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TECHNICAL REPORT

Integrating the Department of Defense Supply Chain

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With Geoffrey McGovern

Prepared for the Office of the Secretary of Defense

Approved for public release; distribution unlimited



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Summary

In the mid-1990s, the U.S. Department of Defense (DoD) began a sustained effort to improve its supply chain, improving performance and harvesting significant efficiencies through process improvement initiatives, rationalizing functional activities across organizations, and integrating functions and organizations within processes. However, additional opportunity exists for integrating the supply chain across processes. In a fully integrated supply chain, processes are intertwined in a way that process design and execution decisions must consider impacts on all other processes and the total supply chain in order to achieve optimal supply chain performance and efficiency rather than focusing on the success of individual processes, functions, and organizations.

To help DoD determine how to tap the full potential of supply chain integration, the Assistant Secretary of Defense for Logistics and Materiel Readiness (ASD(L&MR)) asked the RAND National Defense Research Institute (NDRI), based upon prior research and analysis and ongoing DoD initiatives, to develop a framework for an integrated DoD supply chain, identify barriers and enablers to integration, and make recommendations to align policy with the framework. In addition, NDRI was also asked to identify opportunities for efficiency through improved integration.²

Case Studies

The project developed two related case studies that illustrate the need for improvement in DoD supply chain integration.

- The first is on the DoD journey to improve centralized theater inventory, which focuses on optimizing the trade-offs among inventory, transportation, and materiel handing to minimize total supply chain costs versus focusing on minimizing each of these costs independently.
- The second case study shows how one functionally isolated decision—a well-meaning decision to shift transportation modes to reduce costs—propagated across the supply

² The study's scope included supply classes II (clothing, individual equipment, tools, and administrative supplies), IIIP (packaged petroleum, oil, and lubricants), IV (construction materiel), VI (personal demand items), and IX (repair parts). These are sustainment supply classes currently or recently handled by the DoD distribution network and with the supply chain largely managed by DoD personnel. A few examples in this report also include classes I (subsistence) and VIII (medical materiel).

chain affecting a large number of processes over several years, creating inefficiencies and performance problems as each change was made in isolation.

Review of DoD Supply Chain Policy

The study reviewed the 2003–2004 DoD supply chain policy and regulations in effect when this study was conducted and when the case studies occurred.³ The review suggested that gaps in supply chain integration have been rooted in DoD supply chain policy. During the writing of this report, from December 2011 through May 2012, though, a new DoD supply chain materiel management policy instruction, informed by this study, was released and the accompanying detailed manual was in the coordination and release process. Both of these were reviewed in the course of the study as well. However, to help illuminate some of the underlying factors and thinking that has hindered supply chain integration and produced the opportunities for improvement discussed in this report, we list the major gaps that have existed in policy:

- absence of an overall supply chain objective that integrates readiness and total cost
- lack of an overarching supply chain framework that clearly articulates the roles of each organization and how each process or function affects the others
- overemphasis on customer responsiveness and inventory minimization versus total cost and meeting customer needs by employing the best standard approaches
- limited linkage of stock positioning to minimize total supply chain costs by integrating inventory, materiel handling, and transportation planning
- limited guidance on when to use different distribution methods, which integrate transportation, materiel handling, and stock positioning planning
- no requirement for collaborative planning with suppliers to enable better management of lead times, order quantities, and costs.

The authors provided overarching and detailed recommendations to address these gaps and to add new policies to engender supply chain integration, in addition to making specific recommendations for the new policy documents. All but the second have already largely been addressed in the new policy instruction and the draft policy manual.⁴

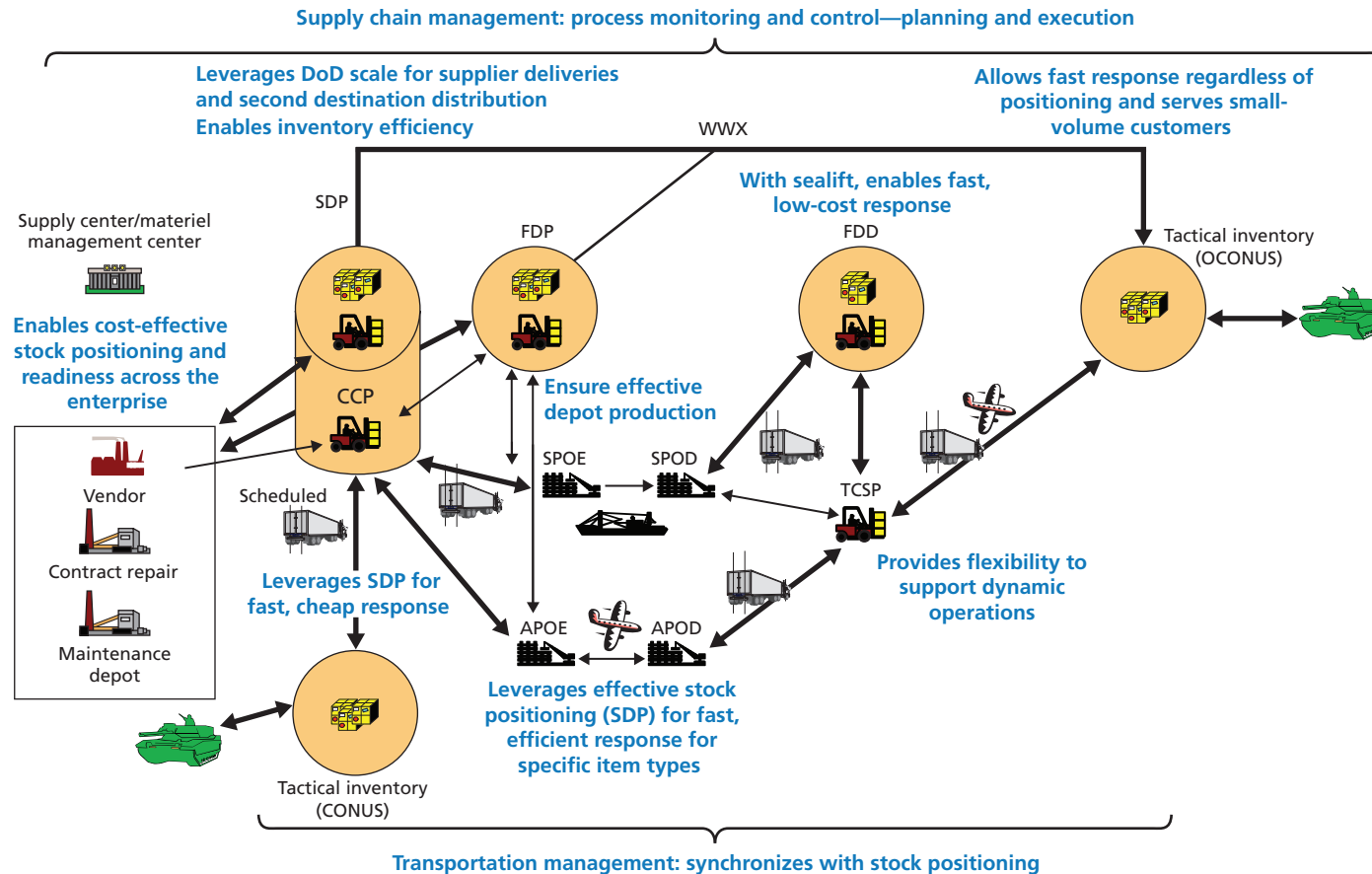
A DoD Supply Chain Framework

The supply chain objective and principles lead to a framework for the DoD supply chain that can provide a common understanding of the design, the roles of each function and process, and dependencies to factor into planning and decisions. Each function and process in the framework has defined, dependent roles as shown in Figure S.1. The framework is described in depth in Chapter Four.

³ Deputy Under Secretary of Defense for Logistics and Materiel Readiness, “DoD Supply Chain Materiel Management Regulation,” DoD 4140.1-R, May 23, 2003; Deputy Secretary of Defense, “Supply Chain Materiel Management Policy,” DoD Directive 4140.1, April 22, 2004.

⁴ Under Secretary of Defense for Acquisition Technology and Logistics, *DoD Supply Chain Materiel Management Policy*, DoD Instruction 4140.01, December 14, 2011; Assistant Secretary of Defense for Logistics and Materiel Readiness, *DoD Supply Chain Materiel Management Procedures*, DoD Manual 4140.01, Volumes 1 through 11, draft as of March 2012.

Figure S.1
DoD Supply Chain Functions and Processes



NOTE: All abbreviations can be found in the Abbreviations List.

RAND TR1274-S.1

- Tactical and/or retail inventory enables readiness to conduct operations and to execute depot production as planned. Responsive replenishment to tactical and/or retail inventory locations is provided through several means guided by condition-based rules depending upon the customer type, location, and item.
- Overseas, with sealift, forward distribution depots (FDDs) provide low-cost, responsive support for certain types of items. Airlift provides the lowest cost, responsive option for other items. The best type of airlift service depends upon the region and its level of security and development, location demand-level, and item.
- Strategic distribution platforms (SDP)—the distribution hubs in the continental United States (CONUS)—enable low-cost transportation to customers. They also enable lower-cost order fulfillment for suppliers by aggregating regional demand.
- Scheduled trucks in an overseas theater or CONUS provide responsive inexpensive transportation from an FDD or SDP, respectively, leveraging the value of concentrated stock positioning.
- Forward distribution points (FDPs) collocated with industrial activities ensure these activities have the parts on hand to execute planned production.
- Supply management organizations ensure stock is at the right places to take advantage of distribution system economies of scale, when appropriate, or concentrate inventory of expensive items when that is the best solution to minimize total supply chain costs, and they ensure the system has enough—and just enough—inventory to meet service level goals and execute the stock positioning plan. Additionally, they work with suppliers to minimize total costs to meet needs, considering item prices, lead times, order quantities, and quality.
- Transportation management keeps the transportation plan synchronized with stock positioning and ensures responsive delivery upon demand, using the lowest cost options that meet customer needs.
- Overall supply chain management keeps all of these capabilities tied together in both planning and execution. In planning, it ensures all of the dependencies are considered to produce the best overall supply chain design, monitoring the system to determine when plans should shift. In execution, it conducts process monitoring and control to ensure processes are being executed to standard and plan.

Enabling Mechanisms

Enabling mechanisms are management and other approaches that engender execution in accordance with policy and planning intent. They should be reviewed to ensure effective policy execution and to gain the maximum benefit from supply chain integration initiatives. They include the following:

1. Incentives to act in a way that is best for the total supply chain, including metrics to understand individual process and functional effects on the total supply chain and other processes and functions as well as budget accounts and lines that enable and encourage people to take the best actions for the total supply chain.
2. Decision rights and authorities that create spans of control or influence that support integrated action.
3. Decision support tools that enable people to understand the total system effects of their decisions.

4. Financial controls and methods that ensure effective resource stewardship without impeding supply chain efficiency.
5. Information systems that ensure the requisite data for the decision support tools are available and shared.
6. Career development that imbues people with the knowledge and capabilities to act in the best interests of the total supply chain both in formal planning and in ad hoc decisionmaking.

Opportunities to Improve DoD Supply Chain Integration

The study identified several opportunities for improved DoD supply chain efficiency through improved integration:

- Improve supplier management and integration of suppliers, supply planning, and procurement to reduce inventory costs.
- Consolidate shipments in accord with the best systems view.
- Integrate supplier and transportation management with the best systems view.
- Base stock positioning and repositioning decisions on total supply chain costs.
- Integrate financial policy with distribution system design and inventory planning and integrate inventory management across organizations.

Improve Supplier Management and Supplier, Supply Planning, and Procurement Integration

To dramatically reduce supply chain costs, it is critical for DoD to attack the cost paid for material and inventory. The cost of material is the largest element of supply chain costs, and contributing to this, DoD has greater inventory on hand than expected based upon inventory theory, inventory planning parameters, and special categories of inventory requirements unique to DoD, such as war reserve materiel. A DoD-wide inventory stratification report for September 2009 suggests an on-hand “should-be” value of \$42.1 billion, with \$97.8 billion on hand.⁵ This greater-than-expected amount on hand comes from several factors, particularly forecast error accumulated over time and the fact that much of the inventory is in reparable items, which are slow to “wash out” of the system.

DoD forecast error is driven by long lead times, not the quality of the forecast methods. Large order quantities compound this effect as they increase the amount of potential excess when demand diverges from the lead-time forecast. Thus, DoD should begin a new initiative to examine how best to reduce lead times and order quantities, along with item prices. This should encompass how DoD selects, manages, and collaborates with its suppliers; demand and supply planning practices; and organizational design, capabilities, and accountabilities.⁶ In addition, DoD should examine how the service materiel/system commands could improve

⁵ This excludes U.S. Army Materiel Command and U.S. Army Communications-Electronics Command inventories, which were not included in the stratification report because of an information system transition. It includes all DoD inventory, whether held in the Defense Logistics Agency (DLA) distribution centers or other locations. DoD inventory stratification report, September 2009.

⁶ The Assistant Secretary of Defense for Logistics and Materiel Readiness (ASD(L&MR)) initiated such a study in April 2012 to be focused on DLA, which manages most DoD consumable items.

how their demand and supply planning organizations work with depot maintenance and DLA, financial planners, and operational planners to reduce the need for reparable item inventory and new buys, which is essential to having a dramatic impact on DoD inventory.⁷

Consolidate Shipments in Accord with the Best Systems View

DoD also has an opportunity to achieve savings through better integration of its distribution network. We recommend new policy based upon the support provider choosing the best method of service that meets operational needs: When route volume supports well-utilized scheduled trucks that meet these needs, all customers on the route will have their shipments on the truck.⁸ To implement such a policy, a central planning organization with the right systems view would need to determine the optimal route structure using an automated route planning tool on a periodic basis.⁹ Effective execution is necessary to ensure that delivery standards are met and efficiency expectations are achieved, requiring metrics for monitoring and control.

Integrate Supplier and Transportation Management

Currently, for classes II, IV, and IX (for items stocked in DLA distribution centers), there is no coordination across suppliers to consolidate shipments and suppliers cannot take advantage of DoD's transportation contracts, which would likely be valuable for smaller suppliers. Together these two issues present a potential opportunity for improved transportation, procurement, and supplier management integration for potentially lower total supply chain costs. A rough analysis suggests annual savings on the order of \$10 million. Additional savings would be possible if some DoD suppliers are paying higher shipping rates. To achieve these savings, DoD would likely need changes in the Federal Acquisition Regulation to allow for DoD management of inbound freight.

Reposition Materiel Based on Consideration of All Supply Chain Costs

DLA employs a hub-and-spoke distribution network, with regional distribution hubs replenishing distribution center spokes that support depot maintenance operations and overseas forces. DLA was not moving materiel among distribution centers using total supply chain cost logic but rather focused on minimizing some functional costs at the expense of others. A DLA team was formed in the fall of 2011 to examine how to address this issue. The team completed its work in December 2011, with recommendations quickly leading to changes in the DLA business logic for repositioning stock in February 2012.

The new logic minimizes total costs by simultaneously considering inventory, materiel handling, transportation, and procurement workload costs. The conceptual total cost logic can be further extended to DLA stock positioning planning and to service stock positioning and redistribution planning, offering further opportunities. In February 2012, DLA initiated an effort to determine how to apply the concepts to stock positioning.

⁷ The ASD(L&MR) initiated another study in April 2012 to examine depot-level reparable item management, encompassing an examination across all four services.

⁸ This policy recommendation has been incorporated into DoD Manual 4140.01 (draft as of March 2012), which calls for DLA to develop scheduled truck networks based on the principles described here and to make their use standard practice, with exceptions only in accordance with policy guidelines.

⁹ In 2012, DLA distribution initiated a project with RAND to transfer the scheduled truck network planning code described in Chapter Seven to DLA for use in a production environment.

Integrate Financial Policy with System Design and Inventory Planning

All DoD operating activities supported by retail and/or tactical supply organizations generate serviceable returns. So the question becomes how serviceable returns can be managed most effectively. It makes sense to keep actively demanded local excess in place to be drawn down. Otherwise, it should be sent back to a central point for reuse. For DLA-managed items, the services transfer money to DLA when they receive this materiel. Often, though, credit for a return is not offered. So the service keeps the item in its inventory, enabling it to reissue the item to the next customer without a second expenditure. The consequence of this practice is some redundancy in distribution system capabilities and masking of demand for DLA planners. There are two potential solution paths to this problem. The first is to ensure that information on service retention stocks of DLA-managed items is integrated into DLA planning systems. The second is to change the credit policy so that there is no incentive to the services for keeping retention stock of DLA-managed items. Changes in the management of retention stock that would eliminate shadow distribution and warehouse capacity would build on a broader DoD trend of rationalizing distribution center capabilities and warehouse capacity.

Conclusions and Overall Recommendations

DoD can increase the integration of its supply chain by addressing shortfalls in policy, enabling mechanisms, and workforce knowledge. Policy creates the foundation upon which to build an integrated supply chain design and the structure within which to work, with enabling mechanisms and workforce knowledge holding it together in the way intended. Fundamental to achieving supply chain integration and pursuing actions consistent with total supply chain optimization as opposed to process or functional optimization is always thinking about doing so, whether in management of the supply chain and its personnel, policy development, process design, and everyday decisionmaking. This starts with ensuring workforce members understand how they affect the rest of the supply chain through a clear DoD supply chain framework—such as the one laid out in this report, receive feedback on their effects on other processes and their effects on the total supply chain, and have the tools to make integrated supply chain decisions. This supply chain framework should be incorporated into DoD supply chain materiel management policy.

DoD has several opportunities to increase supply chain integration with the benefits of improved performance and efficiency. To reduce costs, the most important is increased attention to supplier lead times and order quantities, which can be through increased integration with suppliers. In conjunction, the role of procurement personnel in driving inventory must be recognized to a greater degree. The Office of the Secretary of Defense should launch a new initiative to determine how purchasing and supply management practices could be improved to achieve lead time and order quantity reductions. Related to this is ensuring a tight integration among demand, supply, and repair planning for reparable items to ensure the total supply of unserviceable items in the “closed loop” reparable system is kept to the minimum necessary to support readiness. In 2012, ASD(L&MR) launched two studies to take on these issues with one focusing on improving consumable supply chain management in DLA and one focusing on reparable item management across the services.

Another opportunity is an increased focus on stock positioning, to include improved incorporation of stock positioning in policy and the broad adoption of stock positioning

metrics. Improved stock positioning is at the heart of a number of important DoD supply chain initiatives such as Strategic Network Optimization, Distribution Process Owner Strategic Opportunities supply alignment, and the Base Realignment and Closure (BRAC) 2005-based transition to DLA ownership and management of retail stock in support of maintenance depots. It also has an important interplay and potential for leverage with a scheduled truck network improvement effort based upon the scheduled truck chapter in this report. Yet despite the frequency with which stock positioning is the crux of improvement initiatives, emphasis remains limited as reflected in metrics and the lack of goals for stock positioning.¹⁰

Related to all of these is ensuring that organizations have the breadth of budgets that give them the degrees of freedom to pursue the course of action that will optimize the supply chain and are correspondingly responsible for budgets that they drive the consumption of. A review of supply chain organizational budget categories and the effects that each organization has on costs should be conducted to determine where there is misalignment, with changes made accordingly. Aligning budget authority and organizational effects should also be part of the design process when standing up new organizations or changing organizational designs.

Finally, progress toward supply chain integration could accelerate with improved end-to-end information sharing, to include outside of DoD to the supply base. This includes ensuring each organization knows what information it produces—and more importantly, could produce that it is not—that would be valuable to its upstream and downstream partners. It also includes ensuring that organizations develop capabilities to utilize this information to the full potential.

¹⁰ As described in different places in this report, the stock positioning recommendations in this report have been incorporated into the 2012 draft DoD supply chain policy manual, and DLA has incorporated total supply chain cost considerations into OCONUS stock positioning planning and stock repositioning logic and is in the process of revising its CONUS stock positioning logic accordingly. During the course of this study, DLA developed OCONUS stock positioning metrics and goals.