

and will organize specific teams or task forces to assess the problem and develop an implementation plan. The three primary tasks of the ECRCs are detailed below:

1. Outreach - Outreach promotes recognition of the center and identifies potential clients. Each ECRC provides seminars that promote the functions and services offered coordinates outreach efforts at trade shows and occasionally at client sites. Outreach is an educational effort as well, providing information about the latest electronic commerce technologies, federal government laws, policies and programs.
2. Education and Training - The goal of education and training is to provide a basic level of knowledge about the EC technical domain. Clients travel to the ECRCs and attend classes where formal course materials are presented in a multi-media environment. The class participants are drawn from business, government and the military and may

attend classes in mixed groups or separately if requested. Classes are intended to inform, increase knowledge, and provide direction but not on an informal or casual level. Students are expected to participate in class discussions and to seek additional information that will enable the implementation of EC/EDI in their organization. If the information needs are significant, then the client is requested to apply for project status.

3. Technical Support and Consultation - The ECRCs are committed to providing technical information and assistance in response to specific questions and requests for help. Each client comes to the center with unique problems and difficulties in implementing EC/EDI technologies. Thus, consultation is provided on a one-to-one basis if the efforts will enhance implementation of the EC technology. Consultation cannot be used as a substitute for dedicated in-house efforts to apply a working solution, which are also provided by the ECRCs in the form of in-depth technical support.

Courses taught at the ECRCs are divided into two groups. The first group consists of the standard offering provided by every local ECRC. These courses are planned, coordinated, and administered by the education and training working group. The second group consists of specialized courses adapted by local ECRCs to match the needs of their clients. Each of the sixteen local ECRCs is free to adapt the standard courses to the local environment or to develop new and

specialized courses.

Sixty-four percent of the official courses offered fall into the categories of electronic commerce and electronic data interchange (Figure 2). Electronic commerce courses (10 courses, 40% of the curriculum) hold the largest share of the official curriculum and the next largest segment consists of electronic data interchange courses (6 courses, 24%). The official electronic commerce course listing covers topics such as getting started with electronic commerce, EC hardware and software, EC for government workers, the internet as a business platform, marketing on the internet, internet business operations, HTML, internet security, and the use of E-mails.

The official electronic data interchange courses cover topics such as EDI orientation, issues in EDI implementation, business opportunities with the DoD, EDI software, and EDI ANSI maps. The official business process courses cover business needs analysis, concurrent engineering, and data management. The official technical data exchange courses focus on CALS and integrated manufacturing.

At least half of the official courses have been adapted to meet local requirements. The courses most frequently adapted to local needs are the basic and introductory level EDI and EC courses. Since each region of the country tends to have different groupings of defense contractors, suppliers, defense industries, and military specialties, the application examples are changed to suit the target audiences. The most common changes to

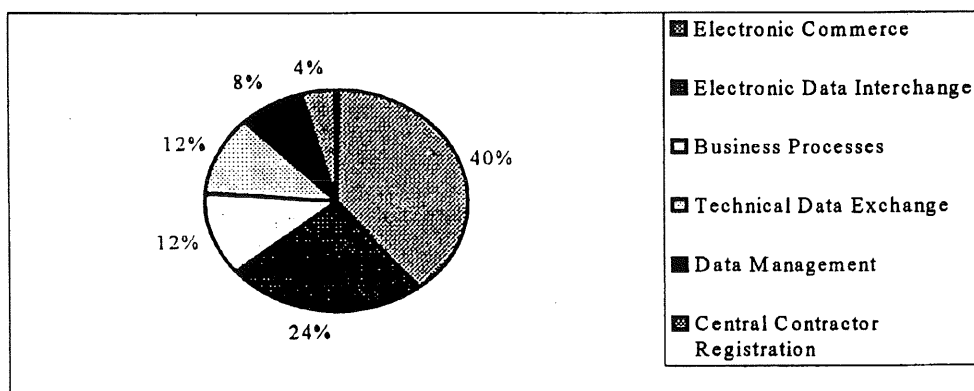


Figure 2. Education and training working group of official course categories

course content concern differences in business opportunities and the differences in clients across regions. Centers also develop courses that reflect the specialties of their teams (e.g., information security) or demonstrate real world applications of and solutions derived from technical support projects.

Linking the Regional Sites

Regional ECRCs, government agencies, and industry identify, evaluate, demonstrate, validate, and transfer electronic commerce technology solutions to industry partners. E-Link is the web-based site that provides members of the ECRC program a central repository of files (lecture notes), activity schedules and communications tools such as threaded messages. The site contains URLs, class materials, minutes and agendas, case studies, success stories, news of upcoming events. The site is the official program distribution site and posting board for related technology to be shared and disseminated among local ECRCs and to

their SME customers (Figure 3).

Fairfax ECRC

This section provides additional background on the ECRC organizational model by providing detailed information about a local ECRC. The Fairfax Electronic Commerce Resource Center (ECRC) is operated by Dimensions International (DI) with The Institute of Public Policy (TIPP) at George Mason University and Iris, LLC. The Fairfax ECRC provides practical solutions for small- and medium-sized businesses transitioning to EC technologies. The companies range from very small start up companies, to state-of the-art high technology firms and major ship-building facilities supplied by more than 24,000 vendors. The technical staff of the center helps SMEs assess their EC requirements, develop transition plans, evaluate EC product and service decisions, train in-house and trading partner staff, and implement EC solutions. Specific areas of Fairfax ECRC expertise include requirements definition modeling and implementation

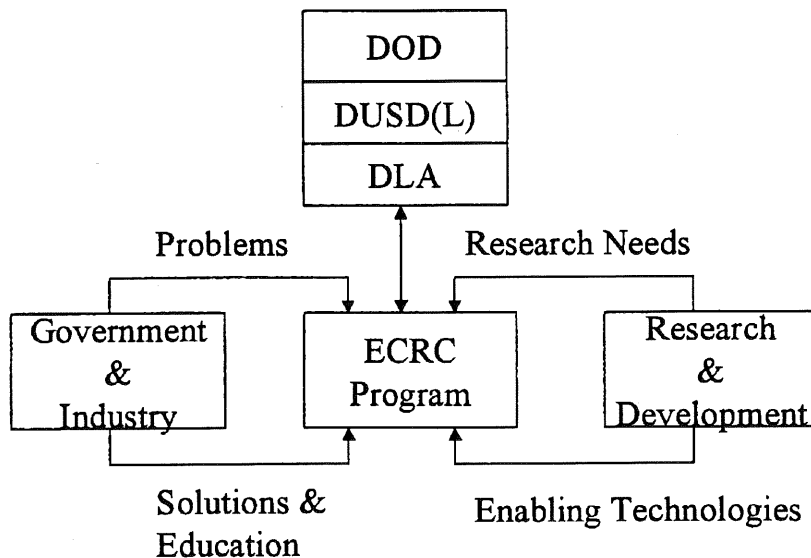


Figure 3. The linkage among nation-wide ECRC's (ECRC, 1998)

planning, Internet-enabled Electronic Commerce, information technology for integrated Electronic Commerce, enterprise resource planning and supply chain integration, and process costing and business case development. Other individual ECRCs have related capabilities in other areas, including computer aided design, metal working, and automated business processes.

CASE DISCUSSIONS FROM THE FAIRFAX ECRC

Two cases are presented to illustrate how electronic commerce is applied in the defense supply chain and how the ECRC provides the training and technology necessary for the transition. The first case describes a success story at a smaller enterprise that provides consulting

services. The second case describes a more involved and ongoing effort with Newport News Shipbuilding, a major supplier of U. S. aircraft carriers and submarines.

Small and Medium Size Enterprises (ECRC, 1998)

O-TECH International approached the Fairfax ECRC with the opinion that an open and flexible information technology infrastructure establishes a powerful base for electronic commerce and EDI technologies. The director of O-TECH believed that by designing such a system, the company could grow and adapt to technological changes over the long term. O-TECH turned to the Fairfax ECRC for guidance in planning its electronic commerce infrastructure from the ground up.

O-TECH is a McLean Virginia company providing consulting services to government clients. The Fairfax ECRC

presented a systems configuration management model as an infrastructure blueprint for O-TECH to build its network hardware and software base. The blueprint provided a means for the company to implement electronic commerce and EDI solutions. The plan supplied local- and wide-area network (LAN/WAN) requirements, configuration and management guidelines, maintenance procedures, planning and layout of facilities, outage prevention, backup and restoration, and problem reporting and resolution.

O-TECH required that the LAN/WAN configuration be flexible enough to grow as the business needs of its clients changed. For example, as Internet services and capabilities increase, the LAN must be able to adapt to take full advantage of those services. As a result, the Fairfax ECRC recommended an open system architecture that conforms to accepted standards and is compliant with current and projected DOD requirements. O-TECH is now doing business electronically with the federal government and reports a reduction in overhead costs, improved turnover time for mailings, paper publishing, presentations, and specialized billing.

Shipbuilding Supply Chains - Newport News Shipbuilding (NNS) (Gulledge, et al, 1998)

The objective of this ongoing project is to assist a DoD shipbuilding prime contractor and its suppliers in implementing VAN-based Electronic Data Interchange (EDI) for their electronic commerce (EC) implementation. The

project deliverables were implemented in several stages. First, training sessions were conducted to promote supplier awareness of VAN-based EDI implementation issues. In this task, 45% of the top 1,000 suppliers that account for more than 50% of the total purchase order (PO) volume attended the training sessions. The second step of the project offered technical support to those suppliers needing further assistance in EDI implementation. The third project task established an effective evaluation criteria for the entire EC/EDI endeavor that considered all aspects of training, outreach, and technical support.

The evaluation criteria used are supplier coverage, understanding the SME, efficacy of training, and integration of EC objectives. Since the suppliers in the chain have a wide range of characteristics and concerns, it is critically important to understand what they need, what they can afford, and what they are capable of accomplishing. A follow-up survey is sent after the training sessions to evaluate the efficacy of the training. After all, the center wishes to accumulate both knowledge and a customer base through its case study endeavors. This case has helped the center gain access to a large number of SMEs that are critical links in U.S. shipbuilding supply chain. Through continued analysis of their needs, the center gains a better understanding of the needs, capabilities and decision patterns of SME's as well as the general knowledge of how to improve the supply chain via EC/EDI implementation.

EC FOR SUPPLY CHAIN MANAGEMENT

Electronic Commerce (according to the official DoD definition) is the paperless exchange of business information using Electronic Data Interchange (EDI), electronic mail, computer bulletin boards, FAX, Electronic Funds Transfer (EFT), and other similar technologies (DoD, 1997c)

Electronic Data Interchange (EDI) is the computer-to-computer exchange of business information using an agreed-upon standard. EDI is one supporting Electronic Commerce mechanism because it enables businesses to exchange business information electronically much faster, cheaper and more accurately than is possible using paper-based systems.

Supply Chain Management

A supply chain is a collection of inter-related activities that must be executed among business entities to accomplish a business objective, e.g., the fulfillment of orders made by customers on time with satisfactory quality. Using retail supply chains as an example, consumers order goods from a retailer that must work with its under-links to ensure sufficient quantity and variety of goods at the store to satisfy the customers' demands. Thus, a retailer must work closely with its suppliers, which in turn work with other component suppliers and manufacturers to ensure the delivery of goods. These inter-related activities are performed by retailers, distributors, manufacturers and even

raw material providers, which form a multi-tier of supply chain systems to fulfill end-customers' orders (Kalakota and Whinston, 1997).

Supply chain management (SCM) is the general concept of coordinating and administering the order generation, order taking, production and order fulfillment/distribution of goods, services, or information as described by Kalakota and Whinston (1997). As the business world becomes more complex and competitive, the research and development (R&D) in making one's SCM efficient, accurate and reliable represents a significant effort in enterprise reform and business process re-engineering.

A typical supply chain infrastructure consists of three basic flows. Within the DoD there are physical flows, information flows, and financial flows. These flows encompass commercial suppliers, DoD procurement and logistics officials, and DoD end users (Bridges, et al, 1997).

- The physical flow is the flow of goods and services through various tiers of the supply chain from raw materials, components, or end products to the end customers. This aspect of SCM includes inventory management, distribution, and transportation.
- The information flow consists of the transmission and exchange of information regarding products, orders and related activities. The business transactions include purchase orders, bills of lading, tracking, receipt acknowledgments, invoices, etc.
- The financial flow deals with the payment and collection of funds

incurred due to business transactions. The monetary transactions are initiated by the acknowledgment of good/service delivery and receipt through the information flow.

Electronic Commerce (EC) focuses on making the information flow more efficient among supply chain business entities to improve the efficiency of the physical and financial flows. The efficiency can be gained by improving business processes and reducing communication speeds electronically. This will result in quality goods delivered on time and more business accomplished with limited resources. The EC functions can be classified into three main activities (Bridges, et al, 1997); i.e., accelerating business communications, facilitating transactions of goods/funds and integrating logistics information into the key processes. These activities serve as the baseline for the mapping of EC benchmarks to the DoD's SCM strategy.

TRENDS AND DIRECTIONS

This paper focuses on the background, the concept, and the execution of ECRC support processes.

The primary objective of the ECRCs is to help the U.S. government, particularly the DoD, become lean, efficient and effective through its business practices within a complex supply chain structure. After eight years of collective effort, most of the first tier (90%) and some second tier (50%) DoD suppliers have successfully complied with government-regulated

EC/EDI practice. However, there is still long way to go before true EC/EDI implementation through out the supply chain takes place. This is to say that SMEs are still far from the realization of electronic commerce in comparison to their upper tier partners. The future direction for ECRCs requires a higher-degree of EC/EDI implementation in the supply chain system and will necessitate extensive outreach to the SME's. Extensive outreach will promote the common interests of the SME's and assist their compliance with DoD EC/EDI practices. The specific guidelines will require international extension, business-to-business EC, and Web-based EC/EDI.

International and Private SME Extension

The most critical ECRC mission is to work from the SME's perspective and to serve the SME's best interests in developing an EC capability for conducting business with their partners (e.g., suppliers, DoD and other customers). This objective via the DoD initiative intends to improve the competitive edge of the government by helping SMEs succeed domestically and globally. Therefore, the goal must be established from the perspective of an international business. Businesses succeed not only by doing business with government but also by competing in the global market place. Thus all ECRCs should focus more on introducing efficient commercial standard solutions and not the proprietary, expensive and

Business to Business EC

According to a recent EC study, the

majority of business transactions are between businesses, and a much smaller proportion of the transactions are conducted between businesses and end-users (business to-consumer EC). Thus, the ECRC functions in education, training and technical support must focus on providing solutions that will result in the development of business-to-business EC.

Historically, business practices target the vertical integration of activities within a single functional domain and result in the creation of "stovepipes" (Gulledge, Sommer and Tarimcilar, 1998b). Stovepipes create barriers that limit the sharing of information and necessitate the duplication of data and information systems. A successful EC implementation takes horizontal integration into consideration where business processes' cross functional or departmental boundaries. The result is the design and development of information systems that follow the most efficient and effective process flows to achieve true electronic commerce with enterprise integration (Kirchmer, 1998).

Web-based EC/EDI

The Internet is progressively becoming

the standard interface and connection mechanism for users, in both industrial and consumer markets. The ECRCs should follow the commercial trend in promoting internet-based (and web-based) EC/EDI solutions so that the very same technology transferred to SME's can be applied across many application-domains. Off the-shelf solutions can be acquired readily with affordable costs and can be implemented by all members of the supply chain - not just the largest players.

CONCLUSIONS

The question remains whether ECRC's designed and dedicated to enhance the U.S. defense supply chain are applicable to smaller economic regions such as Taiwan. Judging from the nature and characteristics of defense industries in both places (Table 2), the solutions may not be suitable via a simple scale-down approach. However, some of the ECRC concepts and methodologies can be applied directly to industries with global supply chains, such as the electronics industry. The reason the ECRC model applies so well to this sector is that the electronics

Table 2. Different characteristics between U. S. defense industry and the defense industry in a smaller economic region

U. S. Defense Industry	Defense Industry of Smaller Nations
Global market	Local market
Larger scale, weapon systems production	Small batch part/component production
Suppliers dedicated to the defense sector	Suppliers manufacturing for both defense and non-defense sectors
Large supply chain network	Smaller supply chain network

industry has a fairly large supply chain network that requires efficient and effective logistic management. The second reason is that time to market and rapid product obsolescence make business EC (B2B EC) a fundamental requirement for competitive advantage. Finally, the electronics industry is the sector most knowledgeable of and most willing to accept IT applications such as B2B EC.

The U. S. is unique in the development of an information infrastructure based on defense technology and funding. Other nations that want to implement EC/EDI face the formation of an information infrastructure without the lead of their defense industries. National strategies for development become increasingly critical (Wong, 1998) as does the leadership of government, the private sector, and universities to address new problems. The literature targets several new areas of research for the successful deployment of EC/EDI:

- Research is needed to forecast the needs of a national ECBDI network and its hardware and software components.
- Commercial enterprises, government agencies and research institutes need to access placement of key ECIEDI gateways and connections (Jo, Pottmyer and Fetzner, 1995).
- Internet Commerce, as it spans international boundary, is re-defining the fundamental definition of money. Will businesses be willing to accept EC/EDI as a new medium of exchange and will companies be willing to restructure business processes to insure privacy, reliability and security (Camp and Sirbu, 1997; Yam, 1998)?
- What effect will ECIEDI have on market channel relationships and will these effects stimulate or hinder economic development (Vijayasarathy and Robey, 1997)?
- The reach of electronic document interchange needs to be broadened so that every company can become a trading partner. The challenges that lay ahead include enabling firms to use EDI and provide more channels for trade on the Internet and not only through VANs (Senn, 1998).
- What are the legal issues of EC/EDI and what new legislation is needed to make local EC laws and regulations internationally compatible (Chen, 1997)?

The development of electronic commerce in the United States has been a long and expensive struggle involving lawmakers, soldiers, business leaders, and academics. The U.S. ECRC efforts and their results are certainly invaluable to other economies that can learn from the positive outcomes and avoid the pitfalls inherent to emerging technology.

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