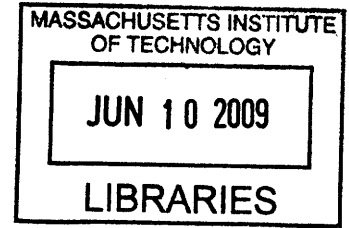


EVOLVING A GLOBAL ARMAMENTS LOGISTICS STRATEGY

By

Nathan Peck

Bachelor of Industrial Engineering, 1999
Georgia Institute of Technology



Submitted to the MIT Sloan School of Management and the Department of Civil and Environmental Engineering in Partial Fulfillment of the Requirements for the Degrees of

Master of Business Administration
and
Master of Science in Civil and Environmental Engineering

ARCHIVES

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ABSTRACT

Few companies globally source and manage commercial transportation for frequent and high volumes of explosive cargo for the U. S. Department of Defense. U.S. regulations are strict and economically competitive options are limited. The challenge is even more problematic when the company has not developed an internal capability to efficiently manage logistics transportation.

Companies view logistics and supply chain management as crucial to their overall success, though most do not claim it as a core competency. Instead, companies often outsource logistics operations and management to 3rd Party Logistics and other transportation solution providers.

This paper explores how a company dealing with frequent shipments of explosive, Department of Defense cargo need not fully outsource logistics operations and management. Rather this paper shows how a company can quickly and cost-effectively improve their internal logistics capability while utilizing the benefits of logistics outsourcing. It is imperative that a company evolving its logistics capability maintain flexibility yet realize the advances in the transportation outsourcing industry.

This research is distinctive in that it provides a case study of an organization that utilizes global partners supplying the U.S. Government in substantial volumes and must operate within the confines of hazardous goods regulations and archaic United States Department of Defense shipping regulations.

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This thesis is dedicated to my wife Allison and sons, Matthew and Davis. Allison, I can never repay you for the sacrifices you have made and I know our relationship and faith have become stronger through this experience. Boys, I hope you are able to recall our great adventures and risks during this time and live with that spirit during the remainder of your lives.

"I can do all things through Christ, who strengthens me."

Philippians 4:13

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GLOSSARY

3PL: 3rd Party Logistics

AOD: Active On-Demand[®]

AS: Armament Solutions

Class 1: Explosive cargo

DFARS: Defense Federal Acquisition Regulations Supplements

DoD: Department of Defense

FAR: Federal Acquisition Regulations

Hazmat: Hazardous materials

IATA: International Air Transportation Association

MARAD: Maritime Administration

MSP: Maritime Security Program

OHMS: Office of Hazardous Materials Safety

PDS: Principle Defense Supply

PDS-L: Principle Defense Supply's Logistics

SDDC: Surface Deployment Distribution Command

SWOT: Strengths, Weaknesses, Opportunities and Threats Analysis

TEU: Ton Equivalent Units

TMS: Transportation Management Systems

USG: United States Government

USTRANSCOM : United States Transportation Command

VISA: Voluntary Intermodal Sealift Agreement

1 Introduction

1.1 Company Background

Principle Defense Supply (PDS), for over 30 years, has been a leader in the production of armaments and program management for the U.S. Government (USG). The company has revenues of half a billion dollars and employs around 300 people. PDS is a business division within a large multi-billion dollar conglomerate company called Armament Solutions (AS).

All company names have been disguised in this paper.

1.2 Problem Statement

Recent program contracts awarded to PDS by the Department of Defense (DoD) have grown in logistics and supply chain complexity. Early programs had only required staffing a small logistics team, as the logistics network had few transactions and was confined to the continental United States. The newer, high-volume programs have necessitated creating an international network of suppliers to meet demand volumes. More than half of the finished goods assembly occurs internationally. Some of these programs require monthly deliveries of millions of units of explosive cargo to U.S. military depots.

Raw materials are still procured from domestic U.S. suppliers but are then transported by air or ocean to global suppliers for final transformation. Figure 1 shows the transportation of goods from the raw material providers to the finished good assemblers and then the transportation of finished goods back to USG depots. The USG expects PDS to manage and oversee all to/from cargo transportation, using commercial vessels, when international shipping is required.

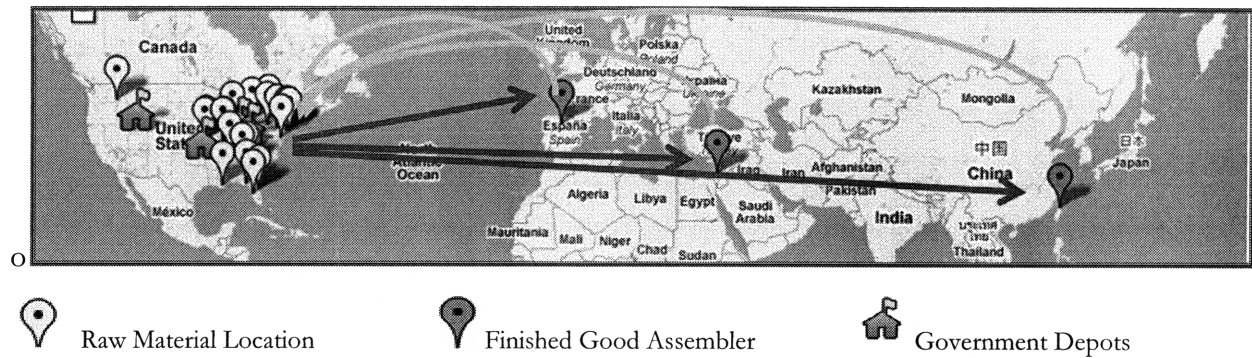


Figure 1: Sample Logistics Network

Adding to the complexity of PDS managing monthly transportation are:

1. An existing contractual agreement with a logistics transportation broker who lacks breadth and resources to support the complexity of high volume international shipping
2. A U.S. legal requirement to ship finished product on U.S.-Flag vessels
3. Non-availability of liner service meeting the necessary legal requirements in international locations either due to non-service or certain ports-of-call not accepting explosive class 1 cargo
4. Hesitancy or rejection by certain ocean liner carriers to transport class 1 cargo

PDS's primary transportation mode previously had been domestic trucking but had transitioned to international ocean shipping as shown in Figures 2 and 3. PDS's small logistics team (PDS-L), with experience supporting a simple transportation network of domestic trucking shipments, was overwhelmed with the complexity of managing a global network. The manpower, tools and capability of the logistics team were underestimated in supporting the more complex programs. Pressure grew on the team to execute high volume, international transactions as well as support new bids without an infusion of people and resources:

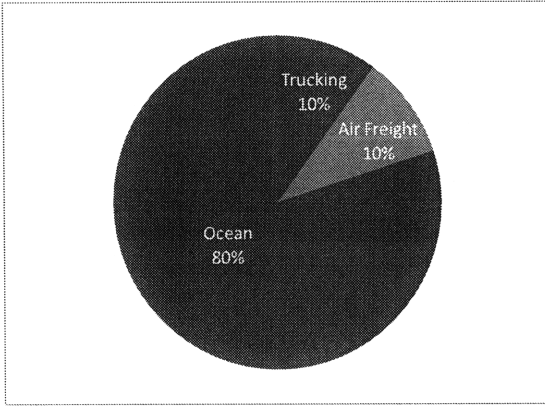


Figure 2: PDS 2007 Transportation Spending By Mode

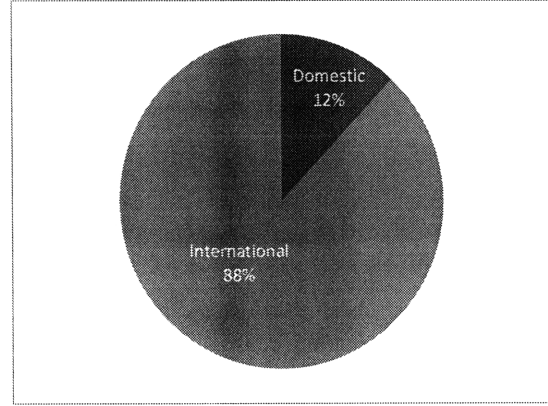


Figure 3: PDS 2007 Transportation Spending By Region

PDS-L entered into a promising new partnership with a freight forwarder, yet this partner was not able to provide complete solutions. PDS-L continued to do much of the work of arranging transportation, completing import/export documents, auditing invoices, providing customer status updates, and consequently fell behind in meeting internal expectations. The PDS-L team struggled with finding reliable solutions for economically feasible shipments to and from the international suppliers. As much of the PDS cargo was explosive in nature, shippers would often prioritize easier-to-handle cargo over PDS's.

PDS-L performed to the best of their abilities to manage all of the shipments workload, but major opportunities became apparent:

1. Need to re-establish matrix structure. PDS was governed by a matrix organizational structure. The PDS-L team was tasked with supporting logistics for all PDS programs but had become unable to provide attention and transportation expertise to less critical PDS programs. These ignored programs went outside of the PDS-L team and handled their own transportation decisions with less experienced personnel and without a holistic view of the entire PDS organization. Many of these transportation decisions weren't efficient and cost effective for PDS.

2. Need for metrics to better understand operational execution, improvement opportunities and drive accountability. PDS-L captured forecasted shipment costs vs. actual costs, but no other transportation and visibility metrics were captured.
3. Tools and resources for driving metrics. PDS had very crude and antiquated systems for automatically capturing data, making data capture very difficult.
4. Process thinking and benchmarking. The team had not thought about processes to simplify their work nor had they reached out to teams and organizations externally for best practices that could have improved execution.

PDS had never made logistics a priority, but the performance and execution of the support function had become highly visible as it had major implications on the financial and operational performance of multiple programs. One program in particular had exposed the opportunities in logistics management. The program had exceeded budget by more than 50% and delivery schedules had been renegotiated numerous times to compensate for previously missed schedules. Several months of finished goods were awaiting pickup at the finished goods supplier, prompting receivables and security concerns. In response, other PDS programs had taken logistics into their own hands and missed transportation cost savings opportunities of 20%. Obvious process improvements were missed. PDS executives were frustrated with the responsiveness of the team. Action had to be taken to improve the PDS-L team's performance for current programs and future programs.

1.3 Problem Approach

Addressing the problem is broken into two distinct tasks:

1. Strategies to assist with complexities in shipping high volumes of explosive cargo subject to U.S.-Flag vessel constraints

2. Strategies to improve the daily execution of the PDS logistics team

1.4 Key Ideas/Hypothesis

Based on the challenges facing the organization and the fact that PDS does not desire to be a logistics provider, PDS should outsource the entire logistics operation to an experienced 3PL which can manage the challenges more efficiently.

1.5 Statement of Thesis Contributions

This research is distinctive in that it provides a case study of an organization that utilizes global partners supplying the U.S. Government in substantial volumes and still must operate within the confines of hazardous goods regulations and archaic United States Department of Defense shipping regulations.

1.6 Thesis Overview

This document provides a short literature review detailing DoD commercial ocean shipping and regulations, more details on the research, analysis and observations conducted onsite, and conclusions and recommendations based on the research and observations.

2 Literature Review

2.1 Ocean Shipping Industry

This section details the ocean shipping industry, organizations that govern the industry and some events that have shaped PDS's challenges.

As shown in Figures 2 and 3, containership ocean shipping accounts for 80% of the shipping mode by the PDS-L team. Cargo is typically priced by and shipped in 20 or 40 ton equivalent unit (TEU) containers. Containers have to be ammo grade certified¹ by the U.S. Coast Guard. Many times PDS-L was responsible for arranging labor for packing containers, adding to the per TEU costs.

Similar to air travel, liner and charter service exists for containerships. Liner service makes regular scheduled voyages on a set route trading on a timetable. Some of the largest containership liner operators include Maersk, Evergreen, COSCO, Hapaq-Lloyd and APL². Liner service benefits from economies of scale and frequently is less expensive than charter service based on economies of scale. Charter service tends to be operated by smaller enterprises and used for unique cargo, infrequent service and service between less trafficked ports-of-call. Most of the time charters are the option of last resort for transporting hazardous cargo; this was the case with PDS.

The Maritime Administration (MARAD) is the agency within the U.S. Department of Transportation dealing with waterborne transportation. The agency works in many areas involving ships and shipping, shipbuilding, port operations, vessel operations, national security, environment, and safety and is also charged with maintaining the health of the merchant marine. MARAD also maintains a fleet of cargo ships in reserve to provide surge sealift during war and national

¹ Per DoD Handbook document MIL-HDBK-138B

² (Burnson, Ocean Carriers: 50 players to watch, 2008)

emergencies and recently realigned many of its functions to revitalize its role as an industry facilitator³. PDS-L maintains regular communication with MARAD on the availability of U.S.-Flag vessels.

2.2 Department of Defense and Explosives Cargo Transportation

This section details the organizations and standards governing the transportation of Department of Defense and explosives cargo.

The United States Transportation Command (USTRANSCOM) through the Military Sealift Command (MSC) is the single entity to direct and supervise execution of the strategic distribution system and oversees all DoD shipments through the world. MSC provides sealift with a fleet of government-owned and chartered U.S.-flagged ships, executed through the VISA program⁴, which is described in section 2.3. PDS-L personnel inferred that USTRANSCOM vessels were restricted to U.S. military business and not to be used by commercial entities (such as PDS), regardless of the cargos end use or destination.

The Surface Deployment Distribution Command (SDDC) acts as a liaison between government shippers and commercial carriers. SDDC is responsible for the establishment and maintenance of contracts, solicitations and agreements with the carrier industry to deploy and distribute Department of Defense supplies, personal property and personnel worldwide. Additionally, SDDC maintains contracts with information technology firms to assist in the development of software applications to manage transportation movements⁵. Trucking companies that want to move DoD cargo have to be certified by SDDC and conform to regulations such as tag team drivers and satellite tracking. PDS

³ (Maritime Administration)

⁴ (United States Transportation Command, 2007)

⁵ (United States Transportation Command, 2007)

did not deal directly with SDDC, but they had to ensure that cargo transported conformed to their guidelines.

Class 1, which denotes any explosive cargo, is divided into hazard divisions and compatibility groups. The Office of Hazardous Materials Safety (OHMS) is the Federal safety authority for ensuring the safe transport of hazardous materials (hazmat) by air, rail, highway, and water, with the exception of bulk transportation of hazmat by vessel. OHMS also works with other DOT operating administrations to help them administer hazmat safety programs effectively⁶.

Some of OHMS responsibilities include:

- Evaluating safety risks
- Developing and enforcing standards for transporting hazardous materials
- Educating shippers and carriers
- Investigating hazmat incidents and failures
- Conducting research

OHMS, in conjunction with the IATA⁷, United Nations Committee of Experts on the Transport of Dangerous Goods and other standards bodies, developed guidelines and rules for how shippers handle class 1 cargo. PDS's cargo tends to fall within the C, D & S compatibility groups of Exhibit 1, located in the Appendix. Exhibits 2 and 3, also located in the Appendix, highlight the complexities in loading class 1 cargo on vessels and how it is important to keep different compatibility groups separated from each other. The complexities and risks in carrying class 1 cargo drove some ocean carriers to refuse all such cargo, further reducing PDS-L's capacity and reliability in meeting schedules.

⁶ (The Pipeline and Hazardous Material Safety Administration Office of Hazardous Materials Safety)

⁷ International Air Transportation Association

2.3 U.S. Cargo Act and U.S.-Flag Regulations

This section details the USG regulations that PDS is governed by relating to shipping Department of Defense cargo.

The Military Cargo Preference Act of 1904, as revised and implemented into Defense Federal Acquisition Regulation Supplements (DFARS), requires that 100% of items procured for or owned by U.S. military departments and defense agencies be carried exclusively on U.S.-Flag vessels unless one of the following occurs:

1. No vessel is available (Reasonable Availability)
2. The proposed charges are higher than charges to private persons for the transportation of like goods (Reasonable Cost)
3. The proposed freight charges are excessive or unreasonable, as determined by the Secretary of the Navy or Army who has been delegated such authority by the President of the United States.

A waiver process exists for an entity to petition to move cargo on non U.S.-Flag vessels. The U.S. Government must be given 45 days to approve or deny the waiver according to the DFARS 252.247-7023.⁸

A U.S.-Flag vessel is owned and crewed by American citizens and subject to higher regulatory, safety, tax, and labor requirements than their global competitors.⁹ On average U.S.-Flag vessels are 38% more expensive to operate¹⁰, therefore the demand shifted from U.S.-Flag vessels to non U.S.-

⁸ Department of Defense Federal Acquisition Regulation located at <http://farsite.hill.af.mil/VFDFARA.HTM>

⁹ (Harrelson, 2008)

¹⁰ Reeve & Associates report p. 18

Flag vessels. U.S.-Flag vessels now only encompass 2% of the overall world oceangoing containership fleet¹¹.

During the 1990-1991 Persian Gulf Conflict, the U.S. Military was forced to contract a high percentage of non U.S.-Flag vessels to maintain supplies to the effort. In response to this event and to preserve a U.S.-Flag fleet and enable flexibility to the USG, a program was created in 1996 and renewed in 2003 called the Maritime Security Program (MSP) and Voluntary Intermodal Sealift Agreement (VISA) to build up a ready reserve of U.S.-Flag capacity. The MSP program subsidizes 40 of 75 useful U.S.-Flag containerships¹².

The MSP/VISA program subsidizes commercial cargo ocean carriers through an annual payment of \$2.9 million per vehicle¹³. In return, the U.S. Military has priority access to the commercial U.S.-Flag vessels and associated intermodal network. The benefits of the MSP program to the U.S. Government are tremendous. It is estimated that the USG maintaining their own fleet would cost around \$1.7 billion annually. The same study estimates that \$140.4 million was paid in subsidies, a tremendous value proposition to the USG¹⁴.

The study also highlights how the subsidy is hardly enough to support the additional costs of supporting a U.S.-Flag vessel for ocean carriers. The MSP subsidy may cover half of the additional 38% cost differential so carriers are dependent on volume to offset their higher costs. Figure 4 displays how carriers have benefited from increased volumes due to the conflicts in Iraq and Afghanistan to offset the cost differentials. Future trends in U.S.-Flag volumes will impact the USG's willingness to allow non U.S.-Flag waivers.

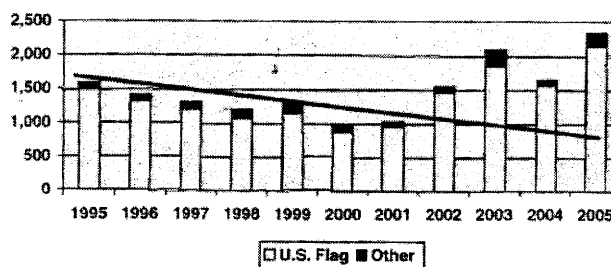
¹¹ Cited from MARAD 2006 Top 25 Flag of Registry report

¹² 40 containerships cited from Reeve & Associates report p. 11. 75 containership cited from MARAD U.S.-Flag 2007 fleet report

¹³ Payments of \$2.9 million 2009-2011 & \$3.1 million 2012-2015 from 70 Fed. Reg. 55582 (2005) (to be codified at 46 C.F.R. § 296)

¹⁴ Reeve & Associates report p. 5

Exhibit III-5
U.S.-Flag Commercial Vessel Carriage of
Military Preference Dry Cargo Shipments
in Fiscal Years 1995-2005
(in thousands of metric tons)



Source: U.S. Maritime Administration

Figure 4: U.S.-Flag Volumes of Military Cargo

2.4 Freight Forwarders and Brokers

This section explains the important roles freight forwarders and brokers serve in international ocean shipping.

Like most global shippers, PDS relies heavily on freight forwarders and brokers to facilitate cost-efficient cargo transportation and navigate complex import/export rules. The USG provides guidance that PDS has to be the intermediary between freight forwarders and brokers, rather than letting PDS's raw material and finished good suppliers work directly with freight forwarders and brokers.

A freight forwarder is an agent that supports moving cargo to international locations. They advise on prices of carriers, assist in import/export documentation preparation and administration. Export freight forwarders are licensed by the International Air Transport Association (IATA) to handle air freight and the Federal Maritime Commission to handle ocean freight.¹⁵

A customs broker performs customs transactions at ports on behalf of other parties. Brokers are hired either directly by the importing/exporting party or by a freight forwarder. They are

¹⁵ (Export.gov)

knowledgeable in the intricacies of import/export compliance and can also advise on prices for transportation.¹⁶

2.5 3PL Outsourcing

This section describes the role a 3PL serves in the transportation industry and current trends in 3PL outsourcing. As the hypothesis tests whether or not it is feasible for PDS to outsource their logistics tasks to a 3PL, it is valuable to understand the 3PL market. The research conducted at PDS included understanding their business and capability and where a 3PL might fit in.

A 3rd Party Logistics Provider (3PL) provides third party and/or outsourced transportation and warehousing services for a shipper. Many companies outsource their entire supply chain management functions to these companies who then develop custom solutions for the shipper.

The term 4PL has been used to describe an enhancement to the 3PL relationship where the third party company will provide onsite human capital and information technology services in addition to the integrated transportation services. There is some dissent in the difference between 3PLs and 4PLs within the transportation industry. For the purpose of this paper, 3PL will be used to describe a 3rd party transportation services provider.

The 2008 State of Logistics Outsourcing¹⁷ study conducted by Georgia Tech and CapGemini provides informative analysis on why companies outsource their logistics operations. Of the 1,644 global logistics and supply chain executives surveyed and interviewed, 87% agreed that logistics exemplifies a strategic advantage for their companies. The study also elaborated on what factors make outsourcing successful. These include:

¹⁶ (Export America, 2003)

¹⁷ The study can be found at <http://3plstudy.com/>

1. Strong relationships – Awareness and relationships from the executive level all the way down to operations are critical for maintaining efficient operations and cost savings opportunities.
2. Strong contracts – A strong up-front contract was critical to regulating business, but ensuring that both parties communicated and didn't rely solely on language in the contract was also important.
3. Metrics – Being able to measure results when working with a 3PL is critical in understanding the value they have brought to the relationship.

3PLs' strength is providing diverse solutions based on their strong and established relationships with many different transportation providers. One potential 3PL partner displayed this strength when shipping weapons for PDS-L. PDS had spent over a month contacting transportation providers, including a well known airline that could potentially move the weapons to Europe. PDS ultimately found no responsive suppliers. Subsequently, an inquiry was made to a 3PL. Less than one day after making a call for help to the potential 3PL partner, the weapons were booked for shipment on the same airline that had previously declined PDS-L. This example underscores the strength in relationships among logistics providers and the value of solutions they provide to shippers.

Approximately 80% of Fortune 500 companies outsource some or all of their transportation to 3PLs¹⁸. Figure 5 highlights the variety of services outsourced:

¹⁸ (Elliff, 2004)

Outsourced Logistics Service	All Regions	North America
Domestic Transportation	85%	81%
International Transportation	81	69
Warehousing	72	70
Customs clearance & brokerage	65	66
Forwarding	52	48
Shipment consolidation	46	46
Reverse logistics (defective, repair, return)	38	31
Cross-docking	38	37
Transportation management (shipment planning and execution with one or more carriers)	37	39
Product labeling, packaging, assembly, kitting	36	29
Freight bill auditing and payment	30	54
Supply chain consultancy provided by 3PLs	17	21
Order entry, processing and fulfillment	15	12
Fleet management	13	9
LLP/4PL services	13	11
Customer service	12	11

Figure 5: Logistics Services Outsourced¹⁹

The ability to integrate information technology quickly without internal investment costs and resources is another key reason that a company would partner with a 3PL. A company is able to acquire technological capabilities that it would not be able to obtain on its own²⁰. 3PLs offer a variety of I/T integrated services as highlighted by the percentages in Figure 6:

¹⁹ From p 13, Figure 6 of (C. John Langley, Jr., Ph.D., and Capgemini U.S. LLC., 2008)

²⁰ (Lynch, 2002)

IT-Based Services	Current
Warehouse/distribution center management	66
Web enabled communications	65
Transportation management (execution)	63
Visibility tools (tracking/tracing, etc.)	58
Barcode generation and scanning	50
Transportation management (planning)	44
Customer order management	31
Collaboration tools (inventory levels, production schedules)	26
Supplier relationship management	26
Yard management	24
Supply Chain Planning	22
Internet based transportation-logistics exchanges	21
Customer relationship management	21
Global trade management	20
RFID (asset tracking)	13

Figure 6: IT-Based Services Provided by 3PLs²¹

Efficiently outsourcing logistics is not a trivial task. Understanding the current state through performance measurements and by developing a clear objective is a prerequisite before approaching a 3PL. Talented employees that can maintain a progressive relationship as well as drive the integration are critical factors for success²². When evaluating whether or not to outsource, these factors should be considered²³:

1. Lack of management commitment
2. Lack of outsourcing communications plan
3. Minimal knowledge of outsourcing methodologies
4. Failure to recognize outsourcing business risks
5. Failure to obtain outside outsourcing professionals
6. Not dedicating the best and brightest internal resources
7. Rushing through the initiative

²¹ From p. 14, Figure 7 of (C. John Langley, Jr., Ph.D., and Capgemini U.S. LLC., 2008)

²² (Elliff, 2004)

²³ (Power, Bonifazi, & Desouza, 2004)

8. Not recognizing the impact of cultural differences
9. Minimizing what it will take to make the vendor productive
10. No formal outsourcing governance program

Firms should also avoid becoming overly dependent on their 3PL partners. Many companies have become locked in to their 3PL partner and a significant amount of work and cost is required to rebuild what has been outsourced. Some suggestions for avoiding this trap included²⁴:

1. Ongoing measurement of 3PL performance and meaningful dialogue
2. Possibility of working with multiple 3PL's
3. Judicious use of rebidding 3PL business as business needs evolve
4. Retaining internal expertise

²⁴ (C. John Langley, Jr., Ph.D., and Capgemini U.S. LLC., 2008)

3 Research Analysis

3.1 Summary of Approach

As the problems witnessed at PDS were organizational in nature, the approach taken to understand and identify current state and future opportunities was the following:

1. Organization analysis
2. Value Stream mapping
3. Metrics definition
4. Partner with customer for process improvement
5. Benchmark
6. Identify 3PL and other transportation partners

This approach ultimately yielded other actions and activities, some of which are highlighted in the conclusion.

3.2 Organization Analysis

A three lenses analysis was conducted to understand the strategic, cultural and political interactions of PDS. Reflecting on each lens helps to balance an individual's bias in order to better understand the functions of organizations, the means of organizing, and information necessary to make sense of an organization.²⁵

3.2.1 Strategic Lens

The strategic lens attempts to describe how the organization has been designed to achieve goals by carrying out tasks. PDS utilizes a matrix organizational design. As illustrated in the Figure 7 below,

²⁵ (Carroll, 2006)

each program is led by a vice president or director responsible for the profit and loss of the program.

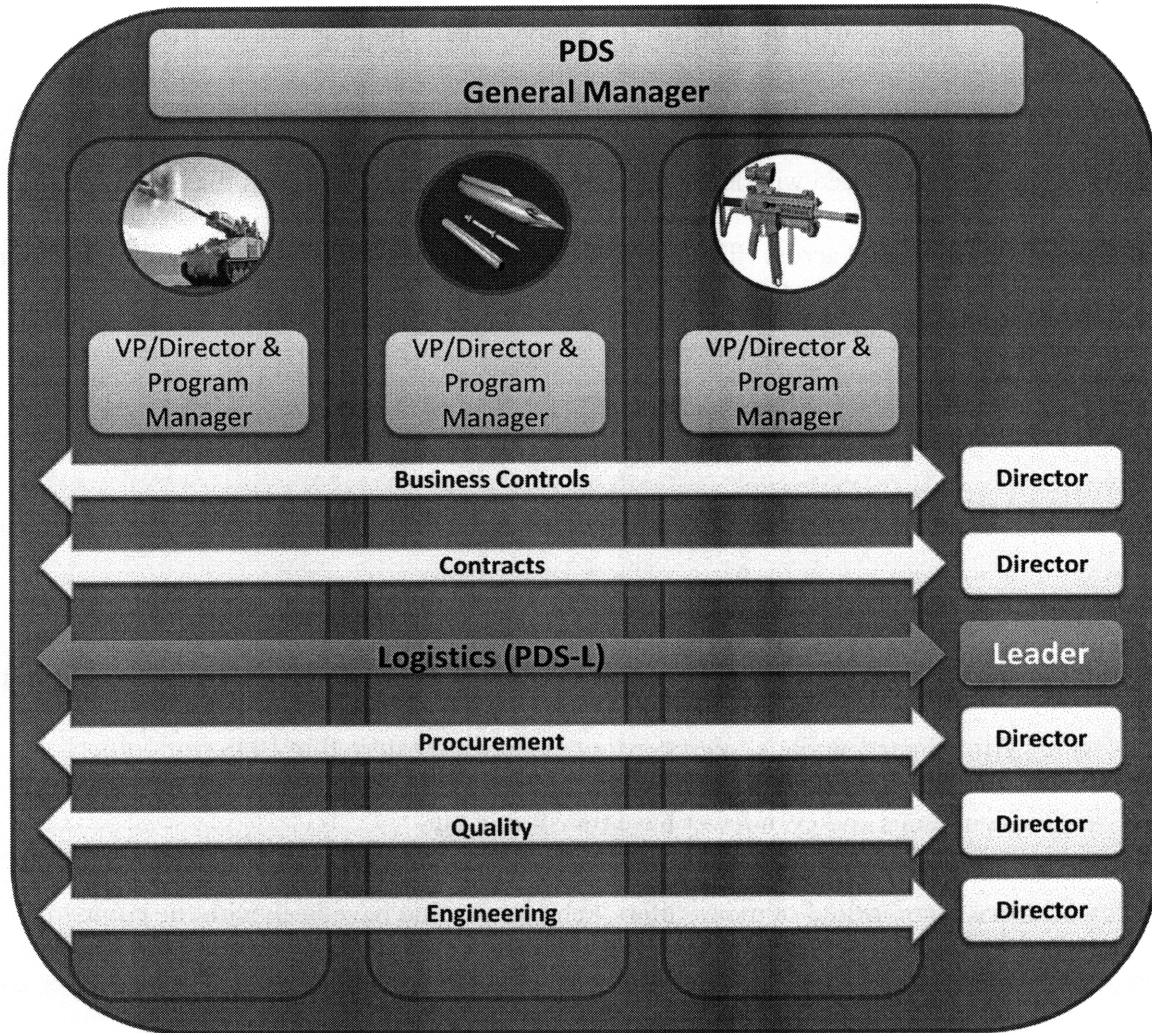


Figure 7: PDS Matrix Organizational Design

Each program VP or director reports to the General Manager of PDS. Functional organizations are represented by horizontal arrows, led by a Senior Manager or Director, and responsible for performance management, issue escalation and driving consistency within the function. Each functional director also reports to the General Manager of the division. Program leads are dependent on the success of their program through the initiative and work of support organizations.

It is imperative that program leads stay in constant communication with functional directors and leads.

During the course of the research, the Director of Supply Chain and Logistics left the company and the position was not backfilled. The PDS-L senior manager was reassigned to another functional Director, who was inexperienced with logistics. This is relevant as it continued the lack of strong leadership needed for logistics across PDS, and it increased the importance of the recommendations conducted through this research.

3.2.2 Cultural Lens

PDS is a business unit within a larger conglomerate company. PDS was acquired less than ten years ago and most of the existing leadership team from the acquisition was left in place and remains to this day. PDS is very proud of their history and isolates itself from the rest of the business divisions and units within Armament Solutions. Very few people have transferred to PDS from other business divisions and units and even fewer have transferred out.

The PDS workforce is comprised of many “lifers,” employees that have been with the company for over 25 years. An attitude sensed in some of the leadership is “The old way has always worked, so why change now?” Therefore, there is not enough emphasis on developing people and investing in technology to retain the institutional knowledge of the division.

PDS captures and posts few operational measures, making it difficult to drive accountability. At the executive level, financial measures are tracked, but at the lower program levels, few metrics are posted and employees have no infrastructure to pull any metrics together. Everything is tracked on individuals’ Excel spreadsheets and frequently employees will be tracking the exact same metrics on

their own files. Many employees within PDS are tactically focused, simply “fighting the fires” of the day and rarely stopping to think about how to improve the process and drive to root cause.

3.2.3 Political Lens

The environment at PDS is collaborative. Everyone is friendly, helpful, and interested in helping new players on the team. There is a strong sense of commitment to the team and programs that individuals are working on. PDS is small enough that most everyone knows each other and knows who the right person is to address questions.

The U.S. Government is the primary customer for PDS and the affability in the relationship between the USG and PDS varies by program. On most programs, there are years of history that have forged strong bonds. The program that had exposed PDS’s lack of logistics management has a significant amount of tension between parties. There is a sense of distrust built by complexities in the program, delayed schedules and negotiations over equitable consideration.

3.2.4 Organization Structure

The PDS-L team, as illustrated in Figure 8, was led by a Senior Manager whose attention was spread between logistics, inventory control and master scheduling functions. The Logistics Operations Manager also had direct reports in non-logistics functions. The Logistics Operations Lead was the one employee solely dedicated to supporting Logistics for all programs.

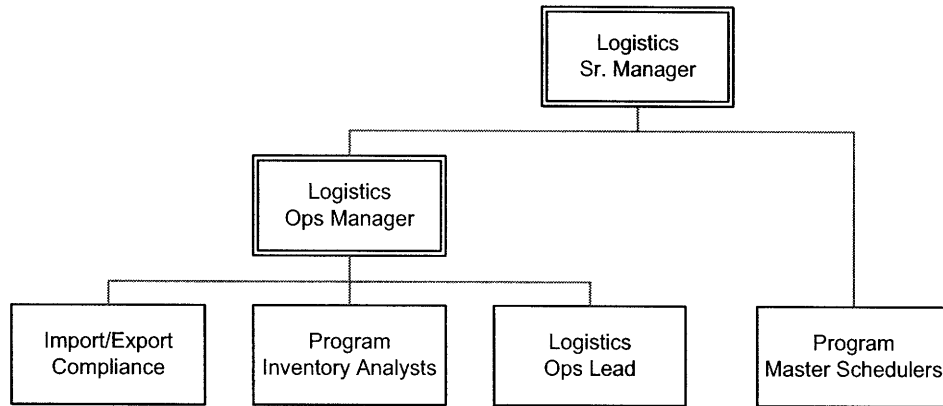


Figure 8: PDS-L Organization Chart

3.2.5 SWOT Analysis

A SWOT analysis was conducted by the author to identify the underlying factors affecting the PDS-L team. The objective was to improve the daily and long term support of logistics initiatives within the PDS organization.

3.2.5.1 Strengths – traits of the organization that are helpful to achieving the objective.

The team has tremendous explosives shipping knowledge and understanding of the constraints with shipping class 1 cargo globally. One member of the team had obtained explosives shipping knowledge through 20 years in the armed forces, but much of the team’s knowledge had been acquired through trial-and-error. In a niche industry such as explosives shipping, understanding the U.S. and international customs regulations is extremely important.

3.2.5.2 Weaknesses – traits of the organization that are harmful to achieving the objective.

The main weaknesses of PDS-L are a lack of standard processes, absenteeism, and a resistance to trying new methods to continually improve. The team has few standardized processes and needs process thinking to simplify their tasks. For instance, there was an ineffective process of

having all inbound communication route to one person on the team. When this employee was absent, no work occurred. Instead of the team developing a solution, a consultant drove implementation of a simple, generic e-mail inbox that was visible to all of the PDS-L team, creating a more reliable and customer efficient process. PDS-L lacks support when team members are absent. Absences of team members put a strain on the workload of other team members. During the six month time frame of this study, it is estimated that one team member was absent at least 35% of the time, including one day where all team members were absent. Redundancy and daily support are critical in logistics operations. With the exception of one new partnership, the team infrequently reached out to new companies in the logistics industry and usually relied on its long-time partnerships. Multiple times it was expressed by the team that only a few players could ship or deal with explosives and it was not worth the investment in evaluating new sourcing opportunities. New ideas and approaches to problems are easily and quickly dismissed.

3.2.5.3 Opportunities – external conditions that are helpful to achieving the objective.

The proliferation and breadth of 3PLs is an important trend in the transportation industry. An outside partner can provide immediate information technology infrastructure as well as cost savings opportunities. 3PLs provide standardized processes that can help alleviate the team's requests for iterative quote solicitations for domestic and international transportation. All PDS programs have a need for transportation information to be used in bids, estimations and actual transportation. 3PLs can also perform in a more cost effective manner administrative tasks that were overwhelming the Logistics team, such as pro-forma invoices, import/export compliance documentation, etc.

3.2.5.4 Threats – external conditions which could do damage to the business's performance.

No outside threats exist to PDS-L. The threat is in the team's ability to execute. Leadership lacks a vision for how to communicate and improve performance. Internal customers desire and need more proactive information from the team.

3.3 Value Stream Mapping

Value stream maps are used in lean manufacturing methods to document all the value and non-value added actions required to bring an item through the main flows of transformation. Value stream maps are useful for evaluating the big picture and not for optimizing one particular operation. Especially critical is that value stream maps document the physical flow as well as information flows within a process.²⁶

Value stream maps are traditionally used in factory environments to better understand the factory floor flows and implications on inventory. For this research, value stream maps were developed for the most complex PDS programs' regular tasks of shipping components to finished good suppliers and returning finished product back to the U.S. Exhibit 4, located in the Appendix, illustrates the process required for PDS-L to facilitate moving raw materials from their domestic U.S. suppliers to their international finished goods suppliers. Exhibit 5 illustrates the process for PDS-L to facilitate transporting finished goods back to U.S. Military depots. Exhibit 6 documents some of the pre-defined processes in Exhibits 4 & 5.

The strength of performing a value stream map on the logistics process was that it highlighted the excessive electronic communication required to facilitate each shipment of raw materials and finished goods. The zigzag lines between boxes represent the electronic communications between

²⁶ (Rother & Shook, 2003)

PDS-L, their transportation providers, brokers, suppliers and customers. The PDS-L team was the central point of all communications in cargo transactions and was consumed by constantly tracking shipments. Daily, they had to contact the different parties involved in each shipment to understand the status and issues. They were also responsible for completing time consuming administrative documentation that could be completed by a knowledgeable partner or party.

An efficient future state for the processes includes removing the constant back-and-forth communications and time-consuming customs paperwork. Transportation statuses and information needs to be pushed or available to PDS-L rather than the team having to constantly contact parties to monitor the latest status. Logistics improvement efforts have to include adopting informative transportation I/T resources and tools as well as identifying headcount or processes that could free the team from administrative tasks so that they could focus on more strategic tasks.

3.4 Metrics Definition

"I often say that when you can measure what you are speaking about, and express it in numbers, you know something about it; but when you cannot measure it, when you cannot express it in numbers, your knowledge is of a meager and unsatisfactory kind."

Lord Kelvin²⁷

The PDS-L team does not possess information technology resources that can facilitate metrics collection for identifying performance improvement opportunities. PDS-L only compiles high level financial metrics such as overall transportation spending. With the exception of the recently adopted transportation partner, past partners had no capability for supply chain visibility or the ability to electronically capture information which could be used at a later date to make decisions.

²⁷ [PLA, vol. 1, "Electrical Units of Measurement", 1883-05-03]

Even with the new partner, a consultant had to work to enhance their reports into a useful format, otherwise the information would have been unusable and ignored. No comprehensive, electronic system of record exists in which to pull historical logistics information. Most information is captured on home-grown excel spreadsheets and rarely shared unless requested. In order to understand the costs and cargoes onboard individual shipments for one of the larger logistics programs, three years of cryptic paper invoices had to be translated into usable information.

By working with the PDS-L team, an initial list of logistics key measurements was compiled, as shown in Figure 9. The metrics were focused on service performance, financial performance and visibility or tracking. Service performance is important in understanding the efficiency of logistics execution. Financial performance provides a more detailed view of expenses which could help drive cost reduction opportunities. Visibility or tracking metrics include information on future workloads that needs to be planned in advance due to long lead times, etc.

Initially, some of these metrics would be uncollectable, but they provide a goal and target for future information technology enhancements.

Type of Metric	Description	Currently Collected	Method to Collect
Service Performance	Transit Time	N	Better visibility tools
Service Performance	On-time pickup and delivery	N	Need visibility tools
Service Performance	Container utilization	N	
Service Performance	Detention charges	N	Summarized list from carriers
Financial Performance	Invoices & charges	Y	Need electronic format with more granularity
Financial Performance	Mode of transport	N	Need in electronic format
Financial Performance	Vendor diversification	N	Creation of scorecards
Financial Performance	Conformance to rates	Y	Manual process to collect. Use freight auditor.
Tracking	Balance against import/export licenses	N	Need electronic capture
Tracking	Workload planning	N	Visibility to upcoming shipments

Figure 9: PDS-L Targeted Metrics

3.5 Partner With Customer for Process Improvements

The PDS-L team spends an inordinate amount of time looking for transportation alternatives for finished goods returning from international partners. PDS-L's process is non-standard, iterative in nature and most times ended in the same result, no shipments booked. Explosive cargo logistical challenges and USG constraints had become roadblocks to finding feasible alternatives. No regular U.S.-Flag liner service exists in the ports of call for the countries from which PDS has to ship finished goods. If U.S.-Flag liner service is available, the ocean cargo carrier either is unwillingly to transport class 1 cargo or makes stops at ports banning class 1 cargo. Liner service is preferred by PDS-L as it usually provides lower per container costs that align with PDS's budget forecasts. As air freight is not economically viable, PDS regularly obtains quotes from U.S.-Flag charter ship operators. As these ocean charter quotes are usually three to five times more expensive than non U.S.-Flag service, PDS declares the quotes as unreasonable cost according to the Military Cargo Act of 1904. PDS ultimately applies for waivers with the USG. Data was collected on the waiver process as shown in Figure 10 below:

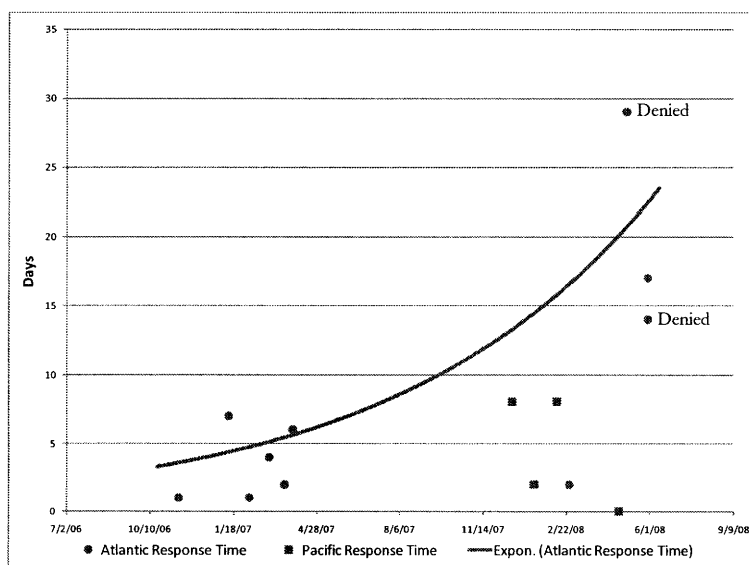


Figure 10: U.S.-Flag Waiver Request Response Times

Some interesting trends were beginning to form. Waivers previously granted within 10 days were increasing in response time and some were denied for the Atlantic. Denials and increasing waiver response time negatively impacted PDS's ability to meet negotiated delivery commitments. Missed deliveries were subject to penalties from the USG, unexpectedly increasing budgeted program costs. Phone conversations conducted with the USG's Program Contract Officers and MARAD to develop economically viable shipping alternatives was unsuccessful. Ultimately the absoluteness of these laws was cited by the USG.

A group from PDS traveled to meet with the USG contract officers to collaboratively develop a value stream map that could identify opportunities within both PDS and USG's processes to help facilitate a smoother process for shipping finished goods from international ports back to the military depots following the U.S. laws. The meetings ultimately proved ineffective as PDS was confined to economic concerns and the USG was confined to processes around the Military Cargo Act of 1904. The experience generated from this meeting ultimately impacted the recommendation described in Section 4.1.

3.6 Benchmark

"Information is the oxygen of the modern age."

Ronald Reagan

Encouraging the organization to reach out to business units in adjacent industries or sections of the supply chain is critical to uncovering cost saving opportunities and partnerships. Many companies stress benchmarking and best practice activities between divisions and business units. Armament Solutions (AS), the parent company of PDS, did not mandate best practices sharing between business units and consequently PDS had insulated itself from the rest of the company. Reaching

out for help and learning from others is not a complex task, and within the company there was a lot of knowledge and willingness to help with identifying possible improvement opportunities. During this study, several partnership and cost saving opportunities were revealed through corporate benchmarking and networking.

3.6.1 Internal Partners

One of AS's business divisions operates ocean shipping vessels for the U.S. military. An initial conversation with executives at this division educated them on PDS's challenge, yet it provided no immediately applicable solutions. Several months later, leaders from this same division approached PDS with a partnership proposal that could significantly simplify the cost and operations of moving explosive cargo and eliminate many of the constraints the PDS-L team faced. This is one example of how reaching out to others is extremely critical in learning and discovering new cost saving opportunities.

3.6.2 Corporate Transportation Committee

Though not mandated by Armament Solutions, many of the business divisions' logistics leaders met quarterly to share best practices through a transportation committee meeting. This committee voluntary came together to identify and measure corporate wide partners whereby pooling divisions' transportation volumes could be used to obtain preferential pricing for different transportation providers in multiple modes (LTL, small package, expedited, etc.). This pricing was available to all business divisions, regardless of their participation in the committee. Each of the transportation provider's representatives attended the meeting to share their latest performance metrics and recent developments.

PDS-L personnel had not participated in these meetings in more than a year-and-a-half and consequently missed on developing relationships and knowledge that could help improve their business and workload. For instance, another business division had been using their own regularly scheduled air charter flight to a country where PDS-L occasionally chartered expedited materials. By not participating in these meetings PDS-L had missed the possibility of “piggybacking” on this division’s work and partnerships to realize possible cost savings.

Using and sharing the transportation committee’s established pricelists could significantly reduce the quote solicitation workload faced by the PDS-L team and result in better rates. For example, research into a business agreement with a carrier with whom PDS had recently renewed a contract revealed that by simply using the price lists put together by the committee would have saved 20% in transportation costs over PDS’s negotiated rates.

3.6.3 Active On-Demand®

Some of Armament Solutions’ transportation committee leaders had begun experimenting with a software solution called Active On-Demand® (AOD). The solution provided an auction marketplace where shippers could post details on the cargo they needed shipped and transportation providers would bid on their best pricing options. Air charter (domestic/international) and domestic trucking were available options. The user could restrict the bidding to their preferred carriers and in the case of PDS, this was important as the list could be confined to SDDC certified carriers. Carrier’s historical on-time performance and other quality metrics were measured and visible through the software. Real time visibility was provided through GPS tracking. Shippers were charged a per transaction fee and invoices were audited by the system. Data was archived for seven years and a variety of reports was available.

AOD provided simple and immediate transportation information for a low cost. The participating business divisions had raved about the simplicity and cost savings realized through the solution. PDS-L could use the tool to establish a portal for all domestic shipments and gain real time visibility to shipments. Shipment bookings could be input by others and the PDS-L team would be responsible for selecting the best carrier option. Based on PDS's relatively²⁸ low quantity of domestic shipments, AOD was a cost effective way to realize the benefits of a transportation management system. Again, none of this information or ideas would have been available if not for participation and networking with others facing similar challenges as PDS.

3.7 Identify 3PL and Other Transportation Partners

The value stream maps constructed were transformed into a request for quote and sent to a variety of 3PL's. As mentioned in section 3.3, outcomes of the value stream maps included a need for information technology to drive metrics collection and tools for simplifying the quotation and administrative paperwork processes. For PDS-L, the right 3PL partner had to provide ready information technology solutions and onsite support to run operations.

In 2007, the 3PL industry had \$122 billion in revenues²⁹, spread among many firms. Figure 11 shows the four criteria established to find the most relevant 3PL partners.

²⁸ Based on comparisons with other Armament Solutions business divisions

²⁹ (Berman, 2008)

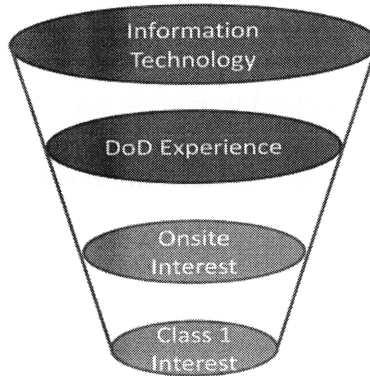


Figure 11: 3PL Decision Criteria

The 3PL industry has had a major focus on building its information technology capability making it hard to differentiate between companies. Fewer companies had DoD experience and were interested in staffing and supporting personnel at a shippers location. Even fewer were experienced and versed in the regulations around global shipping of class 1 cargo, narrowing the list to approximately four companies.

Multiple pricing models were offered that could achieve different goals for PDS. These fees only addressed transportation management and not actual transportation charges:

- Fixed management fee – The 3PL would offer onsite services and transportation management for a fixed fee per year. For instance, the 3PL would assess a yearly charge to manage transportation management. PDS and the 3PL would need to assume volumes and transactions at the start of the contract to properly size the transportation management team. The benefit of this type pricing is that all costs are understood during the duration of the contract, but one party may be leaving cost savings on the table.
- Cost-based management fee – The 3PL would offer onsite services for the cost of those services, plus a profit margin fee. As an example, for every transaction that the 3PL processes, a 5% management fee would be assessed. PDS would need to accurately forecast

transactions to budget for the cost of this solution. Based on their inefficient transportation data collection resources, this could be difficult.

- Shared cost model – The 3PL and PDS would work together to identify opportunities to share their cost burden and improve processes to reduce those expenses. This transparent arrangement prevents the relationship from becoming one sided. The arrangement may initially assume the cost-based model, but as the 3PL and PDS finds cost opportunities through relationships and knowledge, the savings are shared.

All of these models could have a savings initiative added to them, where fees would have to improve year over year based on targeted actions.

4 Conclusions

The PDS logistics organization should not be completely outsourced. It is important that PDS maintain institutional knowledge within the organization, especially when the primary customer is the U.S. Government. Flexibility in solutions and partners must be maintained as PDS operates within a niche in the transportation industry; working with explosive cargo and U.S.-Flag vessel restrictions. New transportation technologies and solutions exist at minimal cost and implementation time that can quickly improve the PDS-L's execution across all programs.

It is imperative that PDS maintains its flexibility by retaining management and oversight of its logistics organization and focus on three key recommendations (listed in order of importance):

1. Lobby the U.S. Government for help in high volume global DoD shipping
2. Build a culture of visible metrics
3. Create a hybrid logistics organization consisting of some outsourcing and new partners

It is estimated that adopting these solutions through a hybrid logistics organization would cost PDS less than 1% of their 2007 transportation spend. Following through on these recommendations will improve the financial performance, estimated in millions of dollars, and daily execution of the PDS logistics organization. Logistics will also become a valuable contributor and differentiator, not an afterthought in the execution of PDS programs.

4.1 Lobby U.S. Government

This section describes why PDS should utilize their corporate group to help educate the USG on their constraints and challenges. Achieving results in this activity could improve the probability of

on-time finished goods deliveries to the USG, eliminate the stockpiling of explosive finished goods at suppliers and reduce iterative quote solicitations by PDS.

PDS has been forced to solicit ocean charter operators in an attempt to ship product back from international ports to the U.S. Most of these quotes were deemed unreasonable in cost, yet the USG was unwillingly to grant cost waivers. Therefore, the product continued to sit at the international supplier and PDS missed delivery commitments.

PDS engaged the USG, who in turn involved MARAD, in an attempt to drive a solution that could enable PDS to deliver product on time, at reasonable cost, when no ocean liner service was available from their Atlantic ports. These grass roots efforts, which included monthly waiver requests, phone conversations with the USG and MARAD as well as a value stream mapping meeting with the USG proved unsuccessful. It was apparent that strategic improvements could not be facilitated at this low of a level.

PDS's corporate parent, Armament Solutions, located near Washington D.C., has not been engaged to help with the transportation puzzle. The recommendation is that PDS engage lawmakers regarding the feasibility of the Military Cargo Act of 1904 when high volume shipments of DoD material are taking place internationally. The laws and infrastructure are not setup to support this level of shipment frequency and cost.

Suggestions for improvement include:

1. Requiring U.S.-Flag service in all trade lanes

The USG currently subsidizes ocean shippers to maintain a fleet of U.S.-Flag vessels through the MSP/VISA provision. Through this same legislation, they could also enforce the availability of U.S.-Flag vessels in trade lanes, including the Mediterranean. Of utmost

importance is that these carriers stop in ports that allow hazardous cargo. It was noticed that there was built-up demand by shippers in locations such as Israel for U.S.-Flag service, yet none existed and ocean carriers planned no service.

2. Increased subsidy

As highlighted in Section 2.3, the USG derives tremendous flexibility and value through the MSP/VISA program which provides subsidies to ocean carriers to maintain U.S.-Flag vessels. These costs are hardly enough to offset the higher U.S.-Flag costs and the carriers rely on their preferred status with the USG for additional volume. The conflicts in Iraq and Afghanistan have provided much of the volume, but with rumors of President Obama pulling out troops, there is reason for concern. The ocean carriers will need volume and enforcement of the Military Cargo Act of 1904 to ensure that volume of cargo comes their way.

This does not bode well for PDS in their hope that more U.S.-Flag liner service would become available or that more waivers would be granted. Increasing the subsidy might encourage more liner operators to provide U.S.-Flag carrier service. This in turn would open up new lanes to U.S.-Flag liner service, which might help PDS. Without an increase in the subsidy, there is no incentive for liner operators to provide additional service.

3. MARAD Facilitation

MARAD maintains relationships and is responsible for governing all trade activities with U.S.-Flag vessels. Due diligence in researching all options by PDS was still not as efficient as speaking with MARAD. Given a set of economic criteria, it would be time efficient to allow

MARAD to facilitate the transactions of hazardous cargo from international ports. Carriers were incentivized to cooperate with MARAD to stay in their good graces.

4. Utilize USTRANSCOM Vessels

PDS is unique in that they are responsible for moving hazardous DoD cargo, yet don't have the luxury of using the U.S. military logistics network. In the interest of economies of scale and tax payer interests, it might be worthwhile to encourage USTRANSCOM to pick up loads in international ports.

4.2 Build Culture of Visible Metrics

*"We made a grave error when we eliminated visual controls such as wall schedules and replaced them with computers."*³⁰

*"Wall charts...They involve the team and compel action."*³¹

*"People looking at well-designed charts on a wall can have very effective discussions"*³²

As identified in sections 3.1 and 3.4, PDS does not have a culture of measuring logistics' performance. This is reflected in their lack of initiative to develop long term infrastructure to collect transportation data. PDS must build a culture of measuring itself to identify logistics improvement opportunities and activities. Creating new metrics and measurements is not enough to drive a culture of accountability. Moving to a culture of Visible Measurement will enable PDS to quickly make tactical and strategic decisions that provide financial and operational success to avoid the surprises previously experienced.

³⁰ (Dennis, 2007)

³¹ (Dennis, 2007)

³² (Liker & Meier, 2006)

Popular in factory environments, wall charts can be successful in the office environment. The Visual Management Triangle³³, illustrated in Figure 12, is a useful way to think about how PDS could engage the entire team into logistics affairs.

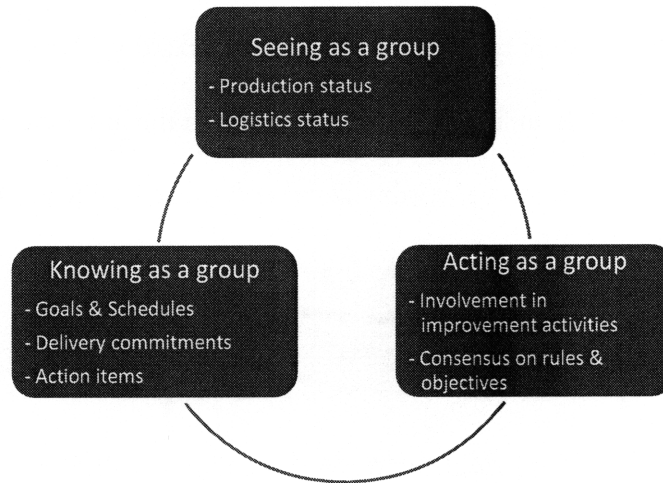


Figure 12: The Visual Management Triangle

Seeing as a group for PDS entails conducting at least weekly meetings around a posted metrics board. Building an area where everyone, from the lowest level to the program leaders, has to participate together helps facilitate conversation and understanding. The board is the facilitator of team meetings and includes all actions and updates. Meetings should take place with everyone standing around the board. This encourages timely and objective execution.

Knowing as a group includes posting goals and schedules to ensure that the team is aligned on the true objectives of the team and organization. As PDS delivery schedules were dynamic, posting them helps ensure alignment among entire teams.

Acting as a group ensures that team members are not acting on their own in their own self interest. It also acts to measure accountability. The peer pressure of acting together will encourage team

³³ (Dennis, 2007)

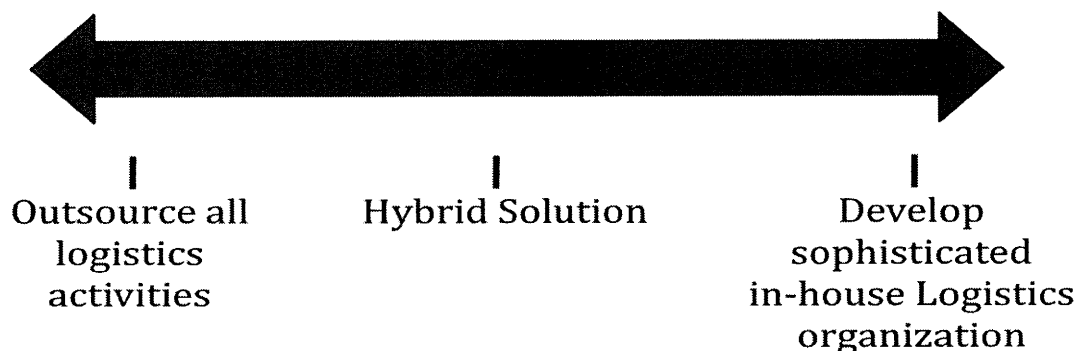
members to participate and keep up. If a team member is not following through, they will quickly be exposed, prompting further action. Posting and talking about metrics are also not enough. Actions must be listed and reviewed at each meeting.

In implementing visible metrics, many organizations become paralyzed by making sure that their visual management board is perfect before it is posted and visible to the team. This is a certain case for delay in overall improvement. Action drives evolution and posting metrics will encourage certain actions from all parties. Each metric should list the owner, updated date and frequency for updating. Data may not be perfect or right, but posting it will drive certain activity to evolve it and make it right.

There was a perception among many in PDS that the PDS-L team was unable to follow through on its commitments, specifically through late or missed shipments. Visibly posting PDS-L metrics and actions will enable the PDS-L team to educate and involve all PDS programs on their statuses and leave no room for conjecture. Program teams will be forced to participate and involve themselves in the affairs of logistics and not place blame after the fact. PDS-L can be the example for the rest of PDS in how to drive a culture of visible measurement and action.

4.3 Hybrid Logistics Organization

PDS has three different options for improving its logistics organization:



Revamping and building an in-house world class logistics organization is a difficult and time consuming proposition. Building a logistics core competency requires PDS management support, which was uncertain. PDS would have to drastically improve their logistics capabilities through improved information technology. Transportation Management Systems (TMS) firms contacted hinted that at a minimum these systems would cost half-a-million dollars and require at least one year of implementation time. Additionally, the systems would have to be maintained by PDS, adding to their yearly maintenance fees. Two of the solution providers contacted mentioned that the overall PDS logistics spend was almost too small for investment in an enterprise level TMS. The life of many PDS programs was less than three years and PDS investing in a significant amount of fixed assets in logistics is risky.

Outsourcing all logistics activities was advocated by several PDS executives. They felt that PDS had gotten in “over its head” with the logistics involved in recent programs. Their desire was to bring in a 3PL or other partner to manage all logistics activities. Though not stated, PDS management really wanted someone they could hold accountable for logistics performance and improvement. This is a fallacy in how to approach a 3PL relationship. Successful 3PL outsourcing relationships are built on working collaboratively. Working with the USG to facilitate shipment of class 1 cargo is a dynamic process and PDS would still have to be engaged in logistics operational support. Retaining internal expertise is also especially important. It is imperative that companies consider 3PLs if logistics is not their core competency, but still maintain logistics management. By outsourcing logistics management, some companies ultimately lost visibility into their supply chains and found it hard to build back that capability.

“Don’t let go of logistics management”³⁴

The hybrid solution recommendation for evolving the logistics operation is predicated on the philosophy that PDS maintains its flexibility by retaining leadership control of the logistics organization. Especially in working a niche market involving explosive, DoD cargo built globally, the organization must retain control and responsibility for all activities. As discussed though, there is a significant opportunity to work more efficiently by employing partners and tools to drive the administrative activities and achieving cost savings. The hybrid solution is implemented by injecting new leadership into PDS-L, employing a 3PL partner onsite to drive operational activities and standardizing all domestic transportation on Active On-Demand[®]. Successful implementation and execution will enable the PDS-L team to trim their administrative workload and possess partners that can develop innovative and cost efficient solutions and avoid problems currently faced by the team.

4.3.1 Leadership

New leadership is critical to improve performance and to facilitate efficient management of the team. Figure 13 illustrates the competencies currently possessed and those needed to transform the PDS-L team. The leader has to manage the internal dynamics and processes of the team as well as manage external expectations. Though explosives and DoD shipping knowledge is useful, the leader must be unafraid to challenge conventional wisdom, explore new processes and reach out to new partners. The team has grown organically and needs outside perspective to inject new ideas into daily operations.

³⁴ (Burnson, Warehousing and 3PLs: Outsource logistics, but not logistics management?, 2008)

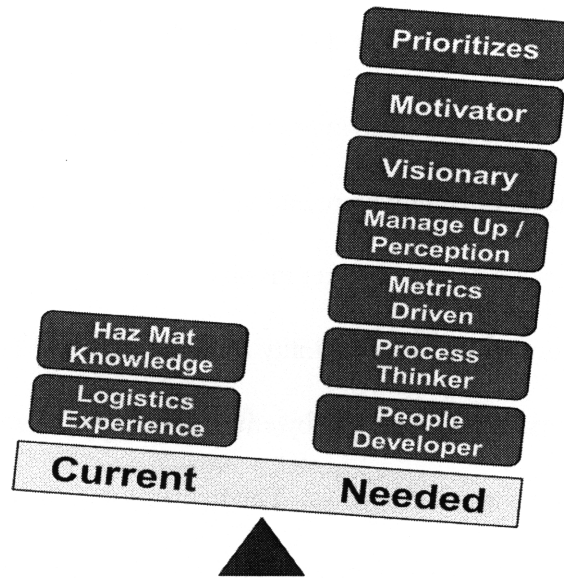


Figure 13: PDS-L Leadership Fulcrum

4.3.2 Logistics Organization Workflow

The hybrid logistics organization operates through two workflows, illustrated in Figure 14. Complex and international shipments are handled by onsite 3PL agents, managed by a PDS-L operations lead. Domestic shipments and any air charters are facilitated through the Active On-Demand® (AOD) tool or established contracts through the Armament Solutions transportation committee.

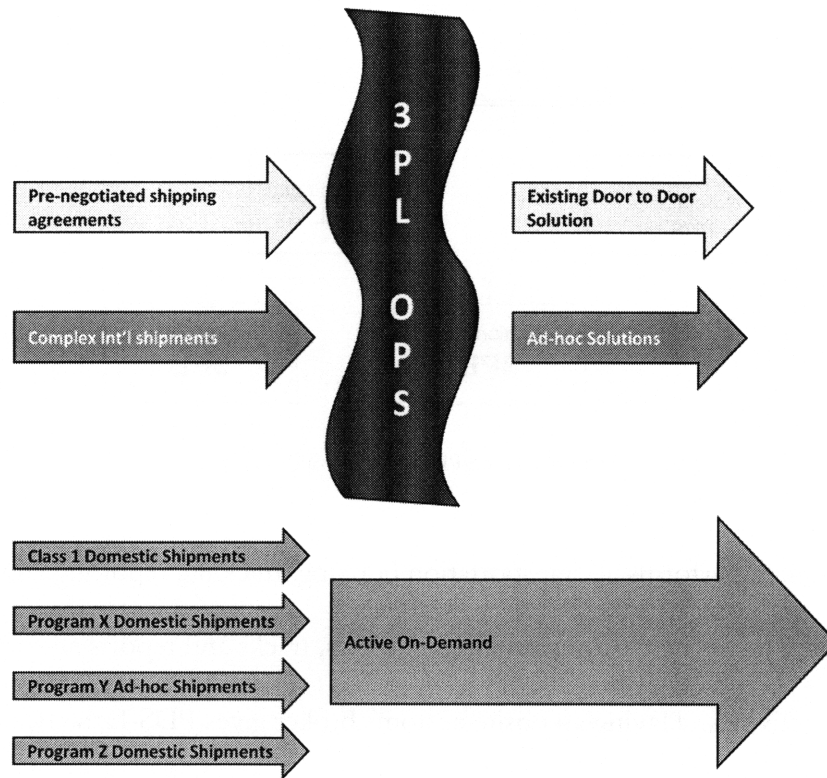


Figure 14: Hybrid Solution Logistics Workflow

4.3.3 Onsite 3PL Support

A 3PL partner brings strong and established shipping industry wide relationships, providing faster transportation solutions execution and avoiding the repetitive work faced by the PDS-L team. 3PLs pool volumes from multiple shippers together to achieve pricing economies of scale. 3PLs bring sophisticated information technology visibility and reporting tools. They bring standardized processes and lean process tools and utilize their transportation knowledge to quickly identify and achieve cost savings.

Onsite 3PL associates will own PDS-L's time consuming and repetitive administrative tasks. An onsite presence will help drive accountability and ownership that PDS leadership desires. The new organization structure, showing the role and employer, is shown in Figure 15:

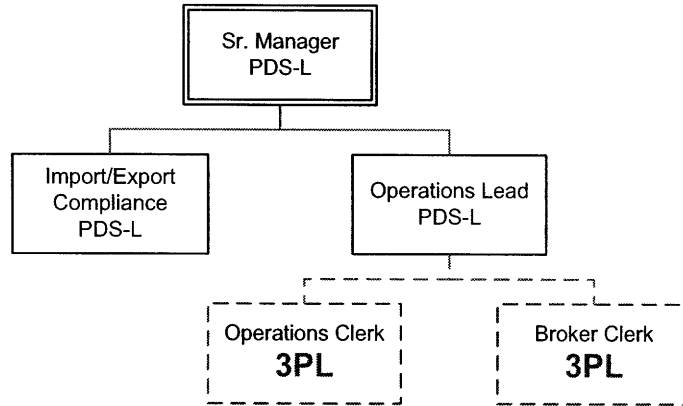


Figure 15: Hybrid Solution PDS-L Organizational Structure

The 3PL operations clerk performs all transportation booking, tracking, reporting and issue resolution functions. The onsite customs broker completes, tracks and reports all customs documentation and activities. Having an onsite customs broker gives PDS-L the flexibility to consider more cost efficient transportation solutions rather than be forced to utilize less efficient partners that provided complex customs brokerage services. In the event of 3PL onsite personnel absences, 3PL personnel from an offsite command center would provide support.

The PDS operations lead will direct and provide support to the onsite 3PL personnel and retains all PDS logistics knowledge. This person will maintain the face of logistics to the U.S. Government.

The lead will also interact with 3PL management in the event of any escalations or problems.

Freeing the operations lead from the daily administrative tasks will enable a focus on improving the USG relationship as well as strategic and improvement initiatives.

4.3.4 Active On-Demand®

Active On-Demand® (AOD) offers a simple, web-based process for driving standardization across all PDS programs for domestic trucking transportation. Implementation takes less than one week and PDS-L's workload is reduced by requesting that all partners use the AOD portal to book

shipments. The PDS team would then approve the quoted booking requests and select a carrier.

Visibility of shipments and auditing of payments occurs automatically through the software.

Other AS business divisions that had been piloting AOD were unclear on whether AOD truly provided lower transportation costs vs. negotiated rates. They were sure of the benefits through simplified transportation booking, tracking and administrative tasks. It is recommended that PDS-L drive periodic audits of the AOD cost per shipment vs. corporate negotiated transportation rates to evaluate perceived versus actual benefit.

4.3.5 Business Case and Implementation

It is estimated that utilizing 3PL fixed management fee pricing³⁵ and AOD³⁶ would cost PDS less than 1%³⁷ of PDS's 2007 transportation spend. This does not assume any shipping savings provided by both the 3PL and AOD. The hybrid logistics organization solution offers a faster time to implement than organically expanding the PDS-L organization or fully outsourcing to a 3PL. The longest lead time items will be selecting a 3PL partner, settling on a contract and integrating the 3PL into PDS³⁸.

PDS would quickly possess a flexible solution that upgrades their transportation industry network as well as implements inexpensive information technology used to drive metrics. This creates an organization that is able to actively track and meet delivery schedules, potentially saving millions of dollars in possible penalties and costly transportation. As PDS's strategy and programs change, the PDS-L team will now have historical data and metrics that can provide insights into setting the

³⁵ Two 3PL salaries plus a margin markup

³⁶ Total 2007 PDS programs' domestic shipments multiplied times AOD's per transaction charge

³⁷ Calculated by dividing total 3PL and AOD costs by total 2007 PDS logistics costs

³⁸ Following the 3PL integration methodologies in section 2.5

correct logistics strategy at the time of enablement, not after the fact. Most importantly, PDS will value the PDS-L team and its partners as an operational and financial contributor to the overall success of PDS's programs.

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APPENDIX

Exhibit 1 – Explosives Classification Codes

Description of substances or article to be classified	Compatibility group	Classification code
Primary explosive substance	A	1.1A
Article containing a primary explosive substance and not containing two or more effective protective features. Some articles, such as detonators for blasting, detonator assemblies for blasting and primers, cap-type, are included, even though they do not contain primary explosives.	B	1.1B 1.2B 1.4B
Propellant explosive substance or other deflagrating explosive substance or article containing such explosive substance	C	1.1C 1.2C 1.3C 1.4C
Secondary detonating explosive substance or black powder or article containing a secondary detonating explosive substance, in each case without means of initiation and without a propelling charge, or article containing a primary explosive substance and containing two or more effective protective features	D	1.1D 1.2D 1.4D 1.5D
Article containing a secondary detonating explosive substance, without means of initiation, with a propelling charge (other than one containing flammable liquid or gel or hypergolic liquid)	E	1.1E 1.2E 1.4E
Article containing a secondary detonating explosive substance with its means of initiation, with a propelling charge (other than one containing flammable liquid or gel or hypergolic liquid) or without a propelling charge	F	1.1F 1.2F 1.3F 1.4F
Pyrotechnic substance or article containing a pyrotechnic substance, or article containing both an explosive substance and an illuminating, incendiary, tear-producing or smoke-producing substance (other than a water-activated article or one containing white phosphorus, phosphide or flammable liquid or gel or hypergolic liquid)	G	1.1G 1.2G 1.3G 1.4G
Article containing both an explosive substance and white phosphorus	H	1.2H 1.3H
Article containing both an explosive substance and flammable liquid or gel	J	1.1J 1.2J 1.3J
Article containing both an explosive substance and a toxic chemical agent	K	1.2K 1.3K
Explosive substance or article containing an explosive substance and presenting a special risk (e.g., due to water-activation or presence of hypergolic liquids, phosphides or pyrophoric substances) needing isolation of each type	L	1.1L 1.2L 1.3L
Articles containing only extremely insensitive detonating substances.	N	1.6N
Substance or article so packed or designed that any hazardous effects arising from accidental functioning are limited to the extent that they do not significantly hinder or prohibit fire fighting or other emergency response efforts in the immediate vicinity of the package	S	1.4S

Source: <http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr;rgn=div8;view=text;node=49%3A2.1.1.3.8.3.25.3;idno=49;cc=ecfr>

Exhibit 2 – Segregation of Hazardous Materials

Class or division	Notes	1.1 1.2	1.3	1.4	1.5	1.6	2.1	2.2	2.3 gas Zone A	2.3 gas Zone B	3	4.1	4.2	4.3	5.1	5.2	6.1 liquids PG 1 Zone A	7	8 liquids only
Explosives	1.1 and 1.2	A	*	*	*	*	X	X	X	X	X	X	X	X	X	X	X	X	X
Explosives	1.3		*	*	*	*	X		X	X	X	X	X	X	X	X	X	X	X
Explosives	1.4		*	*	*	*	O		O	O	O		O				O		O
Very insensitive explosives	1.5	A	*	*	*	*	X	X	X	X	X	X	X	X	X	X	X	X	X
Extremely insensitive explosives	1.6		*	*	*	*													
Flammable gases	2.1		X	X	O	X			X	O							O	O	
Non-toxic, non-flammable gases	2.2		X			X													
Poisonous gas Zone A	2.3		X	X	O	X	X				X	X	X	X	X	X			X
Poisonous gas Zone B	2.3		X	X	O	X	O				O	O	O	O	O	O			O
Flammable liquids	3		X	X	O	X			X	O					O		X		
Flammable solids	4.1		X			X			X	O							X		O
Spontaneously combustible materials	4.2		X	X	O	X			X	O							X		X
Dangerous when wet materials	4.3		X	X		X			X	O							X		O
Oxidizers	5.1	A	X	X		X			X	O	O						X		O
Organic peroxides	5.2		X	X		X			X	O							X		O
Poisonous liquids PG I zone A	6.1		X	X	O	X	O				X	X	X	X	X	X			X
Radioactive materials	7		X			X	O												X
Corrosive liquids	8		X	X	O	X			X	O		O	X	O	O	O	X		

Instructions for using the segregation table for hazardous materials are as follows:

- (1) The absence of any hazard class or division or a blank space in the Table indicates that no restrictions apply.
- (2) The letter "X" in the Table indicates that these materials may not be loaded, transported, or stored together in the same transport vehicle or storage facility during the course of transportation.
- (3) The letter "O" in the Table indicates that these materials may not be loaded, transported, or stored together in the same transport vehicle or storage facility during the course of transportation unless separated in a manner that, in the event of leakage from packages under conditions normally incident to transportation, commingling of hazardous materials would not occur. Notwithstanding the methods of separation employed, Class 8 (corrosive) liquids may not be loaded above or adjacent to Class 4 (flammable) or Class 5 (oxidizing) materials; except that shippers may load truckload shipments of such materials together when it is known that the mixture of contents would not cause a fire or a dangerous evolution of heat or gas.
- (4) The "*" in the Table indicates that segregation among different Class 1 (explosive) materials is governed by the compatibility table in paragraph (f) of this section.
- (5) The note "A" in the second column of the Table means that, notwithstanding the requirements of the letter "X", ammonium nitrate (UN 1942) and ammonium nitrate fertilizer may be loaded or stored with Division 1.1 (explosive) or Division 1.5 materials.
- (6) When the § 172.101 Table or § 172.402 of this subchapter requires a package to bear a subsidiary hazard label, segregation appropriate to the subsidiary hazard must be applied when that segregation is more restrictive than that required by the primary hazard. However, hazardous materials of the same class may be stowed together without regard to segregation required for any secondary hazard if the materials are not capable of reacting dangerously with each other and causing combustion or dangerous evolution of heat, evolution of flammable, poisonous, or asphyxiant gases, or formation of corrosive or unstable materials.

Source: <http://www.myregs.com/dotrspa/goto.asp?ref=CFR49.177.848>

Exhibit 3 – Compatibility Table for Class 1 (Explosives) Materials

Compatibility Group	A	B	C	D	E	F	G	H	J	K	L	N	S
A		X	X	X	X	X	X	X	X	X	X	X	X
B	X		X	X ₍₄₎	X	X	X	X	X	X	X	X	4/5
C	X	X		2	2	X	6	X	X	X	X	3	4/5
D	X	X ₍₄₎	2		2	X	6	X	X	X	X	3	4/5
E	X	X	2	2		X	6	X	X	X	X	3	4/5
F	X	X	X	X	X		X	X	X	X	X	X	4/5
G	X	X	6	6	6	X		X	X	X	X	X	4/5
H	X	X	X	X	X	X	X		X	X	X	X	4/5
J	X	X	X	X	X	X	X			X	X	X	4/5
K	X	X	X	X	X	X	X	X			X	X	4/5
L	X	X	X	X	X	X	X	X	X	X		1	X
N	X	X	3	3	3	X	X	X	X	X	X		4/5
S	X	4/5	4/5	4/5	4/5	4/5	4/5	4/5	4/5	4/5	X	4/5	

Instructions for using the compatibility table for Class 1 (explosive) materials are as follows:

- (1) A blank space in the Table indicates that no restrictions apply.
- (2) The letter "X" in the Table indicates that explosives of different compatibility groups may not be carried on the same transport vehicle.
- (3) The numbers in the Table mean the following:
 - (i) "1" means an explosive from compatibility group L shall only be carried on the same transport vehicle with an identical explosive.
 - (ii) "2" means any combination of explosives from compatibility groups C, D, or E is assigned to compatibility group E.
 - (iii) "3" means any combination of explosives from compatibility groups C, D, or E with those in compatibility group N is assigned to compatibility group D.
 - (iv) "4" means 'see § 177.835(g)' when transporting detonators.
 - (v) "5" means Division 1.4S fireworks may not be loaded on the same transport vehicle with Division 1.1 or 1.2 (explosive) materials.
 - (vi) "6" means explosive articles in compatibility group G, other than fireworks and those requiring special handling, may be loaded, transported and stored with other explosive articles of compatibility groups C, D and E, provided that explosive substances (such as those not contained in articles) are not carried in the same vehicle.

Source: <http://www.myregs.com/dotrspa/goto.asp?ref=CFR49.177.848>

Exhibit 4 – Component Shipment Value Stream Map

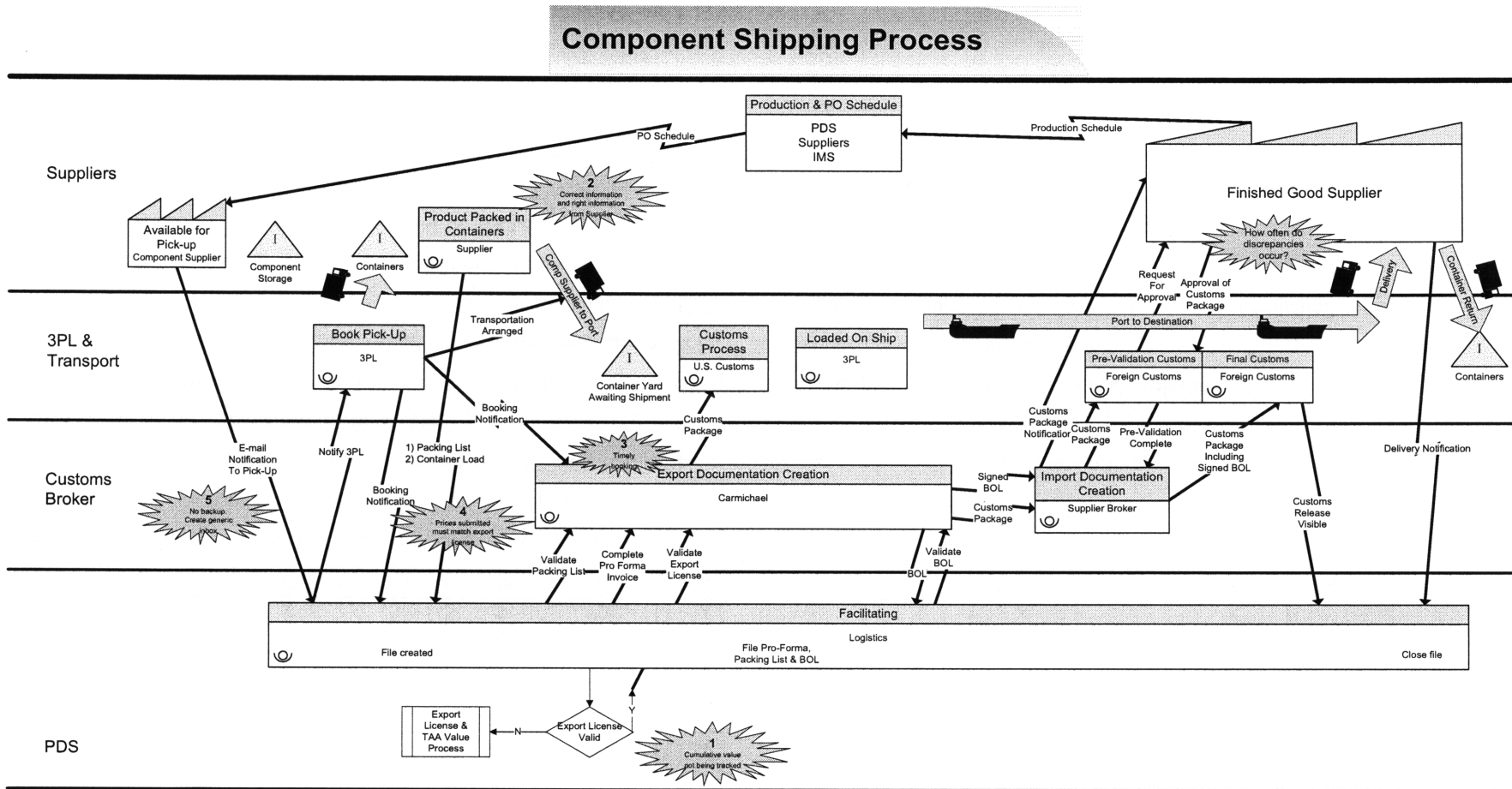


Exhibit 4 illustrates the process required for PDS-L to facilitate moving raw materials from their domestic U.S. suppliers to their international finished goods suppliers. The zigzag arrows show the electronic information that PDS-L was responsible for transmitting and receiving from Raw Material and Finished Goods suppliers as well as 3PL and Customs Broker partners. The main learning from this map was the complexity and attention required to successfully facilitate each shipment. PDS-L needed help through tools and resources to efficiently manage all of the transactions.

Exhibit 5 – Finished Goods Shipping Value Stream Map

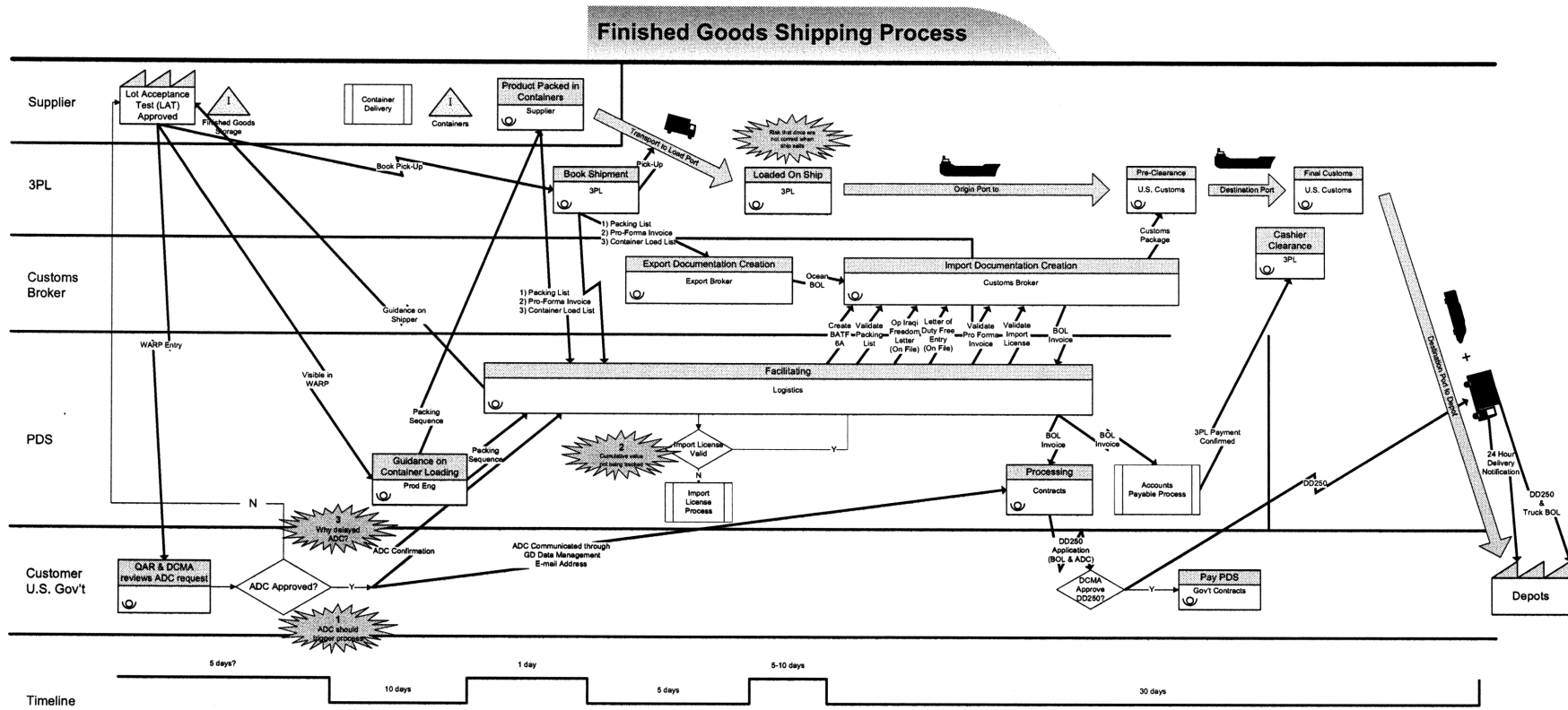
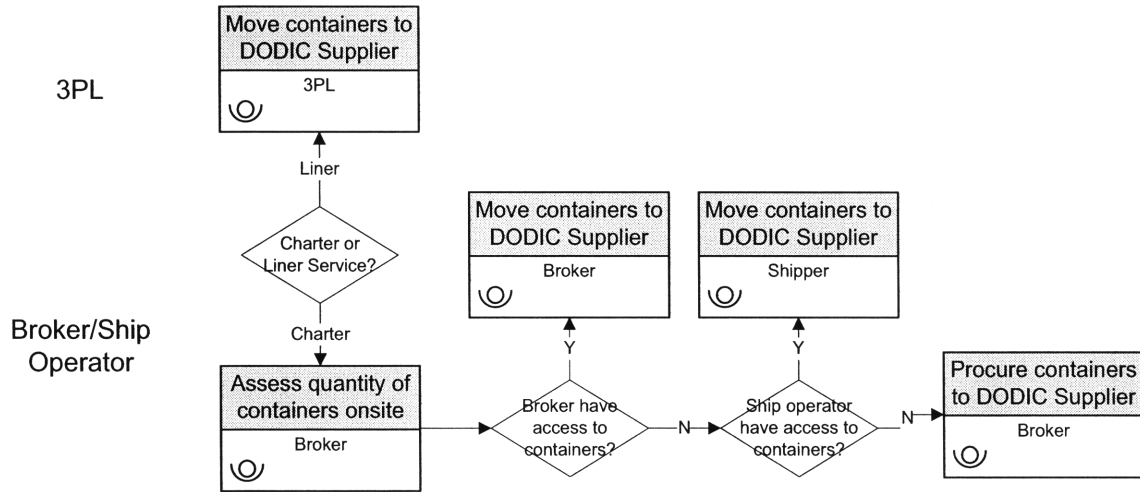


Exhibit 5 illustrates the process for PDS-L to facilitate transporting finished goods back to U.S. Military depots. The zigzag arrows show the electronic information that PDS-L was responsible for transmitting and receiving to the USG, Finished Goods suppliers as well as 3PL and Customs Broker partners. The main learning from this map was the complexity and work required to successfully facilitate each shipment. PDS-L needed help through tools and resources to efficiently manage all of the transactions.

Exhibit 6 – Pre-defined Processes Value Stream Maps

Container Delivery Process



Accounts Payable Process

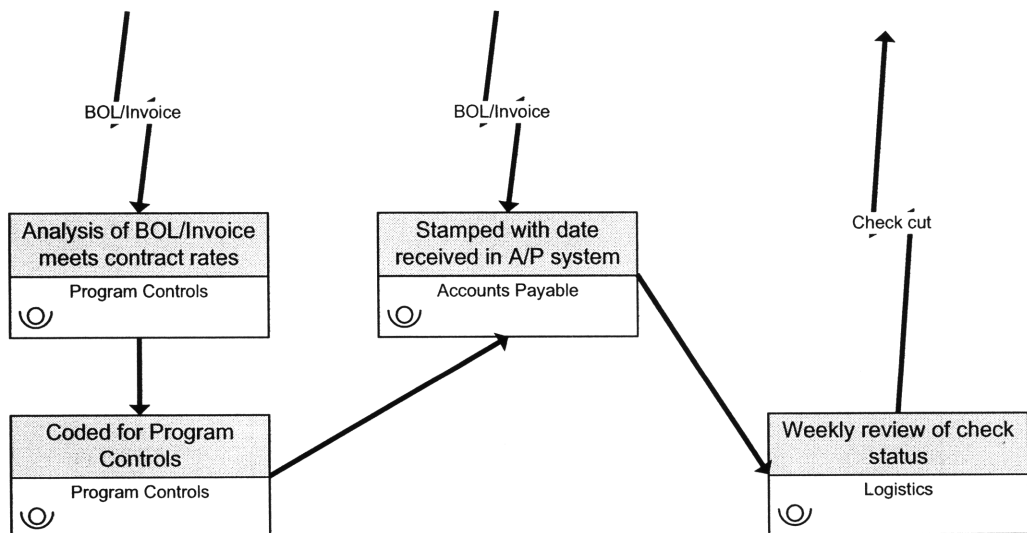


Exhibit 6 describes the pre-defined processes in Exhibit 5. Ensuring that suppliers had containers was critical, otherwise it could delay shipments. Making sure transportation providers were paid was also critical in ensuring that shipments were not held in customs Cashier Clearance.