ABSTRACT

Title of Document:	***APPLICATION AND IMPLEMENTATION OF THE SUPPLY CHAIN OPERATIONS REFERENCE (SCOR) MODEL AT THE UNITED STATES DEPARTMENT OF DEFENSE (DOD)***
	Michael James Arendt Jr., Ph.D., 2012
Directed By:	Roger C. Lipitz Chair in Public Policy and Private Enterprise, Dr. Jacques S. Gansler, School of Public Policy

DoD's supply-chain supports over 1 million uniformed, civilian, and contract employees, manages over $90 billion in inventory, and maintains some 15,000 aircraft, 300 ships, and 30,000 combat vehicles. The supply-chain is undeniably the backbone of DoD operations, ultimately enabling it to achieve mission success under a variety of situations. In recent years, the DoD has pursued numerous initiatives for the purposes of improving its supply-chain. Motivations to seek improvements (such as asset tracking, reduced errors, etc.), decreased costs, and increased responsiveness for the warfighter have been plentiful; however, measured improvement thus far has been difficult to ascertain. It is the intent of this research to establish a framework to enable DoD to use industry best practices and process improvements from the Supply Chain Operations Reference Model (SCOR) as a tool for Defense supply-chain

modernization efforts. To accomplish this, the dissertation will address the following research questions:

1. How can the Supply Chain Operations Reference (SCOR) model be adapted for use as an enterprise-level tool by the United States Department of Defense?
2. Once adapted, what barriers to the implementation of this new tool exist?
3. How can these barriers be overcome?

APPLICATION AND IMPLEMENTATION OF THE SUPPLY CHAIN OPERATIONS REFERENCE (SCOR) MODEL AT THE UNITED STATES DEPARTMENT OF DEFENSE (DOD)

By

Michael James Arendt Jr.

Dissertation submitted to the Faculty of the Graduate School of the
University of Maryland, College Park, in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy
2012

Advisory Committee:
Professor Jacques S. Gansler, Chair
Dr. Sandor Boyson
Dr. Tom Corsi
Ms. Lisa Harrington
Dr. Paul Tesluk

Table of Contents

List of Tables

List of Figures

Chapter 1: Introduction to the Department of Defense Supply Chain

Introduction

DoD's supply-chain supports over 1 million uniformed, civilian, and contract employees, manages over $90 billion in inventory, and maintains some 15,000 aircraft, 300 ships, and 30,000 combat vehicles.[1] The supply-chain is undeniably the backbone of DoD operations, ultimately enabling it to achieve mission success under a variety of situations. To accomplish this feat, DoD spends roughly $270 billion per year on supply-chain operations without doing a world-class job (in response, reliability, costs etc.). Moreover, maintenance costs have risen 87 percent in the last decade while the United States has undertaken military operations in Iraq and Afghanistan. In recent years, the DoD has pursued numerous initiatives for the purposes of improving its supply-chain. Motivations to seek improvements (such as asset tracking, reduced errors, etc.), decreased costs, and increased responsiveness for the warfighter have been plentiful; however, measured improvement thus far has been difficult to ascertain. Despite numerous initiatives, a disconnect exists between the vision for supply-chain modernization and the level of progress made to date. Luckily for the Department, the efficiency and effectiveness improvements it seeks to make are not new—in fact, the private sector has spent the last several decades embracing technology, modern

[1] Estevez, A. (2010). *High-risk logistics planning: progress on improving Department of Defense supply chain management*. Washington, D.C.: Department of Defense.

supply-chain management practices and process improvement methodologies for the purposes of maximizing efficiency and effectiveness while reducing costs. For example, many world-class firms today such as Wal-Mart, Dell, Fed Ex, and Caterpillar are able to provide greater levels of service, move more goods through the supply-chain, and sell to customers across the globe for a fraction of what DoD spends to achieve inferior results. Many of these practices and process improvements can be carried over and applied to the military setting.

It is the intent of this research to establish a framework to enable DoD to use industry best practices and process improvements from the Supply Chain Operations Reference Model (SCOR) as a tool for Defense supply-chain modernization efforts. To accomplish this, the dissertation will address the following research questions:

1. How can the Supply Chain Operations Reference (SCOR) model be adapted for use as an enterprise-level tool by the United States Department of Defense?
2. Once adapted, what barriers to the implementation of this new tool exist?
3. How can these barriers be overcome?

To address these questions the dissertation is organized in the following manner. First, fundamental definitions regarding the supply chain will be provided. Next a review of the supply chain management practices in business will be given, followed by a comparison of military vs. commercial supply chains. Chapter Two will provide a literature review of supply chain management; the various types of metrics which can be used to measure improvement in supply chain management; and, will introduce frameworks for supply chain performance evaluation. During this section of the dissertation, the SCOR model will be briefly introduced and two applied cases will be discussed (1. SCOR at HP; 2. SCOR at Intel). Chapter Three will provide an extended discussion of the SCOR model and adapt it for the defense environment (known as MILSCOR). This chapter will provide an introduction to the MILSCOR model, address why it's important, define the target audience, and provide detailed information on MILSCOR's five performance attributes: Reliability; Responsiveness; Agility; Cost; and Asset Management. Chapter Four will examine the transformational elements for organizational change required for MILSCOR implementation and will provide a literature review, discussion of barriers, and recommendations for improvement. Chapter Five will examine the transactional elements for organizational change required for MILSCOR implementation and will provide a literature review, discussion of barriers, and recommendations for improvement. Chapter Six will provide a brief applied case study comparing the support strategies of the CF34 and TF34 aircraft engines. Chapter Seven will provide concluding remarks.

Fundamental Definitions

Understanding the definitions to be used within the confines of the research is important to ensure readers recognize how the most important terms will be used. Of particular significance are definitions of supply-chain management and logistics management that will be clarified below.

Multiple definitions of supply-chain management exist within the literature. The Council of Supply Chain Management (CSCMP) is considered to be the basis for much of commercial knowledge on the subject and sets many standards used within industry for supply-chain management processes and metrics.

> CSCMP's Definition of Supply Chain Management (SCM): *"Supply chain management encompasses the planning and management of all activities involved in sourcing and procurement, conversion, and all logistics management activities. Importantly, it also includes coordination and collaboration with channel partners, which can be suppliers, intermediaries, third party service providers, and customers. In essence, supply chain management integrates supply and demand management within and across companies"*[2]
>
> Supply Chain Management – Boundaries and Relationships: *"Supply chain management is an integrating function with primary responsibility for linking major business functions and business processes within and across companies into a cohesive and high-performing business model. It includes all of the logistics management activities noted above, as well as manufacturing operations, and it drives coordination of processes and activities with and across marketing, sales, product design, finance, and information technology"*[3]

An important point for this research is the fact that the entire process must be viewed as one system—an end-to-end enterprise with multiple links, each

---

[2] CSCMP. (2010). CSCMP supply chain management definitions. *Council of Supply Chain Management Professional*s. Retrieved from.http://cscmp.org/aboutcscmp/definitions.asp.

[3] IBID.

contributing to the overall process and results. As can be seen from the definitions provided, SCM refers to a higher-level effort than logistics management and includes a focus on the linking of major business functions and processes across entities for the purposes of improving performance. Per the CSCMP, logistics management is a component of SCM that focuses more specifically on the flow of goods from point of origin to the end user.

> CSCMP's Definition of Logistics Management: *"Logistics management is that part of supply chain management that plans, implements, and controls the efficient, effective forward and reverses flow and storage of goods, services and related information between the point of origin and the point of consumption in order to meet customers' requirements"*.[4]

> Logistics Management – Boundaries and Relationships: "*Logistics management activities typically include inbound and outbound transportation management, fleet management, warehousing, materials handling, order fulfillment, logistics network design, inventory management, supply/demand planning, and management of third party logistics services providers. To varying degrees, the logistics function also includes sourcing and procurement, production planning and scheduling, packaging and assembly, and customer service. It is involved in all levels of planning and execution--strategic, operational and tactical. Logistics management is an integrating function, which coordinates and optimizes all logistics activities, as well as integrates logistics activities with other functions including marketing, sales manufacturing, finance, and information technology"*.[5]

Of particular interest is the fact that both definitions of SCM and logistics management fail to note the importance of on-going maintenance, support, upgrades, etc. which may be required following the initial delivery of a good and/or service to the end user. These are key factors that are vitally important when considering such concepts within a military context. Delivery of the good/service from production through to the customer is only the beginning...all aspects of support and interaction after reaching the customer

---

[4] IBID.
[5] IBID.

are equally important, i.e. upgrades, maintenance, etc. Because this research is focused on the application of logistics management and supply-chain management performance improvement efforts within the Department of Defense, the definition to be used will be from DoD's Joint Publication 4.0 in conjunction with the definitions provide by CSCMP for SCM and logistics management.

> Logistics Definition from Joint Publication 4.0: *"Planning and executing the movement and support of forces. It includes those aspects of military operations that deal with: a. design and development, acquisition, storage, movement, distribution, maintenance, evacuation, and disposition of materiel; b. movement, evacuation, and hospitalization of personnel; c. acquisition or construction, maintenance, operation, and disposition of facilities; and d. acquisition or furnishing of services"*.[6]

Historical Baselines for Supply-Chain Management in Business

Providing definitions is only a first step to clearly articulate the research problem to be examined in this dissertation. The next step is to establish baselines for recognition of the importance for performance evaluation and metrics for supply-chain management in the private sector. The beginnings of supply-chain management in business can be traced to numerous innovations that took place with the 1980's and early 1990's which have contributed to most common practices within industry today. More specifically, the textile and grocery industries were of particular importance, as they began to streamline operations and seek ways to improve supply-chain efficiency. For example, an initial study by the "Crafted with Pride in the USA Council" in 1984 examined sources of delay for the apparel supply-chain and found average delivery time for a garment made in the USA to get from raw

---

[6] United States Joint Chiefs of Staff. (2008). *Joint Publication 4-0: Joint Logistics*. United States Department of Defense.

materials to the consumer was 66 weeks with an amazing 40 weeks of that time being devoted to the merchandise either sitting idle in a warehouse or in transit to another location. This use of metrics and collection of important supply-chain performance data is now commonplace now across the business world.[7]

Likewise, further work done by the Efficient Consumer Response Working Group in 1992 sought to find solutions to improve supply-chain performance. This group recognized the importance of using electronic data interchange (EDI) and point of sale (POS) to more accurately forecast customer demand and respond to market fluctuation. The result was a reduction of supply-chain inventory by some 37 percent through improvements and greater reliance upon the EDI and POS innovations to transform supply-chain operations from inventory push to a customer driven demand-pull system.[8] Hewlett-Packard also actively worked during the early 1990's to seek supply-chain performance improvements by linking distribution to manufacturing through the creation of a distribution requirements planning (DRP) system that further enhanced a demand-pulled centered supply-chain strategy.[9] Whirlpool was also a firm who undertook major internal changes to demonstrate a newfound focus on logistics within the supply-chain by creating a corporate level vice

---

[7] Lummus, R. & Vokurka R. (1999). Defining supply chain management: a historical perspective and practical guidelines. *Industrial Management and Data Systems,* 99 (1), 11–17.
[8] Kurt Salmon Associates, Inc. (1993). *Efficient consumer response: Enhancing consumer value in the grocery industry*. Washington, D.C.: Food Marketing Institute.
[9] Hammel, T., & Kopcak L. (1993). Tightening the supply chain. *Production and Inventory Management Journal,* 34(2), 63-70.

president focused on logistics and initiating sole-source agreements with certain suppliers along with the use of EDI on a daily basis with these suppliers. These innovations led to increases in product availability to between 90 and 95 percent, reduced inventories by 15 to 20 percent as well as lead times as short as 5 days.[10] Wal-Mart, perhaps most visible today as a major contributor to innovations in supply-chain management, was one of the first firms to begin working with suppliers directly (bypassing middle-men such as wholesalers) and making the manufacturers themselves responsible for managing on-site inventory, a practice known as "Vendor Managed Inventory or VMI"[11]. The introduction of these innovations have made Wal-Mart an example of world-class supply-chain management with near 100 percent order fulfillment rates for those goods managed by vendors.[12]

These initial commercial innovations in supply-chain management and logistics management have contributed to numerous other innovations in the private sector today. In particular, these innovations highlight the importance of utilizing metrics to evaluate current performance and measurement of improvements to fully understand potential return on investment. Furthermore, these innovations highlight how integration throughout the chain (information or otherwise) was initially viewed as a key to performance

---

[10] Davis, D. 1995. State of a new art: manufacturers and trading partners learn as they go. *Manufacturing Systems,* 13(8), 2-10.

[11] This type of inventory management system has directly influenced the recent introduction of prime vendors within DoD.

[12] Johnson, M.E., & Davis, T. (1995). Gaining and edge with supply chain management. *APICS -- The Performance Advantage,* 5(12), 26-31.

improvement. A consequence of greater integration is information sharing (either upstream or downstream) which not only aids ensuring visibility throughout the chain, but also ensures that performance measurement can occur. Additionally, these innovations highlight how SCM was recognized as a centrally important function requiring specific competency within the organization. Finally, these examples demonstrate the value of incentives (such as cost savings) and what they mean for an organization in terms of incentivizing for continuous improvement and incentivizing personnel for achieving high-levels of performance.

Military and Commercial Supply Chains

Typical commercial supply chains focus on physical efficiency, emphasizing low operating costs, inventory minimization, etc. Alternatively, military supply-chains are typically focused on responsiveness and surge capabilities.[13] For example, some of the quickest responding forces in the military include the Marine Corps, Marine Expeditionary Unit (MEU) which is equipped with some 2,200 Marines and Sailors as well as dozens of armored vehicles and aircraft who are tasked with responding to an initial order for deployment within 6 hours.[14] This example highlights the speed at which a military supply-chain may need to operate, but its important to note that volume is important as well. On a much larger scale, support for Operation Iraqi Freedom (OIF) moved the equivalent of the contents of over 150 Wal-Mart

[13] Wang, Y.D. (2006). *Factory to foxhole: Improving the army's supply chain*. RAND Corporation.

[14] United States Marine Corps (2010). 6 Hours: A marine expeditionary unit needs only six hours to plan and mobilize a mission.

superstores to Kuwait to support some 250,000 soldiers, sailors, airmen, and marines.[15]

While it is widely recognized that high-performance standards for SCM have existed in the private sector for some time, a common critique is to identify vast differences that exist between the military and commercial supply-chains. On the surface it may not seem like a supply-chain from a world-class supplier is vastly different from that of the DoD, however there are unique factors that must be considered which make military supply-chains different. While these differences do indeed exist, they only exist as additional challenges that must be overcome and should not be misconstrued as insurmountable obstacles which prohibit DoD's efforts to achieve high-level, SCM performance improvement. In any research on DoD's supply-chain, the following considerations must be recognized and understood:

DoD's requirements are often mission critical

Perhaps the most obvious difference between commercial and military supply-chains is the fact that DoD needs are "mission critical." In rough terms, this translates to the fact that lives may be lost if water, fuel, ammunition, or other vital supplies are not provided (or if weapons systems are not fully-operational). Thus, the consequences for failure if the military supply-chain is un-reliable, imprecise, or inefficient are far higher than those for a typical commercial firm—whose typical losses are calculated in revenue or profit

[15] Wang, (2006).

alone and not human life. These mission critical requirements force DoD to build in redundancies, have lengthy rules and regulations, and cultivate a general attitude of distrust and resistance to change within the services. Each of these factors contributes to greater inefficiency throughout the process and greatly differentiates military supply-chain from a typical commercial supply-chain.[16]

DoD has three separate supply chains

While the commercial sector typically refers to a single supply-chain to describe its end-to-end processes of obtaining goods/services and delivering them to the customer, DoD is tasked with actively managing three distinct supply-chains that each demand very different management approaches and fall under widely different policy guidance.

> ***1. Commodity Chain.*** First, these fast moving, and low volume items such as medicine, food, and clothing that can be readily acquired in the commercial sector are apart of the commodity chain. The flow of goods through this supply-chain is characteristic of what can be expected from a typical commercial supply-chain. The items that are procured through this chain are representative of all of the consumable needs of a large group of people.
>
> ***2. Weapons Chain.*** Very different from the commodity chain is the weapons chain. This chain is unique to the military in its purpose (although in some instances comparisons can be made to support which may be required for heavy equipment, commercial aircraft, and ships). This chain is focused on providing the on-going maintenance and support that is required to keep major weapons systems functioning for the warfighter.
>
> ***3. Deployment Chain.*** Third, is the transportation of men and support materiel (deployment chain) which is required for military operations. Typically this is required on short-notice, across vast distances and in many cases under difficult conditions (such as current military redeployments taking place from Iraq to Afghanistan through the Khyber Pass). This chain does something that typically only the military does and cannot be aptly replicated in the commercial world outside of

[16] Wharton School of the University of Pennsylvania. (2003). Managing supply chains: What the military can teach business (and vice versa)." *Knowledge@Wharton*.

this context.[17]

Cultural resistance throughout the chain

Because requirements are mission critical in DoD, each link in the chain is often hesitant to rely upon the other links. Further, little incentive exists to align interests across the chain for mission success thus contributing to a general sentiment of cultural resistance to integration across the Department's supply-chain enterprise. Because of these factors, the services seek to ensure they are insulated to meet their own specific mission requirements (which may or may not be directly tied to improving warfighter outcomes). An example would be where a Supply Officer in a maintenance depot decides to order the same part multiple times to ensure he is covered to meet his demand requirements since he may believe the supply-chain to be unreliable. In this case, despite the fact that multiple orders for the same part may place additional burdens on the supply-chain that could negatively impact warfighter readiness, the action is undertaken anyway because this particular Supply Officer is concerned about only meeting his requirement. This approach to supply-chain management is incredibly different than in the commercial world as profit motives tend to align members of the chain. This type of distrust and cultural resistance leads to redundancy, poor visibility, communication, and inefficiency.[18]

---

[17] IBID.
[18] IBID.

The presence of cultural resistance has been widely noted.[19] Kotter—who is well known for undertaking quality research in this area—highlights four types of resistance that this researcher believes to be endemic within the Department.

- *Parochial self-interest* where people believe they will lose something of value as a result. As applied to DoD this could be considered applicable to the military services believing they will lose budgetary resources because a new innovation may permit them to accomplish a mission more efficiently.

- *Misunderstanding and lack of trust* where people do not understand the implications of change and believe it will cost them much more than they will gain from it. As applied to DoD this could be where there has been resistance by the services to undertaking certain joint supply-chain modernization efforts because there is a belief that the costs of giving up individual service autonomy far outweigh the benefits of decreased costs and improved efficiency.

- *Different assessments* where people assess the situation differently than their managers/leaders. As applied to the DoD, missions for each of the service branches are very narrowly focused as compared with the mission of the Secretary of Defense. Consequently what may be a negative for a single military service could be a positive for DoD as a whole.

- *Low tolerance for change* where people are afraid they will not be able to develop new skills/behaviors required of them. As applied to DoD this is typical in cases of DoD logistics where existing acquisition workforce personnel may be resistant to embracing the benefits of advanced technology to accomplish their daily tasks because it requires new learning that may be outside of their comfort zone.[20]

Complexity of the military chain vs. commercial chain

DoD's chain is not only a forward pipeline pushing (or pulling) items through to the warfighter, but it also has reverse and lateral pipelines as well. Unlike

---

[19] Gansler, Jacques S. (2002). "Defense Acquisition History Project Interview of Dr. Jacques S. Gansler," September 12, 2002. Retrieved from http://www.history.army.mil/acquisition/research/int_gansler.html.
Gansler, Jacques S., and Robert E. Luby. (2004). *Transforming government supply chain management*. Rowman & Littlefield.
Abramson, Mark A., and Roland S. Harris. (2003). *The procurement revolution*. Rowman & Littlefield.

[20] Kotter, John. (1999). *John P. Kotter On What Leaders Really Do*. Harvard Business Press.

Wal-Mart and Fed-Ex, when the military moves a product through its supply lines, the end user is still the military (it still owns the product). This creates additional complexity by adding more pipelines besides one that flows forward alone such as in the commercial world. For example, in the event that soldiers are transported to another location, their equipment may be re-allocated to other men in a different unit (such as tanks or armored personnel carriers), this would be considered a lateral pipeline move where the end-user has changed after the product has been delivered. Another example is where a weapons system requires maintenance or upgrades and it will likely need to go backwards through the chain to a depot or other location capable of restoring it to operational condition as is the case with the equipment that must be reset following the draw down from Iraq.[21]

DoD's supply-chain vulnerabilities

Cybersecurity within DoD is paramount for effective military operations. While commercial firms may be vulnerable to individuals seeking to steal information or money, DoD is susceptible to those who seek to undermine the military's efforts to carry out missions that are vital to maintaining American national security. For example, this could occur through the introduction of a Trojan-horse that seeks to disrupt a supply-chain network. The importance of supply-chain cybersecurity has become dominant as the White House's Comprehensive National Cybersecurity Initiative has raised the bar for supply-chain standards through Initiative #11 which seeks to develop a multi-

[21] Wharton 2003.

pronged approach for global supply chain risk management government-wide.[22]

Of particular risk within the realm of cybersecurity for supply-chain management is the potential introduction of security risks during deployment, system operation, and design and development of key supply-chain software and hardware. For DoD, limiting supply-chain security risks initially during software and hardware design/development/deployment requires a strict definition of the particular security properties required to meet DoD's standards. Adding specific language about minimum cybersecurity standards then creates an enforcement problem whereby monitoring contractor performance requires contractual language permitting DoD to review what may be construed as company proprietary practices or trade secrets (such as hardware design specifications or software coding practices). Finally, a contractor's supply-chain security cannot be overlooked either, as often these firms do not complete all work in-house, but rather sub-contract out portions that can be done by others—of particular concern is the foreign sourcing of hardware and software development.[23] These factors all contribute to making cybersecurity within DoD's supply-chain incredibly difficult to achieve.

[22] Hoover, J.N. (2004) Air Force To Tackle Supply Chain Security. Retrieved from http://www.informationweek.com/news/government/security/showArticle.jhtml?articleID=22 6900005.

[23] Ellison, R. J., Goodenough, J.B., Weinstock, C.B. & Woody, C. (2010) *Evaluating and mitigating software supply chain security risks*. Software Engineering Institute, Carnegie Mellon.

On the other hand, physical supply-chain security falls into two categories distinctive categories. The first type of physical security category is physical disruption of the supply-chain by force—such as a direct attack on a forward operating location or a convoy in-theater. The second physical security risk is very different and potentially much more dangerous—this occurs when there is actually the infiltration of improper goods/material into the chain such as counterfeit parts. The impact of this on the supply-chain could be catastrophic as exemplified by recent incidents within DoD:

- **Routers:** The Navy purchased counterfeit network routers that had high failure rates and the potential to shut down entire networks.
- **Global Positioning System:** Oscillators with high rates of failure were provided by a supplier that had been disapproved as a supply source and were used for navigation on thousands of Air Force and Navy systems.
- **DLA Packaging and small parts:** During a 2-year period, a supplier and three coconspirators packaged hundreds of commercial items and repackaged them as military-grade items. For example, the supplier used a basic circuit from a personal computer and repackaged it as a $7,000 circuit for a missile guidance system.[24]

While initial steps have been taken by the Department and some of its defense contractors to implement monitoring systems, the mix of DoD controlled and industry-controlled resources that must be protected adds great complexity to the effort (GAO March 2010). This combination of cybersecurity and physical security vulnerabilities for DoD's supply-chain must be considered in the Departments modernization efforts moving forward.

[24] Government Accountability Office. (2010) *DoD's high risk areas: Observations on DoD's progress and challenges in strategic planning for supply chain management.* Retrieved from http://www.gao.gov/new.items/d10929t.pdf.

Importance of Making DoD's Supply Chain more Effective and Efficient

The short response to this question is three-fold: First, the current economic climate of the United States is such that significant cuts in defense spending are likely to occur in the near future; second, the wide array of threats that exist in the security environment will stretch DoD incredibly thin based on existing capabilities; third, for years DoD's supply-chain and logistics costs have increased due to a variety of contributing factors even during times of reductions in force size. Each of these reasons will be discussed in greater detail below.

Current Economic Climate

First, the historical trend of ever-increasing defense spending has created a difficult situation for DoD to function within given the current economic state of the nation. In 1962, defense spending was roughly $50 billion while today's budget has climbed to well over $600 billion (not including war-time supplemental requests).[25] Due to anticipated increasing demands for additional spending in the coming years (from Social Security, Medicare, Medicaid, etc. and added pressures created by the current economic recession) it is incredibly unlikely the United States will be able to continue on its current path without making a series of difficult choices regarding how discretionary spending is allocated.[26]

---

[25] Office of Management and Budget. (ND). FY 2011 President's Budget: Historical Tables Retrieved from http://www.whitehouse.gov/omb/budget/Historicals/.

[26] Walker, D. M. (2007) *Long-term budget outlook: Deficits matter—Saving our future requires tough choices today*. Washington, D.C.: United States Government Accountability Office.

As defense related spending makes up such a significant portion of the budget—over $600 billion total for FY2010 as compared with only $500 billion for non-defense related discretionary spending, roughly $700 billion for Social Security, and roughly $700 billion for Medicare and Medicaid combined—making defense a prime target for future spending cuts (White House Budget of the United States 2010). As a result of this fiscal reality, many in government believe that in the long-term, the Pentagon will not be given the privilege of having the blank check it seems to have been carrying around for so long. Instead, the twenty-first century will likely mark an era of reform, beginning with fiscal discipline within DoD.

Security Environment

This era of fiscal discipline will be highly difficult to maintain as DoD faces a wide array of challenges in the dynamic security environment of the twenty-first century. As Department of Defense Secretary Gates has recently made clear (along with many others such as Gansler, Walker, Orszag, etc.) the biggest test in the twenty-first century for the Department will be the discrepancy between requirements and available resources.[27] The complete scope of the problems to be faced by the Untied States are well documented in numerous strategic planning resources such as the 2010 Quadrennial Defense Review, 2010 National Security Strategy, and 2008 National Defense

---

[27] Gates, R. M. (2010). *Remarks as delivered by secretary of defense Robert M. Gates*. Retrieved from http://www.defense.gov/speeches/speech.aspx?speechid=1467.

Strategy. More specifically, it has been widely agreed upon that the security factors noted below will be of great concern for the U.S. military in the years to come, drastically changing the nature of its operational focus as well as the policies enacted to provide adequate logistics support. In this environment DoD must be prepared to respond to threats from peer/near peer competitors, non-state actors, WMDs, rogue states, and non-traditional military missions (such as providing humanitarian aid or reconstruction efforts).

State Actors (Peer or near-peer competitors)

The threat posed by state actors, particularly peer or near-peer competitors has traditionally been the focus of U.S. military planning. While currently no clear peer competitor exists, China, Russia, and India serve as potential future near-peer competitors that the U.S. must account for in its military planning today. These peer/near-peer competitors will certainly be aware of American supply-chain vulnerabilities due to the geographical distances that must be covered when the U.S. military seeks to operate overseas. These distances contribute to a host of supply-chain security difficulties (both physical and cyber) that must be overcome in transformation efforts.

Non-State Actors (Al-Qaeda, other terrorist organizations, insurgents)

One of the largest threats the U.S. military will encounter in the twenty-first century is the emergence of numerous non-state actors. Unlike traditional threats posed by peer/near peer competitors, the major difficulty in approaching these groups is that they are not clearly defined by geographical borders. U.S. operations against non-state actors in the future will be incredibly difficult to coordinate as they may take place across an undefined battle space. Such flexibility in location by the enemy can permit them to expose U.S. military weakness, such as forcing the battle into a geographic location that will be very difficult for the U.S. operate for sustained periods of time (such as current operations in the harsh high mountain terrain of Afghanistan where the supply-chain has been forced through the Khyber Pass). For military operations against these forces, logistics planning is incredibly difficult because pre-determined lines of supply and plans may need to be shifted at a moments notice as the battlefield may change rapidly. Furthermore, such uncertainty in the battlefield location creates tremendous stress on securing America's long supply-lines as non-state actors often seek non-traditional means of fighting (such as ambushes and guerrilla tactics). Taking these factors into consideration will further complicate U.S. efforts to modernize its logistics enterprise.

Weapons of Mass Destruction (WMDs) (Threats from non-state actors, rogue states and peer/near peer competitors)

WMD's create another special difficulty for the U.S. military to address. The potential impact of this threat is three-fold. First, the U.S. may be engaged in military operations to identify and secure "loose nukes" to keep them from falling into the wrong hands or perhaps being used, this mission demands a perfect rate of success as the consequences of failure would be catastrophic. The second impact of the WMD threat is the potential fallout after such a weapon is used (either within a war zone or as a terrorist act against a civilian population). In this case the military would be tasked with acting as first responders, to secure the area, minimize the impact, supervise cleanup efforts etc. Finally, the military cannot ignore the potential that impact of a WMD attack on U.S. supply-lines. Examining the invasion of Iraq by the Marines in 2003 demonstrated how the force was restrained from moving forward due to the dependence on the much slower and less agile supply-chain. For example, a chem/bio attack, which is incredibly difficult to defend against and contain afterward, could have been catastrophic in this circumstance. To some degree, the fact that the U.S. has not yet encountered some type of WMD attack is incredibly fortunate. As the United States continues its efforts to modernize its logistics capabilities for the future, it cannot do so without considering the potential impact of WMD's on its supply-chain.

Rogue states (Iran, North Korea, Others)

Similar to the threat posed by peer/near peer competitors, the emergence of rogue states which may be much smaller in size but equally disruptive is an additional twenty-first century security concern that must be addressed by the U.S. military. In these cases, the military must be prepared to take action potentially without typical support of allies and basing at forward operating locations. Such demands require flexibility in logistics planning, asset visibility, effective anticipation of high demand goods and services, as well as adequate security (both cyber and physical) throughout the supply-chain. In cases where the military is engaged in operations against rogue states, the U.S. must also recognize that these states will seek to exploit opportunities to offset traditional American military dominance through asymmetric warfighting and exploiting supply-chain vulnerabilities (both physical and cyber).

Non-traditional DoD missions (humanitarian missions, energy security, pandemics, stability and reconstruction)

Non-traditional DoD missions create added complexity for DoD and must be considered a major part of U.S. military planning for the twenty-first century. As can be easily seen from recent events such as Hurricane Katrina, earthquakes in Haiti and Pakistan, the Swine Flu outbreak, and the Gulf oil spill, non-traditional military missions are now demanding a major military presence. While it is true DoD is accustomed to operating in difficult conditions, such operations typically tend to be within a war-zone where the U.S. is managing an operation in its entirety. In the realm of non-traditional missions, the military often finds itself as a single member of a larger group (public or private) that is responding to the crisis. In these cases, DoD will not be functioning autonomously, but will be working as part of a group of government, national/international organizations, other state or local officials, and even private corporations.[28]

DoD must recognize the complex interactions that exist within this network to facilitate mission success. More specifically, in these scenarios DoD will be functioning within a disintegrated supply-chain composed of several autonomously functioning groups. To succeed throughout these operations, DoD must retain the capability to effectively interoperate with these groups, provide access to critical information, have communication capabilities across multiple methods (voice, data, etc.), and be flexible enough to adjust "standard" operating procedures for contingencies as they develop. The imperative for DoD's supply-chain under these conditions is to remain flexible, adaptive, and responsive to the needs on the ground and while functioning cooperatively with all other support agencies e.g. DHS (FEMA), State, Local, etc. to permit overall mission success.

Because of the widely variable nature of the missions to be undertaken in the future by DoD within this resource constrained environment the "do more with less" mantra will likely flourish for in the coming years. Thus, DoD must find ways to achieve mission success while drastically cutting costs. This emphasis puts logistics and supply-chain improvement at the forefront of DoD priorities for twenty-first century planning. As Operations &

---

[28] Goldsmith, S. & Eggers, W.D. (2004) *Governing by Network*. Brookings Institution Press.

Maintenance (O&M) spending is a major proportion of DoD's overall budget (over 40 percent), it then becomes vitally important to ensure resources within this spending category are being used as efficiently and effectively as possible.

O&M spending has perpetually increased despite periodic of reductions in force size

For several reasons, DoD spending on O&M have perpetually increased and will likely continue to increase in the future unless major changes to its logistics and supply-chain approach are undertaken to improve effectiveness and efficiency. Historical spending on O&M demonstrates how Department spending has been perpetually increasing despite the end of the Cold War. Since 1962, the highest spending on O&M is the budget estimated for FY2011 at just over $318 billion (or some 42 percent) of a total defense budget of $749 billion.[29]

Whereas from 1962 to 1971 an annual average of some $66.5 billion (roughly 24.7 percent of the total defense budget) was devoted to O&M, from 2002 to the present an annual average of some $552.3 billion (or roughly 34.7 percent of the total budget) was devoted to O&M.[30] Interestingly, the number of active duty members in the military was over double (just over 3 million avg.) in the earlier period from 1962-1971 compared to those in active service today

[29] OMB, (2010).
[30] IBID.

(roughly 1.5m).[31] For example, Army divisions through the 1980s and 1990s decreased in size significantly from 16 in 1981 to 10 in 1996.[32]

Other reductions have occurred as well, for example, Army tank miles for training also decreased significantly from just over 3 million in 1981 to nearly half that number or 1.6 million by 1996. For the Navy, the story is similar as the number of ships in the fleet decreased significantly during this period as well from 460 in 1981 to 288 in 1996. Furthermore, Navy underway steaming hours also decreased significantly from just over 1.1 million hours to 812 thousand hours. Moreover, the Air Force has exhibited similar decreases in size. For example, tactical wings shrunk by nearly 50 percent during the same period from 24 to 12.5 while Air Force flying hours dedicated to training decreased by over 40 percent from 1.1 million to just over 650,000. Despite these decreases, spending on O&M has continued to rise. In short, it costs DoD more today to provide significantly less men and material than during the Cold War.[33]

Examining this high-level data in isolation yields some interesting general conclusions. First, DoD is spending far more now on O&M than before not only in terms of real dollars but also as a total proportion of defense spending

---

[31] Daggett, S. & Belasco, A (2002). *CRS report for Congress: Defense budget for FY2003: Data summary*. Congressional Research Service.
, Estevez, (2010).
[32] Congressional Budget Office. (1997). *Paying for military readiness and upkeep: Trends in operation and maintenance spending*. Congress of the United States.
[33] OMB, (2010).
CBO, (1997).

despite periods of reductions in force size. Second, after reviewing this data it becomes clear that at such a rate, this type of growth in O&M spending is simply not sustainable by the Department in the long-term—thus reductions in spending within O&M must occur while maintaining the ability to consistently achieve mission success (the proverbial resources/requirements problem of the twenty-first century Defense Department). On the surface, these facts appear to be directly tied to the increasing costs of maintaining aging equipment and poor acquisition outcomes/new system production delays (known as the "death spiral), as well as the recent use of equipment at much higher than intended operating rates.

The Death Spiral – Acquisition delays and aging equipment creates exponential growth to maintenance costs

An additional contributing factor to the desperate need for supply-chain modernization is the explosion of costs that occur due to acquisition delays and aging equipment. Simply put, the older equipment becomes, the costlier it is to maintain. The death spiral, as coined by Gansler, is defined as a cycle where aging weapons systems coupled with inefficient maintenance and support programs contribute to a diversion defense dollars to the O&M accounts. This shift in spending then contributes to the deferral of the procurement of new weapons, which then directly results in a reliance upon the legacy systems which are highly expensive to maintain as they age.[34]

[34] Spring, B. (2010). Performance-based logistics: Making the military more efficient. *The Heritage Foundation*.

For example, over the past decade the military has invested billions of dollars in upgrading and extending the lives of many 30-plus-year-old aircraft. The difficulty in maintaining these aircraft beyond their initial intended operating life is incredibly difficult because of the delicate nature of the maintenance work that must be done given their age. As noted by one scholar "they cannot just pop out old, tired parts and snap in new ones: The process is more like pulling one strand on a sweater and hoping that the whole thing doesn't unravel." An example of this problem was experienced in one repair effort on the Air Force's F-15's. In this case, some $250,000 in labor was required to replace a $12,000 part because the mechanics had to very carefully peel back the aircraft's steel skin and delicately pull off its ribs in order to access the location of the part which needed to be replaced.[35]

This relationship between age of aircraft and increased maintenance costs has been widely documented.[36] The generally agreed upon findings from research on the subject essentially conclude that spending on O&M for aircraft increases by 1 percent to 3 percent for every additional year of age, after adjusting for inflation, while each additional year of age could decrease time

---

[35] Freedberg, S.J. (2008) Aging aircraft. *National Journal*.

[36] Levy, R.A. (1991). *ASPA and the effect of deferred depot maintenance on airframe rework cost.* Center for Naval Analyses.

Johnson,J. (1993). *Age impacts on operating and support costs: Navy aircraft age analysis methodology*. Naval Aviation Maintenance Office.

Francis, P. & Shaw, G. (2000) *Effect of Aircraft Age on Maintenance Costs*. Alexandria, VA: Center for Naval Analyses.

between breakdowns from 1 percent to 7 percent while increasing downtime anywhere from 1 percent to 9 percent.[37]

For the Air Force, these figures could translate into an increase of some $80 million to $230 million per year in an annual O&M budget of approximately $22 billion (CBO 2001). Likewise, for the Navy, spending could increase by $40 million to $130 million per year in an annual O&M budget of approximately $23 billion). Because these costs compound overtime, increases in maintenance expenditures will then continue to grow exponentially as some systems reach unprecedented ages. For example, the average age of U.S. military aircraft is more than 24 years making it the oldest force in American history. Some aircraft such as the B-52 are actually nearly 50 years old. As one scholar notes, "to put that age in perspective, our B-52 bombers and KC-135 air refueling tankers are analogous to flying biplanes like the Sop-with Camel in the Vietnam War".[38]

Extending the service life of aircraft well beyond initial life-cycle estimates has greatly contributed to O&M cost growth. In the fiscally constrained future, DoD will likely continue capitalize on extending the life of existing systems as opposed to seeking replacements. For this reason, maintenance costs will undoubtedly continue to escalate thus putting a premium on supply-

---

[37] CBO, (2001).
[38] Worden, R.M. (2008). Developing Twenty-First-Century Airpower Strategists. *Strategic Studies Quarterly.* Spring, 18-32.

chain management, efficiency optimization, and techniques for achieving maximum cost savings.

An additional contributing factor to the "death spiral" are the consistent delays in production of new weapons systems caused by a poorly performing DoD acquisition system. In short, DoD's acquisition system, while producing world-class weapons which provide a major war-fighting advantage for our soldiers, sailors, marines and airmen, have done so while failing to meet many basic cost, schedule or performance requirements throughout the acquisition cycle.[39] As a result of numerous delays in the acquisition of new systems, legacy systems are forced to have their life-cycles extended well beyond initially planned timelines. As noted previously, this extension then contributes directly to significant cost growth for maintenance.

One recent example of this problem can be found in the life-cycle extensions of the F/A-18 Hornet due to the delayed delivery of the F-35 lightning aircraft. Although current procurement plans call for the purchase of about 700 new fighter aircraft over the next 15 years, the Navy is projecting that purchases planned for the next 5 to 10 years will be unable to keep pace with the retirement of today's F/A-18A-D Hornets as they reach the limit of their

[39] Gansler, J.S. & Lucyshyn, W. (2008). *Commercial-off-the-shelf (COTS): Doing it right.* University of Maryland Center for Public Policy and Private Enterprise.
Gansler, J.S., Lucyshyn, W. & Spiers, A. (2008). *Using spiral development to reduce acquisition cycle times*. University of Maryland Center for Public Policy and Private Enterprise.

service life.[40] Consequently, a host of suggested remedies have been proposed including:

- Extended service life of current F/A-18A-D by roughly 7 to 8 percent through added structural repairs and more frequent inspections at a cost of $2.2B;
- Implement a service-life extension program requiring more extensive modifications to extend service life of F/A-18A-D by roughly 25 percent at a cost of $7.2B;
- Purchase more Super Hornets at a cost of $12-13B;
- Purchase additional Super Hornets while reducing JSF purchases simultaneously (this option would cost between $3.8 to $4.8B).[41]

Clearly, each of these options increase costs for DoD significantly as the planned F-35 acquisition was supposed to ameliorate the problems associated with extending the service life of aircraft are ready for retirement. Such problems, persist across the Department as the average delay for Major Defense Acquisition Programs (MDAPs) is 21 months.[42]

As one can infer, delays in weapons systems modernization programs have a direct impact on service life of legacy systems and contribute to high growth in weapons systems support costs over the life-cycle. In short, cost growth is contagious when programs for new systems experience delays as additional funds must be allocated to extend the service-life of legacy platforms. As long as the acquisition system continues to delay production of much needed replacement weapons systems, O&M costs will continue to rise. These

---

[40] CBO, (2010).

[41] IBID.

[42] Government Accountability Office. (2009). *Defense acquisitions: DOD must prioritize its weapon system acquisitions and balance them with available resources*. Government Accountability Office.

increases in the face of budget pressures in the current environment demand supply-chain management reform to improve efficiency and effectiveness.

Using equipment at higher than intended operating rates

Another contributing factor to increasing O&M costs is the effect of using equipment at higher than intended operating rates. The reasons for doing this can be as a result of additional equipment being unavailable because it may be currently broken down, undergoing maintenance, or simply not having enough of particular equipment in existence due to inadequate operational estimates. As equipment is used more frequently then it was initially designed to be used or when used in extreme conditions, it then requires maintenance more often. In some cases, operating conditions in Iraq and Afghanistan, particularly the presence of sand and dust, have led the DoD to recognize that additional maintenance and reset efforts are required as platforms being used need more extensive repairs than the had been originally anticipated, ultimately resulting in higher O&M costs.[43]

In recent operations in Iraq and Afghanistan, many of the Army's major systems are operating at rates that exceed—sometimes by factors of five or six— their average operating rates in peacetime. For example as noted by the CBO, helicopters, which have been heavily used in Afghanistan and Iraq, are

---

[43] King, T.K. (2009). Pit crew maintenance in the brigade support battalion. *Army Logistician.* Daniel, L. (2010). Tempo takes toll on navy, marine equipment. Retrieved from http://www.navy.mil/search/display.asp?story_id=51559.

flying at rates two to three times the average pace of active-duty units' peacetime operations. Further, combat vehicles (such as tanks, Bradley fighting vehicles, and Stryker vehicles) are driving four to six times the typical monthly distances in current operations. Based on these high operating rates for equipment, CBO estimates repair costs for depot-level maintenance doubled from 2005 to 2006, while the Administration request for funding for this purpose more than tripled between 2005 and 2007.[44]

When equipment is used at higher than intended operating rates, DoD must spend additional funds (in many cases which was unplanned) to keep this equipment operational. The disconnection between operational requirements and available weapons systems can result in added costs (either via added near term maintenance requirements or longer term replacement costs). In either case, this practice adds to O&M costs for DoD and will create additional pressures in the future to meet operational objectives. The current environment now places a premium on cost savings and supply-chain management to ensure high operational tempos can be supported without a significant increase in costs—a greater emphasis on efficiency and effectiveness.

[44] CBO, (2007).

Chapter 2: Literature Review

This literature review will examine several subjects in the literature to identify a baseline of knowledge in academic research that will support the topics to be addressed in this dissertation regarding supply-chain management and commercial best practices for the evaluation of performance improvements within the United States Department of Defense. Furthermore this literature review will highlight the gap that exists within current publications as related to evaluation of supply-chain performance improvement within the Department of Defense.

Introduction to Supply Chain Management (SCM)

Since its introduction in the early 1980s, supply-chain management (SCM) has caught on as a highly important concept to be explored by both academics and the business community.[45] Recognizing the need for optimization of all links in the chain, the recent explosion in SCM has encouraged innovation across the business world and has driven the study from its early beginnings as a term of art, into a highly complex, continuously evolving science today.

One of the contributing factors to the SCM movement today occurred in the 1990s when a trend towards so-called "business process engineering" emerged. This effort sought to encourage efficiency through integration of

[45] Oliver, R.K., & Webber, M.D. (1992). Supply chain management: logistics catches up with strategy, in *Logistics, The Strategic Issue*. Chapman & Hall.

logistics, operations management, and business functions across organizations to improve the efficiency of product flows from initial raw material stage all the way through to the customer. The information revolution during this period, helped to facilitate rapid improvements in efficiency, visibility and communication between supply-chain members thus opening up firms to the possibility of radical improvements in operations.

Despite this promise of universal progress, for some, the results have been mixed as cultural differences, resistance to change and other contributing factors have stymied successful business transformation in some organizations (such as DoD).[46] The push to evaluate improvement and take advantage of the benefits afforded by information technology has placed a special emphasis on methods of performance evaluation for the purposes of pinpointing improvement (and failure) to better understand how best an organization should apply its resources—a subject to be initially covered in this literature review.

More specifically, as related to SCM, this literature review will examine common metrics for measuring improvement in the supply-chain including cost, customer responsiveness, activity time, flexibility, integration and the Supply-Chain Operations Reference Model (SCOR).

---

[46] Christopher, M. & Peck, H. (2004). *Building the Resilient Supply Chain*. Cranfield School of Management.

Metrics for Measuring Improvement in Supply Chain Management

"If you can't measure it, you can't manage it."
-Peter Drucker

As most management scholars are astutely aware, Mr. Drucker's assessment has far reaching implications for anyone who is working to enhance organizational performance. Such an observation is of course no less important for those seeking to maximize performance of supply-chains. In this case, measurement has the ability to provide managers and organizations feedback information permitting performance monitoring that can identify where improvement is needed. Such monitoring ultimately has a direct impact on an organization and those individuals working within it, as the ability to monitor performance can contribute to motivating the personnel involved to better communicate and work together to diagnose problems for the purposes of resolving issues and improving performance.[47]

Per Neely et. al., performance measurement has been typically defined as the "process of quantifying effectiveness and efficiency of action".[48] This can be further explained as the ability to communicate and report performance through the use of symbols or metrics.[49] A metric is considered to be a definition of the measurement that includes information such as how it will be

---

[47] Rolstandas, A. (1995). *Performance measurement: A business process benchmarking approach*. Chapman & Hall.

[48] Neely, A., Gregory, M. & Platts, K. (1995). Performance measurement system design. *International Journal of Operations and Production Management*,15: 80-116.

[49] Lebas, M.J. (1995). Performance measurement and performance management. *International Journal of Production Economics,* 41(1): 23-25.

calculated, who will be calculating it and the origin of the data.[50] In logistics, early research noted that measurement could be considered one of four core competencies that were important to achieve so-called “world-class performance.” As noted by the Global Logistics Research Team at Michigan State University, the other three competencies include positioning, integration and agility.[51]

Measurement, as applied to the subject of SCM, can permit understanding across organizations throughout the chain and promote integration and communication. Often members of the supply-chain may have different organizational goals and missions, however the introduction of performance metrics across the chain can help align organizations, promote the redesigning of business goals, help develop overarching strategies, and reform processes to meet supply-chain demands.[52] To date, much research has been undertaken to evaluate performance measurement techniques in SCM and provide insight into new methods for undertaking such work through the use of individual metrics and evaluation frameworks. Early research into the field began with highlighting the differences in key measurement parameters: those which were quantitative (such as costs) and those that were qualitative (such as

---

[50] Neely et al., (1995).

[51] The Global Logistics Research Team at Michigan State University. (1995). *World Class Logistics*. Council of Logistics Management.

[52] Chan, Felix T.S., & Qi, H.J. (2003). An innovative performance measurement method for supply chain management. *Supply Chain Management: An International Journal,* 8(3), 209-223.

customer satisfaction and responsiveness).[53] Later, Beamon continued this initial work by identifying three types of more specific measurements to be applied to evaluation of supply-chain performance: resources, output and flexibility.[54]

Gunasekaran et al. (2001) developed a different type of framework for evaluating performance at the strategic, tactical, and operational levels in a supply-chain. This innovative work addressed performance evaluation at these levels for supplier, delivery, customer service, and inventory and logistics costs.[55] Other research has suggested a move away from traditional metrics (such as cost, flexibility, customer satisfaction, etc.) to evaluate supply-chain performance. Non-traditional metrics suggested by Basu appear in five distinctive categories: external, consumer, value-based competition, network performance, and intellectual capital.[56]

One of the reasons which perhaps contributes to the wide variety of opinions on precisely which metrics should be used to measure supply-chain performance is the previously noted lack of a common vision across the supply-chain and likelihood that different members in the chain will react

---

[53] Beamon, B.M.(1999).Measuring supply chain performance. *International Journal of Operations and Production Management*, 19 (3),275–292.
_______. (1998). Supply chain design and analysis: Models and methods. *International Journal of Production Economics* 55, 281-294.
[54] IBID.
[55] Gunasekaran, A., Patel, C. & Tirtiroglu, E. (2001). Performance measures and metrics in a supply chain environment. *International Journal of Operations & Production Management*, 21(1),71-87.
[56] Basu, R. (2001). New criteria of performance measurement. *Meas. Bus. Excel.*, 5, 7-12.

differently to different metrics. Research completed by Spekman et. al. who surveyed 22 private sector firms on the matter has lent significant support to this claim.[57]

When examining standalone metrics for measuring performance improvement in supply-chain modernization, cost is typically the first metric that is discussed. From the point of view of the private firm, cost minimization for the purposes of permitting profit maximization has long been seen as an incentive to making general efficiency/performance improvements within an organization.

Cost as a Measure of Improvement

Cost is a relatively easy measure of performance that tends to reflect meeting strict economic goals of private sector firms (or public sector institutions). Much research has been completed on the subject of using cost as a metric across the supply-chain for gauging performance improvement.[58] The types of costs that can be measured can be very different depending on the type of

---

[57] Spekman, R.E., Kamauff Jr., J.W., & Mhyr, N. (1998). An empirical investigation into supply chain management: a perspective on partnership. *Supply Chain Management* 3,53-67.

[58] Venkatraman, N., & Ramanujam, V. (1987). Measurement of business economic performance: an examination of method convergence. *Journal of Management,* 13,109-122.

Cohen, M.A., & Lee, H.L. (1989). Resource deployment analysis of global manufacturing and distribution networks. *Journal of Manufacturing and Operations Management,* 2,81-104.

———. (1988). Strategic analysis of integrated production-distribution systems: models and methods. *Operations Research,* 36 (2), 216-228.

information an organization cares about, and the data they are collecting.

For example, some costs that could be measured according to Chan include:

1. *Distribution Cost:* Such costs typically include the transportation and handling costs, safety stock cost, and duty required for movement of goods throughout various points in the supply-chain (these costs are very important for DoD).
2. *Manufacturing Cost.* Such costs include labor, maintenance and re-work costs for goods. Also, there are purchased materials, equipment charges and the supplier's margin (both supplier and supplier's supplier are included).
3. *Inventory Cost.* Such costs include the work-in-process and value of finished goods inventories.
4. *Warehouse cost.* This cost reflects the allocation from one tier to another and typically encompasses only the finished goods.
5. *Incentive Cost and Subsidy.* These costs include any taxes and subsidies provided to a member of the chain.
6. *Intangible Cost.* These costs include quality costs, product adaptation or performance costs and coordination (such costs are incredibly difficult for DoD to evaluate).
7. *Overhead Cost.* This cost is considered to be the total current landed costs.
8. *Sensitivity to Long-term Cost.* Long-term costs typically include more general estimates of productivity and wage changes, currency exchange rate changes, etc. This cost is especially important for global supply-chains in the twenty-first century environment.[59]

While on the surface these cost metrics appear to be incredibly valuable, they do not tell the entire story of performance improvement within a supply-chain. A fact well documented in the literature, financial performance metrics alone do little to illustrate the full range of problems a supply-chain may have or identify areas of much needed improvement.[60]

Specific criticism of using costs alone for performance measurement include the problem with shifting a supply-chain's focus to short-term profit

[59] This cost is also an area of potential future research for DoD. More specifically an evaluation of cost reductions that could be expected from embracement of globalized business practices could be incredibly valuable.
[60] Neely et. al., (1995) and Beamon, (1999).

maximization, encouragement of local vendor optimization alone (not across the greater chain itself), and a general failure to support continuous improvement.[61] As a result of these factors, many scholars believe that examination of additional performance metrics beyond cost alone must be undertaken to gain a clearer picture of supply-chain management performance improvement.

Cost and Activity Time as a Measure of Improvement

Other research has examined the use of multiple metrics for performance improvement including cost and activity time (such as production or distribution times). Typical time-based performance metrics that have been noted in the literature are delivery speed, reliability, and dependability[62], new product development time/introduction[63] and manufacturing lead-time.[64]

While such an approach is certainly more innovative than relying upon financial metrics alone, it does still limit the ability to see clearly into the

[61] Holmberg, S.(2000). A system perspective on supply chain measurement. *International Journal of Physical Distribution & Logistics Management* 30(10), 847-868.
De Toni, A., & Tonchia, S. (2001). Performance measurement systems: models, characteristics and measures. *International Journal of Operations & Production Management* 21 (1),

[62] Handfield, R.B. (1995). *Re-engineering for Time-based Competition*. Quorum.
Roth, A.V., &.Miller, J.G. (1990). Manufacturing strategy, manufacturing strength, managerial success, and economic outcome.. *Manufacturing Strategies*, 97-108.
Vickery, S.K., Droge,C., Yeomans,J.M., & Markland, R.E. (1995). Time-based competition in the furniture industry: an empirical study. *Production and Inventory Management Journal* 36, 14-21.

[63] Safizadeh, M.H., Ritzman,L.P., Sharma, D., & Wood, C. (1996). An empirical analysis of the product–process matrix. *Management Science* 42,1576-91.

[64] Handfield, R.B., & Pannesi, R.T. (1992). An empirical study of delivery speed and reliability. *International Journal of Operations and Production Management* 12 (58).

entirety of a supply-chain and has the potential to still encompass some of the pitfalls noted previously that can occur when using cost alone (isolated focus, short-term time reductions, etc.) without accounting for more important factors like customer responsiveness or, in the case of DoD, weapons system availability.

Cost and Customer Responsiveness as a Measure of Improvement

Another common measure of performance improvement is found in research that has examined cost and customer responsiveness as combined measures of supply-chain performance improvement.[65] Such considerations have been staples in the business world for the past few decades and have contributed to the creation of more advanced metrics and data collection methods. Some initial research on the subject addressed relatively simple aspects of maximizing stock levels and lead times for inventory to ensure costs were minimized while maximizing customer responsiveness (typically this approach is referred to as a "pull type" logistics system).[66]

Towill et. al. examined the limitation of supply-chain performance improvement (in meeting cost and responsiveness goals) by using just-in-time (JIT) production methods alone. Despite findings that noted the

---

[65] Ishii, K., Takahashi, K. & Muramatsu, R. (1988). Integrated production, inventory and distribution systems. *International Journal of Production Research,* 26 (3), 473-82.
Davis, T. (1993). Effective supply chain management. *Sloan Management Review*, 35-46.
Christy, D.P., & Grout, J.R. (1994). Safeguarding supply chain relationships. *International Journal of Production Economics,* 36, 233-42.

[66] Ishii and Muramatsu, (1988).

improvements which can be had in using these metrics for performance evaluation, such improvements often led to a failure to manage the supply-chain as a total system—a concern that has been previously echoed in evaluations of other performance metrics thus far.[67] Other work on the subject noted the importance of implementing safeguards throughout the supply-chain to ensure customer responsiveness.[68] Additional research done by Altiok and Ranjan examined timing of suspending and resuming the production process based on inventory levels to maximize customer responsiveness while minimizing costs.[69] Further research by Newhart et. al. examined supply-chain performance improvement via minimization of product types at various points throughout the chain in conjunction with optimization of safety stock which together were found to permit improved responsiveness to variations in customer demand while minimizing costs in various geographic locations.[70]

Having a slightly different focus, Lee and Billington examined removal of organizational barriers to improve customer responsiveness at Hewlett-Packard (HP). Through examination of feedback from manufacturing managers at HP, they were able to develop a supply-chain model that

---

[67] Towill, D.R., Naim, M.M., & Wikner, J. (1992). Industrial dynamics simulation models in the design of supply chains. *International Journal of Physical Distribution & Logistics Management,* 22(5), 3-13.

[68] Christy and Grout, (1994).

[69] Altiok, T., & Ranjan, R. (1995). Multi-stage, pull-type production/inventory systems. *IIE Transactions,* 27, 190-200.

[70] Newhart, D.D., Stott, K.L., & Vasko, F.J. (1993). Consolidating product sizes to minimize inventory levels for a multi-stage production and distribution systems. *Journal of the Operational Research Society,* 44 (7), 637-44.

provided improved performance for customer responsiveness without having the entire chain centrally controlled.[71]

The sum of this research on cost and customer responsiveness is very similar to the previous research that has been noted—while some limited benefits can be had from using these metrics alone to evaluate supply-chain performance improvement, the fact still remains that many other factors that are vitally important to measuring improvement are being overlooked in much of this research. In short, these few metrics in isolation provide minimal benefit in measuring performance improvement across the entirety of the chain and often contribute to a failure to view the chain as a total inter-related system.

Flexibility as a Measure of Improvement

Some research has suggested that focusing on the flexibility metric was most important for ensuring improved supply-chain performance. Early research done by Voudouris examined improved supply-chain improvement through increased flexibility within the chemical manufacturing industry. More specifically, the research attempted to improve operations once a change was made within the manufacturing setting (such as when a new product was introduced) and sought to provide analysis on maximizing flexibility to reduce

[71] Lee, H.L., & Billington, C. (1993). Material management in decentralized supply chains. *Operations Research,* 41(5), 835-47.

"bottlenecks".[72] Taking this initial research significantly further, Baramichai introduced the Agile Supply Chain Transformation Matrix (ASCTM) to be used for optimizing agility within the supply-chain through configuration management and business process improvement.[73]

Again, while flexibility is certainly an important metric, its measurement in isolation is not ideal for providing a complete picture of supply-chain modernization. For example, using the flexibility metric alone without taking into account costs or customer responsiveness could be incredibly detrimental to supply-chain improvement efforts.

Integration as a Measure of Improvement

Another common measure of improvement which has been noted extensively in the literature, is integration. Per Pagell, "the entire concept of supply-chain management is really predicated on integration".[74] In much academic research, it has often been noted that the more integration, the better.[75]

---

[72] Voudouris, V.T. (1996). Mathematical programming techniques to debottleneck the supply chain of fine chemical industries. *Computers and Chemical Engineering,* 20, S1269-74.

[73] Baramichai, M., Zimmers, E.W., & Marangos, C.A. (2007). Agile supply chain transformation matrix: An integrated tool for creating an agile enterprise. *Supply Chain Management: an International Journal,* 12, 334-348.

[74] Pagell, M. (2004). Understanding the factors that enable and inhibit the integration of operations, purchasing and logistics. *Journal of Operations Management,* 22(5), 459-87.

[75] Stock, G.N., Greis, N.P. & Kasarda, J.D. (1998). Logistics, strategy and structure: a conceptual framework. *International Journal of Operations & Production Management,* 18 (1), 37-52.

Gimenez, G., & Ventura, E. (2005). Logistics-production, logistics-marketing and external integration – their impact on performance. *International Journal of Operations and Production Management,* 25 (1), 20-38.

However, multiple definitions of integration exist and many researchers who discuss the subject fail to agree upon a unified definition.[76]

In a very general sense, integration can be referred to as trying to achieve two principal outcomes: 1. alignment; and 2. linkage. Alignment is created through the fostering of a common vision, goals, and purpose across organizations that exist as members of the supply-chain. Linkage refers to the creation of an environment that provides open communication, sharing of information, and high levels of interaction between stakeholders involved throughout the chain. The combination of these two factors contribute to supply-chain “integration”.[77]

The information technology revolution of the 1990s has given organizations a tremendous opportunity to improve their business processes, increase efficiency, decrease costs, improve communications, and, ultimately, integration of their supply-chains. Of particular importance in enabling supply-chain integration has been the emergence of e-business, whereby web-based computing permits the execution of all business processes and allows global visibility across the supply-chain—thus affording modern businesses with levels of integration that were previously impossible. Related research by Trkman and Groznik (among several others) has examined the application

---

[76] Pagell, (2004).
[77] Carter, P. L., Monczka, R.M., Ragatz, G.L., & Jennings, P.L. (2009). *Supply chain integration: challenges and good practices*. Tempe, AZ: CAPS Research.

of information technology to complete business process modeling through simulation to demonstrate expected levels of supply-chain improvement that can be had with integration.[78]

While the benefits of measuring integration as a metric for evaluating supply-chain performance improvement have been noted, alternative research by Fabbe-Costes and Jahre has shown that the benefits of integration on supply-chain performance improvement shown thus far in the research may not be entirely convincing. In short, their research found that differences in scope (regarding the level of integration sought) may actually yield different performance results when integration is sought for the purpose of achieving supply-chain performance improvement. Their research demonstrates the need to use a "multi-dimensional approach – not only with regards to the concept of integration, but also to performance and context".[79] This finding supports the previous findings from the review of literature on other supply-chain metrics: when used in isolation the benefits may be limited, what is really needed is an overarching framework that permits the use of multiple metrics for evaluation of supply-chain performance improvements.

---

[78] Trkman & Groznik, (2006).
[79] Fabbe-Costes, N. & Marianne J. (2008). Supply chain integration and performance: a review of the evidence. *The International Journal of Logistics Management,* 19 (2), 130-154.

Frameworks for Measuring Supply-Chain Management Performance Improvement

Much of the research noted above has concluded, to some degree, that metrics used in isolation (particularly those related to cost) without consideration of other vitally important factors have the potential to paint an incorrect picture of the state of a supply-chain and its achieved level of performance.

This literature has tended to point to the need for a "framework" or overarching methodology to be used for the purposes of measuring supply-chain performance improvement. Such a methodology should undertake a systematic approach to performance evaluation that uses a combination of metrics to provide an overall assessment of performance, typically via a performance measurement system (PMS). Kaplan and Norton note that a PMS (such as a balanced scorecard) should be comprehensive enough to permit information throughout the chain in functional areas such as finance, customer internal processes, innovation and improvement. This approach utilizes both financial and operational performance measures throughout the chain at all levels (supply-chain, organizational, functional and team).[80]

As noted by Beamon 1999, three general metrics that should be used in any framework for evaluation of supply-chain performance improvement (or via a

[80] Kaplan, R. S. & Norton, D.P. (1996). *The balanced scorecard*. Boston, MA: Harvard Business School Press.

PMS) include resource measures (generally cost), output measures (generally customer responsiveness), and flexibility measures—a combination of some of the metrics previously mentioned. In what is called a balanced approach—like a balanced scorecard—a large number of supply-chain performance metrics are compiled at strategic, tactical, and operational levels and separated between those which are financial and non-financial in nature.[81] Considered to be one of the most common problems with any PMS is the connection of an organization's strategy or mission with the measurement system being used to evaluate performance.[82] This problem is at the core of DoD's logistics modernization difficulties in recent years. One model that incorporates the best of all worlds including numerous difference types of performance metrics along with a baseline of world-class standards for evaluation is the Supply-Chain Operation Reference Model or SCOR.

SCOR in the Literature

Originally proposed in 1996 by the Supply-Chain Council (SCC), SCOR is a widely accepted framework used to evaluate supply-chain performance improvement today. As defined by the SCC, "the SCOR model provides a unique framework that links business process, metrics, best practices and technology features into a unified structure to support communication among supply chain partners and to improve the effectiveness of supply chain

[81] Beamon, (1999), Gunasekaran et. al., (2001).
[82] Holmberg, (2000)

management and related supply chain improvement activities".[83] The model, which integrates business process re-engineering, bench marking, and process measurement, has wide applicability to both industry and the government and has been used extensively in world-class corporations.[84] The literature has provided numerous references to applications of the SCOR model, the SCOR experience at HP and Intel will be briefly discussed below.[85]

SCOR at HP

Perhaps to be considered one of the most successful applications of the SCOR model has been at Hewlett Packard during its acquisition of Compaq. Of major concern during this period, was the integration of the two companies, their business processes, and supply-chains. Certainly, a careful approach had to be undertaken to ensure continuity of operations was maintained along with the strengths that each company had previously brought forth to bare prior to the merger. As of 2006, HP was the IT industry's largest supply-chain with

---

[83] Supply Chain Council. (2010). What is SCOR? Retrieved from http://supply-chain.org/about/scor/what/is.

[84] Huan, S.H., Sheoran, S.K. & Wang, G. (2004). Review and analysis of the supply chain operation reference (SCOR) model. *Supply Chain Management: an International Journal* 9, 23-29.

[85] Poluha, R. G. (2007). *Application of the SCOR model in supply chain management*. Cambria Press.

Stadtler, H. (2008). *Supply chain management and advanced planning: concepts, models, software, and case studies*. Springer Verlag.

Dong, J., Ding, H., Ren, C., & Wang W. (2006). *IBM SmartSCOR- A SCOR based supply chain transformation platform through simulation and optimization techniques*. IBM China Research Laboratory.

Stewart, G. (1997). Supply-chain operations reference model (SCOR): the first cross-industry framework for integrated supply-chain management. *Logistics Information Management* 10(2), 62-67.

Pierre-Alain, M., Schmitt, P., & Botta-Genoulaz, V. (2009). The SCOR model for the alignment of business processes and information systems - Enterprise Information Systems. *Enterprise Information Systems* 3 (4), 393-407.

over $40B in spending on materials such as memory, microprocessors, windows software, etc. They also provided over 1 million service support parts each month to customers in addition to all of the new hardware and software that flowed through the chain.[86] The merger to be undertaken with Compaq by the numbers represented the largest merger in history with over 142 distribution hubs, over 1,200 sites, 1,500 major material suppliers, 385 logistics partners, over 600 global customer services locations, 119 call centers, over 7,000 distinct applications, and some 30 million business to business messages each and every month to customers.[87]

Throughout the merger process, SCOR was used as an integral component of evaluation. First and foremost, HP applied the SCOR model in the broadest possible context, going beyond traditional notions of the supply-chain in its application. Furthermore, because significant buy-in existed from all stakeholders in using the SCOR methodology, each company agreed to provide unrestricted access to operations for the purposes of documenting processes and collecting information. Supply-chains were mapped and language differences between HP and Compaq were removed because of standardization brought forth in the SCOR model. Further, use of the SCOR model removed internal politics from the equation as precise processes were separated from each organization during the modeling process (essentially

[86] Phelps, T. (2006). *SCOR and benefits of using process reference models.* Taipei: Hewlett Packard.
[87] Phelps, (2006).

mitigating potential for assigning blame). The results from this use of the SCOR model in HP's merger with Compaq are staggering. In the first two years the firms achieved $2.7B in cost savings including $1.1B in direct materials procurement, $300M in redesigning products and re-qualifying components, $295M in manufacturing overhead, $235M in logistics, $525M in indirect procurement and some $265M in systems and programs.[88] The careful application of the SCOR methodology in this case has proved incredibly valuable and can be used to demonstrate the potential for SCOR's application at DoD. The scale of business operations undertaken at HP and Compaq can be considered somewhat analogous to those undertaken within the Services and agencies at the Department of Defense.

SCOR at Intel

The experience in using SCOR at Intel is similar to that at HP. Like HP, Intel is a world class technology firm. Intel is best known for its semiconductors which it produces on a massive scale and provides to computer manufactures around the world. Intel first utilized the SCOR model to assist in improving its internal supply-chain efficiency and customer services capabilities. Intel's approach was to use a pilot program to establish guidance for the use of SCOR throughout the company. The pilot program was used to document the constructs of the supply-chain and current process improvement efforts; identify short term improvements; gain internal support and buy-in; and

[88] Phelps, (2006).

identify owners of potential long-term improvements. Intel used the SCOR model because it wanted to provide a mechanism for benchmarking; standardizing evaluation of performance improvements (while maintaining the ability to diagnose potential problems); and to align performance metrics across all levels of the organization (tactical, operational, strategic).[89] After undertaking this effort, representatives at Intel were amazed at how SCOR permitted them to improve their processes. First and foremost, they found the application of the SCOR model permitted the use of common terminology across trading partners in the supply-chain allowing enhanced communication and visibility. They also found that using SCOR's predefined metrics made it very easy to organize many business processes for evaluation across the company. The Intel team further discovered that SCOR facilitated a major increase in the level of knowledge for those employees who participated in the process while enhancing team-member relationships. These individuals also became more attuned to the internal dynamics of Intel's business and supply-chain processes. These initial findings encouraged Intel to continue using the SCOR model throughout its business to achieve continuous process improvement, greater efficiencies and significant cost savings. As a result of all these benefits, Intel created an internal SCOR model repository that is widely used by the company today as a resource to document all of the applications of SCOR within the company and to be used as a reference for

[89] Poluha 2007.

future supply-chain optimization efforts.[90]

[90] Intel. (2002). The SCOR experience at Intel. Retrieved from http://logespro.cujae.edu.cu/upload/Caso7SCOR-INTEL.pdf.

Chapter 3: The MILSCOR Framework

The MILSCOR framework is an applied version of the SCOR model to be used specifically within the Department of Defense environment. First, the chapter to follow will provide an overview of the SCOR model. Second, an introduction to the MILSCOR model will be given which will address why the model is important and identify its intended audience. Finally, the chapter will provide a detailed explanation of the MILSCOR framework.

What is the SCOR Model?

The Supply Chain Operations Reference (SCOR) model was created by the Supply Chain Council (SCC), as an overarching performance management and evaluation framework designed and used by council members. The model combines business processes, metrics, best practices and technology features into a unified structure to improve the effectiveness of supply-chain management. SCOR is updated frequently to keep up with the dynamics of industry and currently contains over 200 process elements, 550 metrics, and 500 best practices including those that capture both risk and environmental management factors. As stated by the SCC:

> *The SCOR model is used to help organizations (public or private) to identify, measure, reorganize and improve supply-chain processes through a systematic breakdown and evaluate of the supply-chain from the bottom up.*[91]

[91] Supply Chain Council, (2010).

The basis of SCOR occurs through the classification of five primary management processes: Plan, Source, Make, Deliver, and Return. Each of the five primary management processes within the SCOR model is measured through the evaluation metrics at each point in the supply-chain (supplier's supplier, supplier, client, customer, customer's customer). Within these management processes there are five levels of decomposition (in order from least to most sophisticated), these levels of decomposition are:

- Level 1: Scope: differentiates business, defines scope, sets strategy.
- Level 2: Configuration: Differentiates complexity, differentiates capabilities, first tier diagnostics.
- Level 3: Activity: names tasks, links, metrics, tasks and practices, second tier diagnostics.
- Level 4: Workflow: sequences steps, job details, industry or company specific.
- Level 5: Transactions: links transactions, details of automation, technology specific.

Each of these levels of decomposition has a series of metrics associated with them. As an organization works its way through mapping its processes and establishing metrics to compare to SCOR's standards, the review begins at Level 1 and ultimately seeks to reach Level 5. Examples of Level 1 attributes and metrics include:

- Customer reliability-perfect order fulfillment.
- Customer responsiveness-order fulfillment cycle time.
- Customer agility-supply-chain flexibility and adaptability.[92]

The SCOR model measures performance of the supply-chain through a series

[92] Supply Chain Council, (2010).

of metrics and permits comparison of these to industry standards, these metrics fall into five performance attributes:

- Reliability - achievement of customer demand fulfillment on-time, complete, without damage etc.
- Responsiveness - the time it takes to react to and fulfill customer demand;
- Agility - the ability of supply chain to increase/decrease demand within a given planned period;
- Cost - objective assessment of all components of supply chain cost;
- Assets - the assessment of all resources used to fulfill customer demand.

Finally the SCOR model permits a re-alignment of supply-chain processes using a series of widely documented best practices to meet business objectives. The SCOR model help an organization accomplish this through the use of:

- Classic process re-engineering from "As-Is" to "To-Be";
- Lean Manufacturing analysis and process change;
- Six-Sigma analysis of defective processes;
- Theory-of-Constraints analysis of systems of processes to elucidate root-cause issues;
- ISO-9000 style process capture and control;
- Balanced SCORcards and benchmarking;
- And a host of other combined industrial engineering based best-practice techniques in improvement.[93]

Introduction to MILSCOR

SCOR, as it was initially derived, was intended to be a tool for industry's use to evaluate their supply chains. The model was designed to help identify potential areas for improvement. As a result, a majority of SCOR's underpinnings can be traced to manufacturing or production-based businesses.

---

[93] IBID.

Consequently, some SCOR metrics were designed to capture data, which as currently defined, are not applicable in the public sector or the military operational environment. As a result, the SCOR framework should be adapted when applied within the United States Department of Defense (DoD)—this is the basis for development of the MILSCOR framework.

What is MILSCOR?

MILSCOR is an adaptation of the SCOR framework designed for broad application across the DoD enterprise. MILSCOR consists of the same general performance attributes in SCOR, adjusted for the military context, including considerations for both goods *and* services in the weapons chain. The weapons chain consists of a variety of goods and services, which must be acquired in support of DoD's operation and support of a weapons system. Examples of weapons systems include tanks, planes, or ships. Goods within this chain can include systems (e.g. an airplane), sub-systems (e.g. a radar), components (e.g. radar control unit), and weapons spares (non-commodities) (e.g. capacitors, transistors, diodes). DoD's supply chain environment and its supporting policies and processes have been developed primarily around acquiring goods such as the examples provided above. Alternatively, services within this chain can be found in 5 of 6 portfolio groups (in bold below) as identified by the Department of Defense's Director for Defense Procurement and Acquisition Policy (DPAP).[94] These groups include:

1. **Knowledge-based services**
2. **Transportation Services**
3. **Facility Related Services**
4. **Electronics and Communications Services**
5. **Equipment Related Services**
6. Medical Services[95]

The figure below provides a visual representation of the various types of goods and services which DoD acquires. The services which will be primarily associated with DoD weapons systems will be in the brown area in the center referred to as "information technology".

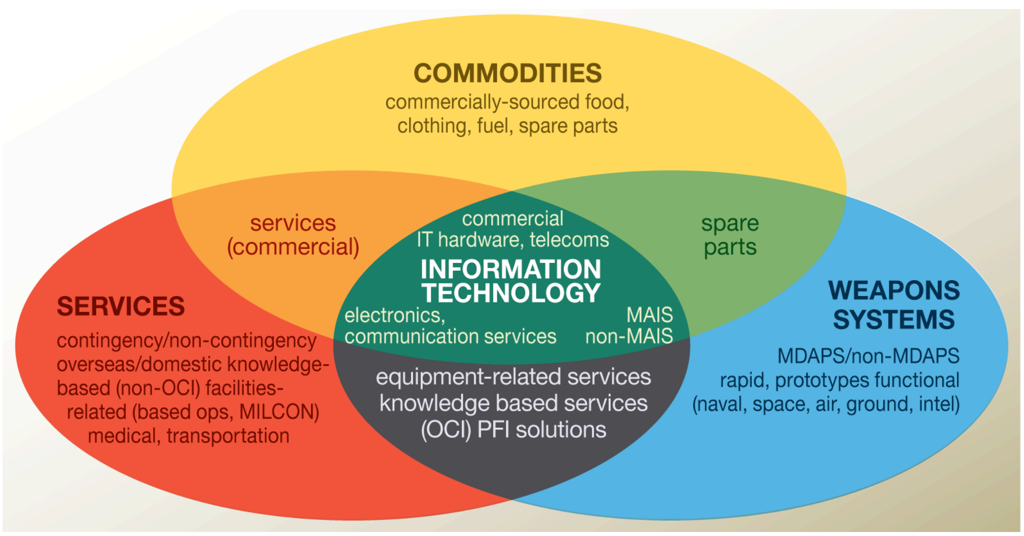


Figure 1. Distribution of Goods and Services in DoD Supply Chains.[96]

Within each MILSCOR framework attribute is a series of Level 1 and Level 2 MILSCOR metrics. A Level 1 metric is a high-level scope metric to help set

---

[94] Office of the Secretary of Defense, Director for Defense Procurement and Acquisition Policy. (2010). Taxonomy for the acquisition of services. Retrieved from http://www.acq.osd.mil/dpap/policy/policyvault/USA006267-10-DPAP.pdf.

[95] Not to be included in weapons systems chain.

[96] IBID.

strategy. A Level 2 metric is a configuration metric designed to help differentiate complexity and capabilities to provide first tier diagnostics. Nearly all MILSCOR Level 2 Metrics have been further decomposed to address goods and services separately. MILSCOR generally assumes that the supply chain being addressed is the weapons chain, although the concepts and metrics provided can be expanded to cover the deployment chain and commodity chain as well. To demonstrate this, examples from each of the chains may be provided to help illustrate the concept being discussed.

MILSCOR assumes that most of the services that are "not inherently governmental" will be provided by industry unless they are required by law (e.g. 50 percent of depot repairs) to be provided organically by the Government.[97] According to the Federal Acquisition Regulations (FAR) examples of "inherently governmental functions" include:

> 1. The direct conduct of criminal investigations.
> 2. The control of prosecutions and performance of adjudicatory functions other than those relating to arbitration or other methods of alternative dispute resolution.
> 3. The command of military forces, especially the leadership of military personnel who are members of the combat, combat support, or combat service support role.
> 4. The conduct of foreign relations and the determination of foreign policy.
> 5. The determination of agency policy, such as determining the content and application of regulations, among other things.
> 6. The determination of Federal program priorities for budget requests.
> 7. The direction and control of Federal employees.
> 8. The direction and control of intelligence and counter-intelligence

[97] 10 USC 2466. (ND). Limitations on the performance of depot-level maintenance of materiel. Retrieved from http://www.law.cornell.edu/uscode/text/10/2466.
Federal Acquisition Regulations (FAR) Subpart 7.5, Retrieved from https://www.acquisition.gov/far/html/Subpart%207_5.html.

operations.

9. The selection or non-selection of individuals for Federal Government employment, including the interviewing of individuals for employment.

10. The approval of position descriptions and performance standards for Federal employees.[98]

Finally, for successful application of the MILSCOR model, work units, depots, commands, component Services, and, support contractors must be able to assess their state of "maturity" during MILSCOR model implementation. To accomplish this, a supply chain maturity model should be used to assess MILSCOR implementation efforts across DoD. Use of this model during the implementation of MILSCOR provides a methodology for comparing the progress of various military/contractor work units and higher level organizations against each other as they seek to improve their supply chain operations. The Supply Chain Maturity model provided below is an adaptation of a model developed by the Performance Management Group and PRTM. The model provides four stages of maturity during MILSCOR implementation efforts.

[98] IBID.

MILSCOR Maturity Model Stage 1	Functional work units (e.g. a single depot, a single program office, a single support contractor) across DoD focus on improving their own process steps and use of resources. Focus for improvement is primarily related to costs and functional performance. Processes that cut across multiple functions or work units are not well defined or understood, resulting in limited effectiveness of complex supply chain processes.
MILSCOR Maturity Model Stage 2	Command level processes are now defined, allowing individual work units to understand their roles in complex supply chain processes. Cross-functional performance measures are clearly defined, and individual work units are held accountable for their contributions to overall Command operational performance. Resource requirements are typically balanced across the organization. A well-defined demand/supply balancing process that combines forecasting and planning with sourcing and manufacturing beings to emerge at this stage.
MILSCOR Maturity Model Stage 3	Stage 2 practices are now extended into the points of interface with customers and suppliers. The component Services supported by their commands and depots have identified strategic customers and suppliers, as well as the key information needed from them in order to support its business process. Joint service agreements (JSAs) and scorecard practices are used, and corrective actions are taken when performance falls below expectations.
MILSCOR Maturity Model Stage 4	Customers and suppliers work strategically to define a mutually beneficial strategy and set real-time performance targets. Information technology automates the integration of business processes across the defense enterprise in support of an explicit overarching supply chain strategy. The Supply Chain Maturity Model is used to assess the stage of capability for each of supply chain performance attributes defined by MILSCOR—including "overall" supply chain management practices. The model also evaluates the extent to which IT enables richer practices and cross-enterprise collaboration in supply chain management.

Table 1. Adaptation of the Supply Chain Maturity Model for MILSCOR.[99]

[99] Performance Management Group, LLC. (2003). Boost the bottom line with supply chain best practices. Retrieved from http://www.pmgbenchmarking.com/resource/publication/signal/SC_SignalVol4No1. Pdf.

Why is MILSCOR Important?

The MILSCOR framework is important because it can help DoD identify areas where it can improve readiness while reducing costs. As noted by a recent Defense Business Board Study on the subject, major opportunities for improvement lay in the following areas:

Areas for Potential Improvement	*Current Spending Level*
Total for contracted services	**$197B**
Total for supplies and equipment	**$179B**
Contracted logistics and supply chain services	$190B
Contracted knowledge based services	$ 52B
Contracted information technology expenses	$37B

Table 2. DoD Opportunities for Cost and Performance Improvement as Identified by the Defense Science Board[100]

As can be seen from the data above, services represent a major opportunity to improve performance and reduce costs across the Defense-enterprise. Recently, due to a major reduction in both the civilian acquisition workforce and size of the military following the end of the Cold War, the Department has seen a major increase in the proportion of services it acquires. In fact, over 50 percent of the Department's acquisition budget is now used for service acquisition.[101] As noted by the Defense Science Board, nearly every activity not considered "inherently governmental" in nature, is acquired as a contracted service.[102] Despite this, a majority of DoD's supporting policies

---

[100] Defense Business Board. (2010). Reducing overhead and improving business operations. Retrieved from http://dbb.defense.gov/MeetingFiles/presented.pdf.

[101] Gansler, J. Lucyshyn, W., & Arendt, M. (2010). Defense acquisition workforce modernization. Retrieved from http://www.acquisitionresearch.net/files/FY2010/UMD-AM-10-163.pdf.

Defense Science Board. (2011). Improvements to services contracting. Retrieved from http://www.acq.osd.mil/dsb/reports/ADA550491.pdf.

[102] IBID.

and processes are focused on acquisition of goods—which are entirely different. These differences have created an opportunity for expansion of the traditional SCOR framework in the MILSCOR model to address both goods and services in DoD's weapons chain.

The impact having Government execute "non-inherently governmental" tasks cannot be understated. Consequently, there is immense value in identifying areas where room for improvement in service delivery may lie. For example, a recent study by the Defense Business Board identified roughly 339,000 active duty military performing commercial activities at a cost of over $54 billion per year (8 percent of the FY10 base DoD budget).[103] To overcome these increased costs, Government can capitalize on the private sector for provision of "non-inherently governmental" services. In this context, numerous studies have demonstrated the value of outsourcing, competitive sourcing, and/or engaging in public-private partnerships for those functions that are not considered inherently governmental in nature. For example, NASA has demonstrated the benefits of outsourcing in their efforts to remake the provision of desktop services and increase interoperability across their 15 independent networks. The results of this effort led to some 32 percent cost savings while improving service availability to 99 percent. Likewise, the benefits of competitive sourcing have been demonstrated by the 55th Wing at Offutt Air Force Base who used competitive sourcing to achieve a 58 percent decrease in manpower costs while having Government employees beat out the

[103] Defense Science Board, (2010).

private sector for the work.[104] Finally, the Defense Logistics Agency (DLA) capitalized on a public-private partnership approach when it selected a "Virtual Prime Vendor" to provide parts and consumables for C-130 aircraft allowing it to reduce its on-hand inventory for related parts by some 98 percent.[105] For these reasons, the default assumption of the MILSCOR model is that these approaches should be used across the DoD-enterprise to optimize performance while lowering costs. Its important to highlight this cannot be an either/or proposition; the twenty-first century Department of Defense demands both.

The MILSCOR framework is different because it covers several areas not currently addressed by recent DoD supply chain modernization initiatives. While the DoD has undertaken several logistics/supply chain performance improvement efforts, MILSCOR is different. Table 2 below details the differences between the attributes (or goals) and supporting metrics of DoD's Logistics Roadmap 2008, Logistics Strategic Plan 2010, and Joint Supply Chain Architecture (JSCA) 2011 against the MILSCOR framework. Notable distinctions between the MILSCOR framework and these recent DoD efforts are highlighted below:

- MILSCOR specifically distinguishes between goods/services;
- MILSCOR provides sample contract language for performance incentives;

[104] Gansler, J. & W. Lucyshyn, (2004). Implementing alternative sourcing strategies: Four case studies. Retrieved from http://www.businessofgovernment.org/sites/default/files/Implementing%20Alternative%20Sourcing%20Strategies.pdf.

[105] Gansler, J. & W. Lucyshyn,, (2004).

- MILSCOR includes metrics to evaluate risk impact on supply chain;
- MILSCOR includes flexibility/adaptability metrics to evaluate unanticipated changes in demand;
- MILSCOR includes Return on Investment (ROI) metrics to evaluate "value" of supply chain modernization efforts;
- MILSCOR includes a comprehensive change management framework for implementation that addresses both transformational and transactional elements;
- MILSCOR includes a weighting methodology and maturity model.

	Logistics Roadmap (2008)	Logistics Strategic Plan (2010)	Joint Supply Chain Architecture	MILSCOR
Author	Assistant Secretary of Defense for Supply Chain Integration (SCI).	Assistant Secretary of Defense for Logistics & Material Readiness (L&MR).	Assistant Secretary of Defense for Supply Chain Integration (SCI).	M. Arendt.
Attributes (or overarching goals)	1. Unity of Effort; 2. Visibility; 3. Rapid and Precise Response.	1. Provide Logistics Support in Accordance with Warfighters' Requirements; 2. Institutionalize Operational Contract Support; 3. Ensure Supportability, Maintainability; and Costs are Considered throughout the Acquisition Cycle; 4. Improve Supply Chain Processes, Synchronizing from End-to-End & Adopting Challenging but Achievable Standards for Each Element of the Supply Chain.	1. Reliability; 2. Speed; 3. Efficiency.	1. Reliability; 2. Responsiveness; 3. Agility; 4. Costs; 5. Asset Management (ROI); 6. Elements for Organizational Change
Metrics	***No Metrics Identified. See Objective 1.5*** *Adopt enterprise-wide metrics that promote common goals and interoperability*	Goal 1 Metrics: % negotiated Time Definite Delivery standards met in the area of contingency operation; and wait time. Goal 2 Metrics: % of contracts and contractor population properly registered in the Synchronized Pre-Deployment and Operational Tracker (SPOT); and % of geographic Combatant Command plans that have been reviewed/analyzed for OCS equities. Goal 3 Metrics: % of major programs meeting current DoD sustainment metrics. Goal 4 Metrics: Same as Goal 1 Metrics *plus* % of actual demand compared to forecasted demand.	Goal 1 Metric: Perfect Order Fulfillment; Goal 2 Metric: Customer Wait Time; Goal 3 Metric: Total Supply Chain Management Cost.	Goal 1 Metric: Perfect Order Fulfillment Goal 2 Metric: Order Fulfillment Cycle Time Goal 3 Metrics: Upside Supply Chain Flexibility; Upside Supply Chain Adaptability; Downside Supply Chain Adaptability; Overall Readiness at Risk Goal 4 Metric: Total Supply Chain Management Cost Goal 5: Return on Program/Initiative Investment

	Logistics Roadmap (LR) (2008)	Logistics Strategic Plan (LSP) (2010)	Joint Supply Chain Architecture (JSCA) (2011)	MILSCOR
Notes / Suggested Rec's.	GAO highlights the Roadmap's lack of metrics as being a major hurdle for successful transformation: *The roadmap lacks outcome-based performance measures that would enable DoD to assess and track progress toward meeting stated goals and objectives.*[106] *Should have established clear measures for success prior to issuance of the LR.	Primarily focused on "material"; also focused on current contingency operations (as of 2010); currently U.S. is withdrawn from Iraq and drawing down from Afghanistan—goes to need to establish vision for supply chain future state. *Should have expanded scope beyond current operational requirements in the near term. *Needs greater focus on output metrics vs. compliance metrics.	GAO highlights several problems with JSCA metrics: *Two of these three measures, customer wait time and perfect order fulfillment, are not new and predate the Joint Supply Chain Architecture… Perfect order fulfillment is used by DLA…but it is not used by any other DOD components or at the enterprise-wide level. A total supply chain management cost metric is far from completion, and various officials stated that the meaningfulness of this measure is uncertain.*[107] *Perfect Order Fulfillment should be collected across the enterprise; Should include additional flexibility/agility metrics to measure responsiveness to unanticipated demands; Should address the impact of risk on the supply chain; Should address organizational changes required to implement framework.	*Distinguishes between goods/services; specifically, *Provides sample contract language for performance incentives; *Includes metric to evaluate risk impact on supply chain; *Includes flexibility/adaptability metrics to evaluate unanticipated changes in demand; *Includes Return on Investment metrics to evaluate "value" of supply chain modernization efforts; *Includes comprehensive change management framework for implementation that addresses both transformational and transactional elements; *Includes weighting methodology and maturity model.
Sources	DoD Logistics Roadmap Vol. 1 and 2. https://acc.dau.mil/CommunityBrowser.aspx?id=267660	Logistics Strategic Plan: http://www.acq.osd.mil/log/sci/DoDLogStratPlanFinalSigned-100707.pdf	Joint Supply Chain Architecture: https://acc.dau.mil/CommunityBrowser.aspx?id=454906	Modified SCOR 10.0: http://supply-chain.org/f/SCOR-Overview-Web.pdf

Table 3. Differences Between Recent DoD Supply Chain Approaches and MILSCOR.

[106] Government Accountability Office. 2009. Lack of key information may impede DoD's ability to improve supply chain management. Retrieved from http://www.gao.gov/products/GAO-09-150.

[107] Government Accountability Office. (2011). DoD needs to take additional actions to address challenges in supply chain management. Retrieved from http://www.gao.gov/new.items/d11569.pdf.

MILSCOR's Target Audience

MILSCOR can be used by those support organizations across the DoD who perform operations & maintenance functions for weapons systems such as depots and/or commands (Army Materiel Command, Air Force Materiel Command, etc.). MILSCOR's intended audience, therefore, are civilian, military and contractor personnel who execute strategic, operational and tactical level functions in support of the DoD's weapons chain. Aspects of this framework can and should be adopted across DoD in support of its greater supply chain modernization efforts. The MILSCOR framework should also be treated as a starting point. The framework can and should be adapted with additional metrics, cases, and supporting data by supply chain professionals across the Defense enterprise that may hold weapon systems specific experience and knowledge. For example, some very specific metrics may be only applicable to a certain type of weapons system (such as an airplane vs. ship) or for more specific application across the commodity chain and/or deployment chain. These types of metrics should be developed at lower MILSCOR levels than what are provided in this first variant of the framework—Levels 3, 4 and/or 5. Thus, these inputs will be dependent upon feedback from supply chain practitioners throughout DoD.

The MILSCOR Framework

The MILSCOR framework is laid out in the following format that is consistent with the same format which is used by the Supply Chain Council's SCOR 10.0 framework:

Performance Attribute – Each of the MILSCOR metrics are associated with a top-level performance attribute (e.g. reliability, responsiveness, agility, cost, or asset management). Each MILSCOR metric description will include a reference to the applicable performance attribute.

Hierarchical MILSCOR Supply Chain Metric Structure — The metric structure will provide a visual representation of how each of the MILSCOR performance attributes are related to their associated Level 1 and Level 2 metrics. Note: MILSCOR Level 2 metrics have been further decomposed to allow for separate data collection for goods and services.

Performance Metric – The performance metric will be the MILSCOR equivalent metric that takes the SCOR metric and (if necessary) adapts it to the military environment.

Calculation – The calculation section will provide an overview of how the metric will be calculated. The section will identify each of the elements and the associated data required to complete the calculation. In most cases, the calculations will not be overly complex and will be described in a straightforward manner so that the practitioner can easily understand them.

Data Collection and Relevant Information Technology

The data collection section for each MILSCOR attribute/metric will discuss how data for the measures will be collected, who should collect it, and what should be done with it once it has been collected. These sections may also describe any challenges to data collection that may currently exist across the Defense enterprise. In general, data for the MILSCOR framework can be collected across the enterprise through the coordination of current logistics information system programs and initiatives being pursued across DoD. While each component Service/agency are pursuing efforts independently, effective MILSCOR implementation would require coordination of these systems to enable seamless data sharing and real-time visibility across technological stovepipes. The table below provides a brief summary of selected, relevant information technology programs/initiatives that would be applicable in collection and reporting of data to be used in the MILSCOR framework. Note: This table is not inclusive of all DoD efforts.

Initiative/ Program Name	Military Service	Summary
Single Army Logistics Enterprise (SALE)	Army	The SALE initiative comprises three components that integrate strategic, operational, and tactical logistics functions into a fully integrated, end-to-end Army logistics enterprise solution: • The Logistics Modernization Program (LMP) is the Army's national logistics system that will replace two legacy wholesale systems: the Standard Depot System (SDS) and the Commodity Command Standard System (CCSS). • The Global Combat Support System-Army Field/Tactical (GCSS-Army (F/T) is the tactical logistics picture that will fold tactical logistics systems into one integrated environment at the combat service support levels and will interface them with the rest of the Army enterprise environment and will replace multiple legacy tactical-level logistics information systems • Product Life Cycle Management Plus (PLM+) is the technical link between LMP and GCSS-Army. PLM+ serves as the single data repository and provides seamless linkage from the national to the tactical levels.[108]
Naval Tactical Command Support System (NTCSS)	Navy	• NTCSS is a tactical command support information system for maintenance management of ships, submarines, aviation squadrons, and intermediate maintenance activities (afloat and ashore). • Provides supply control, requirements processing, parts ordering and tracking, inventory management and financial management. • Integrates numerous stand-alone applications program that provides standard information resource management to provide consolidated reporting afloat and ashore.[109]
Integrated Data Environment & Global Transportation Network Convergence (IGC)	USTRANSCOM/DLA	• IGC a net-centric, service oriented data capability that provides access to supply chain and transportation data across DLA and TRANSCOM landscape. • IGC will enable a common logistics picture, distributed visibility, and material asset and in-transit visibility and status.[110]

[108] Department of the Army. (2008) Single Army Logistics Enterprise. Retrieved from http://www.army.mil/aps/08/information_papers/transform/Single_Army_Logistics_Enterprise.html and https://acc.dau.mil/CommunityBrowser.aspx?id=267660.

[109] Department of the Navy. (UD). NTCSS. Retrieved from http://www.public.navy.mil/spawar/Atlantic/ProductsServices/Pages/NTCSS.aspx.

[110] JITC. (UD). Integrated Data Environment & Global Transportation Network Convergence (IGC). Retrieved from http://jitc.fhu.disa.mil/igc/index.html and https://acc.dau.mil/CommunityBrowser.aspx?id=267660.

Initiative/ Program Name	Military Service	Summary
Logistics Installations Mission Support–Enterprise View (LIMS-EV)	Air Force	Equipment View • AF-wide total asset visibility tool for Equipment for readiness reporting and aggregation of data from multiple data sources • Provides a POM Priority view, builds a "What If Analysis" based upon requirements and views equipment impacts/benefits of individual or collective Air Force commodities. Logistics Balanced Scorecard (BSC) • Encompasses the Warfighter Perspective (Aircraft Availability and Flying Schedule Effectiveness) • Logistics Process Perspective (Depot Maintenance and Supply metrics) Pipeline Analysis • Provides visibility into Customer Wait Time (CWT) and Logistics Response Time (LRT).[111]
Common Logistics Operating Environment (CLOE)	Army	• Total situational awareness within a common operating picture for all aspects of logistics, from factory to foxhole. • A single set of interfaces for "business" processes such as calls for support, requisitions of supplies, in-transit visibility, and domain-wide total asset visibility. • Will synchronize multiple programs to ensure processes work seamlessly end to end.[112]

Table 4. Selected Supply Chain IT Systems Applicable to MILSCOR.

Discussion – The discussion section will provide any additional information or details that are relevant for a particular metric. Examples may include a discussion of the metric's significance on performance improvements vs. process improvements; references to specific DoD policies; and/or case examples to highlight importance and how the metric may be applied in a real world situation.

[111] Department of the Air Force. (2011). LIMS-EV 101 Brief. Retrieved from http://www.acq.osd.mil/log/mpp/cbm+/Briefings/LIMS-EV_OSD_CBMPlus_AG_Brief.pdf.

[112] Department of the Army. (UD). Common Logistics Operating Environment. Retrieved from http://www.army.mil/aps/08/information_papers/transform/Common_Logistics_Operating_Environment.html.

MILSCOR consists of the same general performance attributes in SCOR, adjusted for the military context, including considerations for both goods *and* services in the weapons chain. Within each MILSCOR framework attribute is a series of Level 1 and Level 2 MILSCOR metrics. A Level 1 metric is a high-level scope metric to help set strategy. A Level 2 metric is a configuration metric designed to help differentiate complexity and capabilities to provide first tier diagnostics. MILSCOR is also unique because it includes a framework for organizational change that addresses both transformational and transactional elements is required for substantive organizational change.[113] Transformational elements are defined as those elements that are directly impacted by the external environment[114] (political, economic, social, etc.) and require substantial amounts of effort to change. On the other hand, transactional elements are those which require less effort to change and can be altered over a shorter duration; ultimately these elements are directly impacted by the noted transformation elements. The table below provides an overview of the MILSCOR framework, its attributes and supporting metrics.

---

[113] Burke and Litwin, (1992).
[114] These external elements have been previously addressed in Chapter 1.

Attribute	Metric	Sub-metrics	Rationale
Reliability	Perfect Order Fulfillment (MIL.1.1)	% of Orders Delivered in Full; Delivery Performance to Customer Commit Date; Documentation Accuracy; Perfect Condition	Required to evaluate trustworthiness of supply chain to ensure "right item, right place, at right time."
Responsiveness	Order Fulfillment Cycle Time (MIL.RS.1.1)	Source cycle time (MIL.RS.2.1); Make cycle time (MIL.RS.2.2); Deliver cycle time (MIL.RS.2.3)	Required to provide inputs for Readiness at Risk (RaR) metric.
Agility	Upside Supply Chain Flexibility (MIL.AG.1.1)	Upside Source Flexibility (MIL.AG.2.1); Upside Make Flexibility (MIL.AG.2.2); Upside Deliver Flexibility (MIL.AG.2.3); Upside Deliver Return Flexibility (MIL.AG.2.5)	Required to evaluate DoD supply chain readiness given unanticipated increase in demand.
	Upside Supply Chain Adaptability (MIL.AG.1.2)	Upside Source Adaptability (MIL.AG.2.6); Upside Make Adaptability (MIL.AG.2.7); Upside Deliver Adaptability (MIL.AG.2.8); Upside Deliver Return Adaptability (MIL.AG.2.10)	Required to evaluate DoD supply chain readiness given unanticipated increase in demand.
	Downside Supply Chain Adaptability (MIL.AG.1.3)	Downside Source Adaptability (MIL.AG.2.11); Downside Make Adaptability (MIL.AG.2.12); Downside Deliver Adaptability (MIL.AG.2.13)	Required to evaluate DoD supply chain readiness given unanticipated decrease in demand.
	Overall Readiness at Risk (RaR) (MIL.AG.1.4)		Required to assess impact of risk events on military readiness.
Cost	Total Supply Chain Management Cost (MIL.CO.1.1)	Cost to Plan (MIL.CO.2.1); Cost to Source (MIL.CO.2.2); Cost to Make (MIL.CO.2.3); Cost to Deliver and/or Install (MIL.CO.2.4); Cost to Return (MIL.CO.2.5)	Required to provide baseline enterprise cost information to drive supply chain improvement initiatives.
		Supply Chain Management Risk Mitigation Cost (MIL.CO.2.7)	Required to assess Return on Program/Initiative Investment.
Asset Management	Return on Program/Initiative Investment (MIL. AM.1.1)		Required to evaluate improvement in supply chain performance and costs for a given program/initiative.
Change Management	Transformational Change Elements	Leadership; Vision, Mission, Strategy; and Culture	Required to effectively implement the MILSCOR framework and improve the supply chain based on its usage.
	Transactional Change Elements	Structure; Systems; Task Requirements and Individual Skills; Motivation; Management Practices; and Work Unit Climate	Required to effectively implement the MILSCOR framework and improve the supply chain based on its usage.

Table 5. Summary of MILSCOR Framework.

Weighting Metrics in MILSCOR

All metrics in the MILSCOR model are not equal. In certain circumstances, some may be more or less valuable than others. As a result, metrics provided in the MILSCOR framework should be weighted to reflect relative level of importance/value depending on their particular application. The discussion section will also generally address metric weighting as necessary.

The pair-wise comparison method can be used to weight metrics within the MILSCOR framework. This technique allows for two or more alternatives to be compared on a scale to determine which is preferred over the other(s).[115] The pair-wise approach relies heavily upon the judgment of the decision-maker which makes it a suitable solution for weighting of MILSCOR metrics because it allows senior DoD leadership to determine the relative value/importance for each metric across the supply chain. Factors that may influence metric weight determinations at DoD include the following:

- *Strategic factors such as DoD supply chain modernization priority.* For example, there is typically a constant struggle between achieving some combination of higher performance at lower costs. In the current fiscal environment, cost reduction has become a major priority, thus additional consideration could be given to supply chain cost metrics.

- *Operational factors such as mission urgency.* For example, DoD is consistently conducting multiple missions, the level of importance for these missions can range drastically as a function of mission prioritization around the globe. If a mission is deemed only moderately important, certain metrics such as responsiveness and/or reliability metrics may be weighted less important for that particular mission as

[115] Saaty, T. L. (2008). Relative measurement and its generalization in decision making why pairwise comparisons are central in mathematics for the measurement of intangible factors the analytic hierarchy/network process. Retrieved from http://www.rac.es/ficheros/doc/00576.PDF.

additional resources are re-allocated to meet other urgent mission priorities where these metrics may be much more important.

- *Tactical factors such as mission system requirements.* For example, DoD can utilize multiple systems to complete a given mission, e.g. Tanks vs. HUMVEEs. Further, some systems may be deemed more important than others for a given mission. Depending on which system is preferred, additional demands are placed on the supply chain to execute a given mission. Thus reliability, responsiveness, agility, etc. would be weighted more heavily for the preferred system over the non-preferred system.

The table below provides a description of the weighting values which can be assigned to each of the factors noted above when using the pair-wise method.

Relative intensity	**Definition**
1	Equal value
3	Slightly more value
5	Essential or strong value
7	Very strong value
9	Extreme value
2, 4, 6, 8	Intermediate values between two adjacent judgments

Table 6. Pair-Wise Weighting Methodology for MILSCOR.[116]

The values for the pair-wise comparison are represented on a continuum such as the one below.

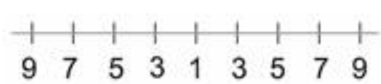
Alternative X  Alternative Y

Figure 2. Pair-Wise Comparison Continuum.

[116] Sourced from Arrif, H. et. al. (2008). Use of the analytical hierarchy process (APH) for selecting the best design concept. *Journal Teknologi.* 49(A): 1−18 Retrieved from http://www.penerbit.utm.my/onlinejournal/49/A/49siria1.pdf.

The following is an applied example of weighting for MILSCOR using the simplified pair-wise method to evaluate mission system requirements: A recent natural disaster requires the military to provide humanitarian assistance overseas. As a result, DoD must prepare to respond accordingly. DoD must evaluate which military systems are needed to respond to the humanitarian mission and ensure the supply chain is fully optimized to ensure mission success. During the planning phase, DoD determines that the closest military unit to the disaster zone has a combination of Tanks and HUMVEEs available for rapid deployment. To execute this mission, DoD planners have determined the force will require vehicles that are highly maneuverable, can carry a flexible payload, and, have an intermediate fuel range. For each characteristic identified by military planners, 2 points is awarded on the pair-wise scale. When the Tank is compared to the HUMVEE for these three factors, for this particular operation, the HUMVEE beats the Tank in each.

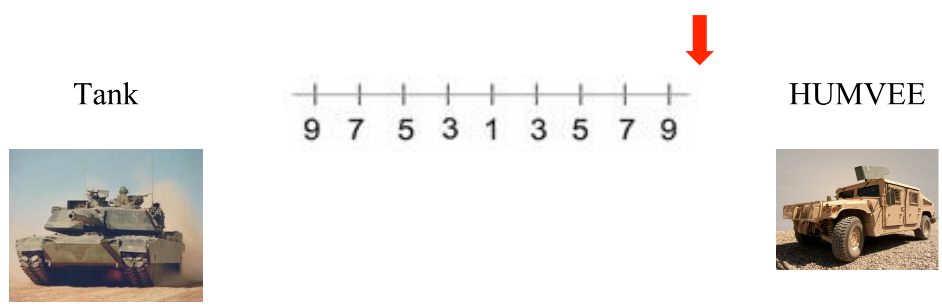


Figure 3. Example Pair-Wise Comparison for MILSCOR Weighting.

In this scenario, the MILSCOR performance attributes and metrics which are related to the HUMVEE's supply-chain are given additional weight over the identical metrics for the Tanks. For example, despite the fact that both tanks and HUMVEEs are supported by the same unit being deployed to provide the humanitarian assistance, the agility and responsiveness of the tanks supply chain are far less important than the agility and responsiveness of the HUMVEE supply chain thus additional resources will be dedicated toward optimization of the HUMVEEs supply chain for this type of operation specifically.

Finally, the pair-wise approach can also be expanded further to support the use of more advanced weighting techniques such the Analytic Hierarchy Process (AHP) method. AHP is tool to help decision-makers quantify relative priorities among a set of alternatives on a ratio scale and would permit checking of consistency in decision-making across the enterprise.[117] The next section will begin to examine MILSCOR attributes and their supporting metrics in greater detail. The first attribute to be described is Supply Chain Reliability.

---

[117] Saaty, R.W. (1987). The analytic hierarchy process—What it is and how it is used. *Mathematical Modeling*, 9 (3-5), 161-176.

MILSCOR Performance Attribute: Supply Chain Reliability

MILSCOR supply chain reliability is defined as the performance of the supply chain in delivering: the correct good or service, to the correct place, at the correct time, to the correct customer (warfighter, support contractor, civilian, etc.) with the correct documentation. In the case of goods, they must also be delivered in the correct condition, with the correct packaging, and, in the correct quantity. For services, the service must be delivered with correct performance characteristics (e.g. with the appropriate level of service) and level of effort required to complete the task.

Hierarchical MILSCOR Supply Chain Reliability Metric Structure

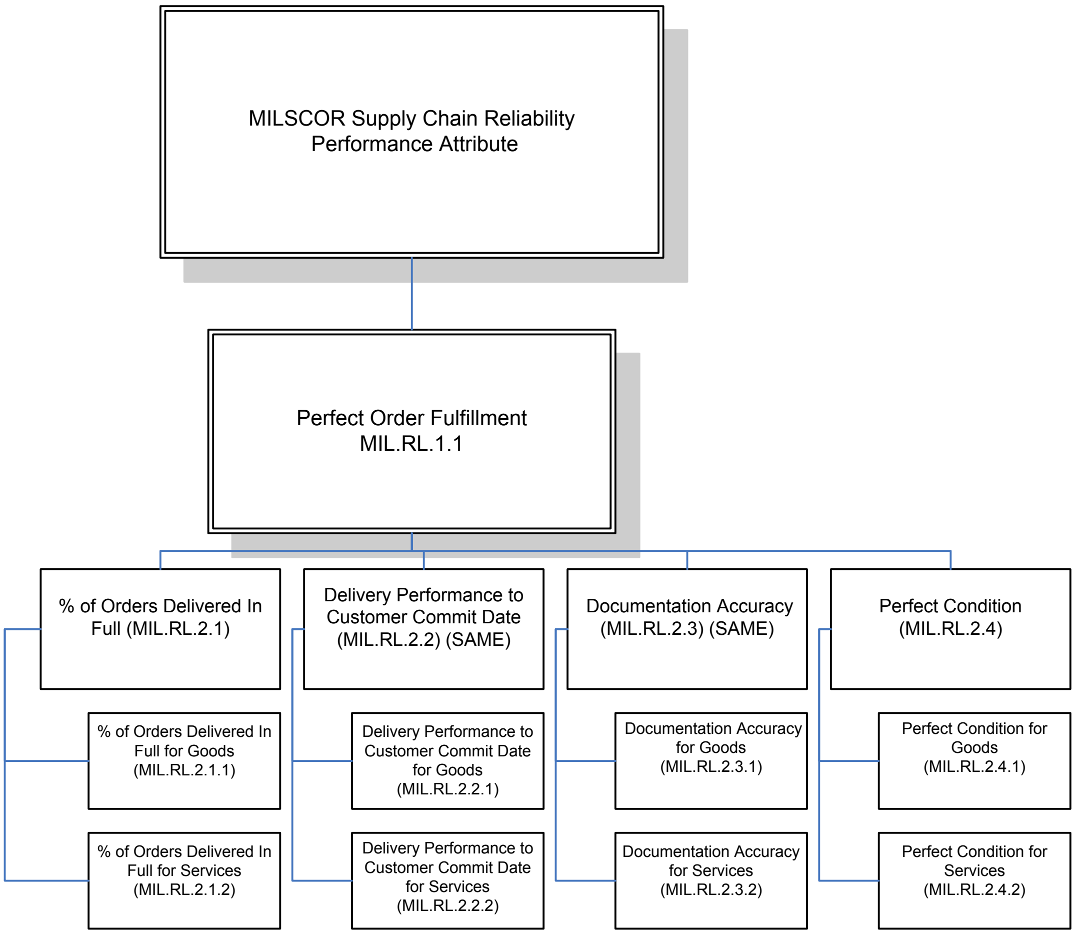


Figure 4. MILSCOR Reliability Metric Structure.

MILSCOR Metric: Perfect Order Fulfillment (MIL.RL.1.1)

Definition: The percentage of orders meeting delivery performance with complete and accurate documentation with no delivery damage and/or inappropriate performance characteristics. Components of this metric include all items and quantities of the prescribed good/level of effort for the service delivered on-time, and, including all documentation deemed appropriate by both parties including but not limited to – packing slips, bills of lading, invoices, resumes, curriculum vitae, certifications, performance specifications, etc.

Calculation: Total Perfect Orders / Total Number of Orders x 100%

Data Collection: Data should be collected for this metric at each link in the chain. This data should then be reported back upstream upon delivery and used for benchmarking.

An order is considered perfect if the goods or services for the customer are the goods or services provided and the quantities (or level of effort for services) ordered match the quantities (or level of effort for services) provided (% In Full, MIL.RL.2.1). A delivery is considered perfect if the location; specified end user entity and delivery time ordered is met upon receipt (Delivery Performance to Customer Commit Date, MIL.RL.2.2). Documentation supporting the order is considered perfect if it is all accurate, complete, and on time (Accurate Documentation, MIL.RL.2.3). The product condition is considered perfect for goods if: the percentage of orders delivered in an undamaged state that meet end user specified requirements, are in the proper configuration, are properly installed and/or integrated into the weapons system (as applicable), and accepted by the end user; For services, a delivery is considered perfect if the quantity of services provided are in the correct manner, with the correct performance level (Perfect Condition, MIL.RL.2.4). This data should then be used to identify the poorest performing parts of the chain to generate lessons learned and best practices so leadership and management can work to make the appropriate improvements in each of elements of which may be important for sustained organizational change (e.g. culture, organizational structure, processes, policies, strategy, incentives, etc.).

Discussion: As per SCOR 10.0*, "The performance of the supply chain is considered "perfect" if the original commitment made to a customer is met through the supply chain."*[118] This approach is consistent with the MILSCOR metric for perfect order fulfillment with the exception that a provision for the consideration of perfect order fulfillment for service-delivery has been included.

Perfect order fulfillment for the warfighter is critical as his/her needs may often be a matter of life and death—thus, requirements are often critical for mission success. As a result, supply chain reliability is perhaps one of the most important MILSCOR performance attributes of the framework and should thus be given additional weight and consideration when evaluating overall supply chain performance.[119] Consistent with the Defense Logistics Agency's (DLA) publication on Perfect Order Fulfillment, each of the four components of this metric (on-time fill, quantity, quality and documentation) should be evenly weighted when calculating the MILSCOR metric for Perfect

---

[118] SCOR 10.0.
[119] Note: The specific weighting for the components of this metric should always be applied based on the requirements identified by senior military planners.

Order Fulfillment (MIL.RL.1.1)."[120] It should also be noted that while the Perfect Order Fulfillment metric is used by DLA, it is not used by any other DoD component at the enterprise-wide level as a reporting metric for supply chain transformation efforts.[121]

When a good or service is provided by industry (not government), data collected for this metric should also be used for development of contractual incentives. These incentives can help drive improved performance by using as a basis of comparison against best-in-class targets. Upon achievement of these targets, a set of award fees or additional award terms should be given to the most highly performing firms. It should be noted that development of these incentives must be undertaken during the planning and sourcing portion of the framework. Per the Defense Federal Acquisition Regulations, Subpart 216.4, DoD entities are permitted to use various types of incentive contracts for the purposes of improving contractor performance. Available contracts for use at DoD include: Award fee contracts; fixed price incentive (firm target) contracts, cost plus-incentive-fee contracts, and cost-plus-award fee contracts.[122]

---

[120] Defense Logistics Agency. (2010). Perfect order fulfillment. Retrieved from http://www.aviation.dla.mil/userweb/seprt/seprt17/doc/pof_book_draft5_dec10.doc.

[121] Government Accountability Office, (2011).

[122] Department of Defense. (2011). Defense federal acquisition regulations: Subpart 216-4—incentive contracts. Retrieved from http://www.acq.osd.mil/dpap/dars/dfars/html/current/216_4.htm#BM216_4.

MILSCOR Performance Attribute: Supply Chain Reliability

MILSCOR Metric: % of Orders Delivered in Full (MIL.RL.2.1)

Definition: Percentage of orders which all of the goods and services are received by the customers in the quantities (for goods) or level of effort (for services) committed.

Calculation: [Total number of orders delivered in full] / [Total number of orders delivered] x 100%

Data Collection: Data for percentage of orders delivered in full must be collected by the customer and reported back up through the chain to verify that the number delivered corresponds with the number ordered. For goods, this data can be collected from automation through technology such as RFID[123], however care must be taken to ensure those items that are tracked using this technology are ultimately cross referenced for accuracy. For example, if RFID tags are improperly placed on deliveries they may be unreadable, or the wrong tags (or wrong information on the tags themselves) may be placed on items eventually providing the customer with incorrect data.

In contingency operations, this information is sometimes recorded and maintained manually leaving significant opportunities for incorrect data collection and delayed reporting. In these cases, manually collected data

[123] As required by DoD's Supply Chain Material Management Regulation (DoD 4140.1-R), 23 May 2003.

should be entered into a reporting database as soon as possible, and marked accordingly to signify that it was collected by hand. To-date RFID tag implementation across DoD's supply chain has faced enormous hurdles (such as cost, data standards, management, etc.) to wide-spread implementation.[124] GAO has noted that in particular the DoD has had trouble making a cost savings justification for those RFID tags which it has already implemented. Per GAO, this problem exists, in part, because of a lack of standardized data collection on costs and benefits across DoD (e.g. return on investment).[125] While many commercial firms see RFID as the standard in tracking order fulfillment in the industry, having RFID as a fully implemented standard operating procedure across the Defense enterprise will require a substantial effort in the years to come.[126]

For services, this data should typically be kept through a Government approved timekeeping system. This time should then be cross-referenced against contractual requirements—a task that is usually done during the billing process before invoices are paid. For example, were all tasks executed by a service provider completed in the number of hours specified on the task order? In cases where services are provided by Government employees who are

[124] Srivastava, B. (2010). Critical management issues for implementing RFID in supply chain management. *International Journal of Manufacturing Technology and Management.* 21(3/4).
[125] Government Accountability Office, (2009).
[126] Defense Industry Daily. (2010). RFID Technology: Keeping Track of DoD's Stuff. Retrieved from http://www.defenseindustrydaily.com/RFID-Technology-Keeping-Track-of-DoDs-Stuff-05816/.

salaried, invoice-type information for services and hours worked would only be applicable where activities based-costing has been implemented.[127]

This data should then be used to identify the poorest performing parts of the chain to generate lessons learned and best practices so leadership and management can work to make the appropriate improvements in each of elements of which are important for sustained organizational change (e.g. culture, organizational structure, processes, policies, strategy, incentives, etc.).

Discussion: The MIL.RL.2.1 metric measures the percentage of orders which all of the goods and services are received by the customer in the quantities (for goods) or level of effort (for services) committed. In the military context, this metric is very important, and thus when completing a supply chain performance evaluation it should be weighted heavily depending on the urgency of the requirement. For example, the operational demand to have the appropriate amount of tank spares delivered might be considered highly important a counter-insurgency operation but not very important for a humanitarian mission.[128]

---

[127] As required by J. S. Gansler, Undersecretary of Defense - Acquisition and Technology, Department of Defense, memorandum to Secretaries of Military Departments, Chairman of the Joint Chiefs of Staff, Undersecretaries of Defense, Director - Defense Research and Engineering, Assistant Secretaries of Defense, Director - Operational Test and Evaluation, Directors - Defense Agencies, subject: Defense-wide Implementation of ABM, 9 July 1999.
[128] Note: The specific weighting for the components of this metric should be undertaken based on the requirements identified by senior military planners.

It should also be highlighted that unlike the commercial world, the Government typically has broad powers to change and/or cancel contracts that could alter expected timelines and/or delivery performance targets. Such changes may occur for multiple reasons beyond the control of the end-user who has a demand requirement for the good or service. For example, the recent delay in approval of a Federal budget caused enormous problems for Government and contractors this past year as requirements remained in place with contracts established, but there was no certainty of funding available for contract execution. These kinds of unexpected events negatively impact the ability for industry and Government to ensure existing orders of goods or services can be delivered on time. As a result of this factor, orders canceled or modified by the Government are excluded from the metric at the macro level, but could be calculated separately at a lower tier MILSCOR metric (levels 3, 4 or 5).

The widespread usage of Indefinite Delivery/Indefinite Quantity (ID/IQ) contracts should also be noted as an additional consideration when using this metric and several others as identified in the later MILSCOR framework. An indefinite delivery contract is a contract with no fixed delivery date specified. Instead these types of contracts provide a period or range for expected delivery (for example, the contract may be for a five year term without a specific date identified during the five year period for delivery of the good/service). The indefinite-quantity contract is a type of an indefinite delivery contract that "provides for an indefinite quantity, within stated limits, of supplies or services during a fixed period. Quantity limits may be stated as number of units or as dollar values."[129] ID/IQ contracts are a combination of these two types of contractual vehicles.

While ID/IQ contracts do add additional flexibility for the Government and help improve performance and speed up the procurement process, these types of contracts must be carefully administered to reap the expected benefits.[130] Recently, the ID/IQ contracting vehicle has become immensely popular; depending on its size, it can also be somewhat difficult to manage—particularly with respect to services.[131] For the MILSCOR metric on supply-chain reliability, the challenge thus becomes tracking how the ID/IQ contracting mechanism can support fulfillment of the Government's identified requirements. As a result, it is imperative that MILSCOR metrics be applied to each ID/IQ task individually to provide the most detail possible into ID/IQ task performance and cost.

It should also be noted that in some cases, the Government may change its requirements mid-stream, thus disrupting the flow of the supply chain and altering the integrity of the reliability metric. As a result, order changes

---

[129] Federal Acquisition Regulations (2011). Subpart 16.5-Indefinite delivery contracts. Retrieved from https://www.acquisition.gov/FAR/current/html/Subpart%2016_5.html.

[130] Gansler, J. S. & Lucyshyn, W. (2011). An evaluation of IDIQ contracts for services.. Retrieved from http://www.acquisitionresearch.net/_beta/files/FY2011/NPS-AM-11-C8P08Z02-107.pdf.

[131] IBID.

initiated by the Government and agreed to by the supplier supersede original commitments and form a new comparative basis for the metric. Further, this metric has no “timing” element as this information is captured in MIL.RL.2.2, Delivery Performance to Customer Commit Date.

Weighting for MIL.RL.2.1 must also account for the potential inclusion of ID/IQ contracts. In cases where ID/IQ contracts are present, a range of acceptable performance targets based upon potential changes in Government requirements should be identified.

When a good or service is provided by industry (not government), data collected for this metric should also be used for development of contractual incentives and used as a basis of comparison against best-in-class targets. Upon contractor achievement of performance improvement, a set of award fees or additional award terms can be given. The table below provides sample performance evaluation criteria which could be used to evaluate contractor performance for % of Orders Delivered in Full (MIL.RL.2.1).

		Submarginal	Marginal	Good	Excellent
% of Orders Delivered in Full	***Adherence to Order***	Consistently fails to deliver orders in full based on requirements	Occasionally fails to deliver orders in full based on requirements	Meets quantity and/or level of effort requirements.	Meets quantity and/or level of effort requirements including unanticipated changes in demand.
	Action on Anticipated Changes to Order	Does not expose changes or resolve them as soon as recognized.	Exposes changes but is slow to develop resolution.	Keeps customer posted on changes, resolves independently meets all requirements.	Anticipates in good time, advises customer, resolves independently, exceeds all requirements.

Table 7. Sample Contract Performance Evaluation Criteria for % of Orders Delivered in Full. [132]

[132] Office of the Secretary of Defense. (2011). PGI 216.4: Incentive contracts. Retrieved from http://www.acq.osd.mil/dpap/dars/pgi/pgi_htm/PGI216_4.htm.

MILSCOR Performance Attribute: Supply Chain Reliability

MILSCOR Metric: Delivery Performance to Customer Commit Date (MIL.RL.2.2)

Definition: The percentage of orders that are fulfilled on the customer's scheduled or committed date.

Calculation: [Total number of orders delivered on the original commitment date] / [Total number of orders delivered] x 100%

As per SCOR 10.0, an order is considered delivered to the customer's commitment date if: The order is received on time as defined by the customer; and, the good or service is delivered to the correct location and customer.

Data Collection: Data for delivery performance to customer commit date must be collected by each customer in the chain and reported back upstream to verify that the date delivered corresponds with the original customer commit date. For goods, this data can be collected from automation through technology such as RFID, however care must be taken to ensure those items that are tracked using this technology are ultimately cross referenced for accuracy as noted in MIL.RL.2.1. In some cases, such as contingency operations, this information is recorded and maintained manually leaving significant opportunities for incorrect data collection and delayed reporting.

For services, this data would typically be kept through a government approved time keeping system. The time recorded in these systems for a given task should then be cross-referenced against contractual requirements for delivery commit date to ensure the level of effort was expended in accordance with the agreed upon delivery schedule. This data should then be used to identify the poorest performing parts of the chain to generate lessons learned. For both goods and services, when these items are provided by industry, data for delivery performance to customer commit date should be used as a basis of comparison against best-in-class targets. Upon achievement, a set of award fees or additional award terms can be given to the highest performing contractors.

Discussion: Consistent with SCOR 10.0, the acceptable window for delivering a good or service on time should be defined in the suppliers contractual agreement. In the case where the good or service is provided organically by DoD, it should be fulfilled according to relevant DoD policy requirements. In the military context, on-time delivery is very important and thus when completing a supply chain performance evaluation should be weighted heavily depending on the urgency of the particular requirement in a given operation. For example, building on the previous illustration given in MIL.RL.2.1, on-time delivery for tank spares during a humanitarian operation may be less important than on-time delivery of HUMVEE spares. As a result, weighting for on-time delivery metrics should be modified accordingly given the specific operational requirements at hand.[133]

In cases where orders are canceled or modified by the Government, this data should be excluded from the metric. As also noted by SCOR 10.0, evaluating the acceptance of customer original request date (delivery date order preference) vs. supplier commit date can be a means to evaluate customer satisfaction (i.e. the supplier was able to meet delivery preferences for the customer (x) percent of the time). This metric can be used to compare customer satisfaction levels at various links in the chain and more specifically to evaluate government vs. private sector performance. Finally, the widespread usage of ID/IQ contracts noted earlier is an additional consideration when using this metric. In cases where these contracts are used, an undefined delivery date for the goods or services may have been established at contract execution however the specific delivery date for each task will ultimately be identified upon award of each task order.

When a good or service is provided by industry (not government), data collected for this metric should also be used for development of contractual incentives and used as a basis of comparison against best-in-class targets. Upon contractor achievement of performance improvement, a set of award fees or additional award terms can be given. The table below provides sample

[133] Note: The specific weighting for the components of this metric should always be applied based on the requirements identified by senior military planners.

performance evaluation criteria that could be used to evaluate contractor performance for Delivery Performance to Customer Commit Date (MIL.RL.2.2).

		Submarginal	**Marginal**	**Good**	**Excellent**
Delivery Performance to Customer Commit Date	***Adherence to Schedule***	Consistently fails to deliver orders in on time.	Occasionally fails to deliver orders on time.	Meets customer commitment requirements.	Meets customer commitment requirements including unanticipated changes in demand.
	Action on Anticipated Changes to Schedule	Does not expose delays or resolve them as soon as recognized.	Exposes delays but is slow to develop resolution.	Keeps customer posted on delays, resolves independently meets all requirements.	Anticipates in good time, advises customer, resolves independently, exceeds all requirements.

Table 8. Sample Contract Performance Evaluation Criteria for Delivery Performance to Customer Commit Date. [134]

[134] Office of the Secretary of Defense, (2011).

MILSCOR Performance Attribute: Supply Chain Reliability

MILSCOR Metric: Documentation Accuracy (MIL.RL.2.3)

Definition: Percentage of orders with accurate documentation supporting the order, including packing slips, bills of lading, invoices, etc.

Calculation: [Total number of orders delivered with accurate documentation] / [Total number of orders delivered] x 100%

An order is considered to have accurate documentation when the customer accepts the following:

For goods and services, the following types of documentation may be applicable:

- Shipping documentation – Packing slips (Customers), Bill of lading (Carriers), Government or Customs documentation / forms, all other documentation as referenced in DoD's Standard Practice Military Marking for Shipment and Storage (MIL-STD-129P w/CHANGE 4 19 September 2007),[135] Department of Defense Standard Practice Identification Marking of U.S. Military Property (MIL-STD-130N, 17 December

[135] Department of Defense. (2007). DoD's standard practice military marking for shipment and storage. Retrieved from http://www.acq.osd.mil/log/rfid/mil-std-129pch4.pdf.

2007),[136] Department of Defense Standard Practice for Military Packaging (MIL-STD-2073-1E, 23 May 2008).[137]

- Payment documentation – Invoice, Contractual outline agreement, task order documentation and all other documentation as required by the Defense Finance and Accounting Service Contractor and Vendor Payment Information Guidebook.[138]

- Compliance documentation – All documentation required by the Contract Data Requirements List (CDRL) for contract execution. Examples may include:

    1. Data which is not otherwise essential to the contractor's performance of the primary contracted effort (production, development, testing and administration).

    2. Data which is essential to the performance of the primary contracted effort but the contractor is required to perform additional work to conform to Government requirements with regard to depth of content, format, frequency of submittal, preparation, control or quality of the data item.

    3. Data which the contractor must develop for his internal use in performance of the primary contracted effort and does not require any substantial change to conform to Government requirements with regard to depth of content, format, frequency of submittal, preparation, control and quality of the data item.[139]

---

[136] Department of Defense. (2007). Department of Defense standard practice identification marking of U.S. military property. Retrieved from http://www.easysoftcorp.com/usefulfiles/MIL-STD-130N.pdf.

[137] Department of Defense. (2008). Department of Defense standard practice for military packaging. Retrieved from http://elsmar.com/pdf_files/Military%20Standards/MIL-STD-2073-1E.pdf.

[138] Defense Finance and Accounting Service. (n.d.). Defense finance and accounting service contractor and vendor payment information guidebook. Retrieved from http://www.dfas.mil/dms/dfas/contractorsvendors/pdf/ContractPayInformation-011110.pdf.

[139] Department of the Air Force. (ND). DD Form 1423, Contract data requirements list items. Retrieved from http://www.kirtland.af.mil/shared/media/document/AFD-080401-055.pdf.

4. Personnel documentation (for services) – Resumes and/or qualification documentation/certifications, appropriate identification badges required for facility access, appropriate security clearance documentation.

All documentation must be complete, correct, and readily available as expected by the Government. Note that documentation does not necessarily have to be in paper format; electronic formats are acceptable and considered the preferred method. In many cases this type of documentation is in fact required to occur electronically but practices vary widely across DoD.

Data Collection: Data collection for the MIL.RL.2.3 metric is fairly straightforward however its execution may prove to be much more difficult given the current business environment at DoD. Currently, severe downward budgetary pressure and decreased resources will become the norm for the next several years, making accurate and efficient business processes highly important. One major problem is the current data collection and sharing problem which exists because most work units across the Department function within the confines of dozens if not hundreds of unique business systems. As shown in the table below, most of these systems are unable to interoperate and share information—this is a major roadblock to timely processing of necessary documentation across the enterprise.

Number of Systems	Financial Management	Human Resources	Other Systems	Total
Army	97	253	397	*747*
Navy	93	111	269	*473*
Air Force	43	103	343	*489*
Agencies	102	234	275	*611*
Total	335	701	1284	*2320*

Table 9. Number of Distinct Business Systems at DoD. [140]

While some invoicing and payment processing has become streamlined through systems such as Wide Area Work Flow (WAWF), this technology is only one small piece of the larger puzzle.[141] As noted by the Marine Corps' WAWF training guide, WAWF is a secure web-based system for electronic invoicing, receipt and acceptance which combines the three documents required to pay a vendor – the contract, the invoice and the Receiving Report in order to support DoD's goal of moving to a paperless acquisition process.[142] However, WAWF only addresses a small portion of DoD's supply chain documentation requirements. For example, WAWF only addresses paperwork needed for DoD's relationships with contractors and processing payments for goods and/or services—"payment documentation" as noted above. In the case of goods, the system does not track current inventory levels to identify when additional orders might need to be filled to notify the Government acquisition personnel and associated contractors accordingly—

[140] Department of Defense, Office of the Deputy Chief Management Officer. (2011). Department of Defense enterprise transition plan. Retrieved from http://dcmo.defense.gov/etp/FY2011/content.html?tpl=tpl1&d=content_etp_sys_over.xml.

[141] Department of Defense. (2012). Wide area work flow. Retrieved from https://wawf.eb.mil/ Defense Finance and Accounting Service. (2011). Electronic commerce and wide area workflow overview. Retrieved from http://www.dfas.mil/dms/dfas/ecommerce/pdf/WAWFOverviewCaptivatever5.pps.

[142] United States Marine Corps. (n.d.). Wide area work flow detailed instructions. Retrieved from www.lejeune.usmc.mil/contracting/**wawf**_detailed_instructions.doc.

thus there an information disconnect between acquisition, procurement, and the customer. If this data can be collected seamlessly, it could be used to identify the poorest performing parts of the chain to generate lessons learned and best practices for leadership and management to improve various elements for each supply chain organization (e.g. culture, organizational structure, processes, policies, strategy, incentives, etc.).

Discussion: The Documentation Accuracy (MIL.RL.2.3) metric is calculated at the order level. The timeliness and quality of the documentation is measured from the perspective of the customer. The importance of accurate and on-time documentation cannot be stressed enough in the defense contracting environment where a litany of rules, which are often highly difficult to navigate, directly impact the timeliness of deliveries for goods and services throughout the supply chain.

Traceability for the precise cause of delayed documentation are key for improvement as countless statutes, Federal Acquisition Regulations (FARS), Defense Federal Acquisition Regulations (DFARS), as well as additional rules, policies, directives, and Service/Agency specific requirements, exist across the Department. In some cases, these requirements can be conflicting—where for example, an agency specific requirement might conflict with a DoD level directive or visa versa. As a result, these issues may make it incredibly difficult to satisfactorily address any documentation problems on- schedule.

In the military context, the accurate documentation metric is very important and thus when completing a supply chain performance evaluation it should be weighted heavily—dependent upon on the urgency of the particular requirement. In short, incorrect documentation may directly contribute to the incorrect delivery of the specific quantity of goods/services or failure to deliver goods/services in a timely manner (MILSCOR metrics MIL.RL.2.1 and MIL.RL.2.2)—the importance of this point cannot be overstated.

This is especially true in the case of service delivery where many services which may be delivered require personnel performing each service possess a minimum security clearance. In short, without the proper clearance, the individual who is supposed to provide the service may be unable to provide it on-time. As noted by a recent GAO review on the subject, industry personnel contracted to work for the Federal government were required to wait more than 1 year on average to receive top secret clearances—about twice as long as the stated goal. Not only do these types of delays increase costs for contract execution, but they also increase risk to national security by keeping key resources such as subject matter experts, engineers, etc. out of DoD's pipeline for services. Instead, these resources remain sitting on the sidelines while requirements go unmet.[143] Finally, depending on the type of military operation

[143] Government Accountability Office. (2007). DoD personnel clearances: Delays and inadequate documentation found for industry personnel. Retrieved from http://www.gao.gov/new.items/d07842t.pdf.

the weighting for identical goods/services might differ considerably as the need for accurate documentation may vary greatly.[144]

[144] Note: The specific weighting for the components of this metric should always be applied based on the requirements identified by senior military planners.

MILSCOR Performance Attribute: Supply Chain Reliability

MILSCOR Metric: Perfect Condition (MIL.RL.2.4)

Definition: For goods, the percentage of orders delivered in an undamaged state that meet specification, have the correct configuration, are faultlessly installed (as applicable), and accepted by the customer as well as not being returned for repair or replacement (within the warranty period *if applicable*); For services, the quantity of services provided in the correct manner, with the correct performance level.

Calculation: [Number of orders delivered in Perfect Condition] / [Number of orders delivered] x 100%

For goods, the percentage of orders delivered in an undamaged state that:

- Meet specification,
- Have the correct configuration,
- Are faultlessly installed (if applicable),
- Accepted by the customer without being returned for repair or replacement (within the warranty period *if applicable*);

For services, the quantity of services provided:

- In the correct manner; and
- With the correct performance level.

Data Collection: Perfect condition data should be collected at multiple points throughout the supply chain as inspections for condition can be reasonably conducted. Data collected to satisfy this metric could include confirming condition of the good or service, installation (if applicable) and/or for services the correct performance level (if applicable). Finally, data collected from this metric should be cross-referenced to verify if the goods/services are indeed satisfactory of the original order commitment (e.g. does documentation applicable to condition match customer expectations for condition? Does delivered condition match this documentation?).

Data regarding fulfillment of order commitment can be acquired through examining customer satisfaction metrics such as complaints, returns, etc. This data would typically be collected once orders are received and inspected. Data should be collected at multiple points throughout the supply chain and can be collected manually or through the preferred method of using advanced information technology systems predicated upon Enterprise Resource Planning (ERP) applications such as SAP or Oracle.

In some cases for DoD acquisitions, the vendor may be required to self-certify or receive outside third-party certification prior to delivery that the goods provided meet certain minimum standards for quality, performance, etc. as part of their contractual obligations. While these self-certifications provide a streamlined approach for getting items through the supply chain quickly, third party inspections after delivery and prior to payment processing should ideally occur to verify condition. This data should then be used to identify the poorest performing parts of the chain to generate lessons learned and best practices so leadership and management can work to make the appropriate improvements.

Discussion: The Perfect Condition (MIL.RL.2.4) metric is calculated at the order level and evaluates the quality and integrity of goods or services delivered to the military. Problems with goods being in imperfect condition may either arise out of some negligence in production, shipping, and installation by the government and/or contractor ***or*** through deliberate malice as a result of the supply chain being a legitimate military target where action by an adversary has occurred for the purposes of disrupting the chain. In either case, goods and/or services that are unable to be delivered in perfect condition should be evaluated to determine if the integrity of the supply chain may have been broken.

For goods in the military environment, data collection should occur at multiple points along the supply chain as items may need to be tested for quality prior to being sent into the field. For services, inspection can occur once the provision of the service commences. For example, if a contract required 2 FTE's with a minimum of 20 years experience to provide vehicle maintenance services, they could be evaluated to ensure they meet contractual requirements through an initial “trial period”. During this time, if the individuals provided were unable to meet Government requirements, they may be “returned” and the contractor would be required to provide new personnel. In this case, it is incredibly important to ensure that the service providers, which were submitted during the source selection process, are the actual providers completing the services and that their “documentation” such as resumes, certification, and training actually checks out in the field. It should also be noted that for particularly complex services, such as certain types of engineering services, it may not be possible to readily substitute personnel as precise qualifications and knowledge for service execution may be required.

When a good or service is provided by industry (not government), data collected for this metric should also be used for development of contractual incentives and used as a basis of comparison against best-in-class targets. Upon contractor achievement of performance improvement, a set of award fees or additional award terms can be given. The table below provides sample performance evaluation criteria which could be used to evaluate contractor performance for Perfect Condition (MIL.RL.2.4).

		Submarginal	Marginal	Good	Excellent
Perfect Condition	***Adherence to Condition Specifications***	Consistently fails to deliver orders in perfect condition—negatively impacts readiness.	Occasionally fails to deliver orders in perfect condition—negatively impacts readiness.	Meets customer quality requirements—maintains readiness.	Meets customer quality requirements including unanticipated changes in demand—improves readiness.
	Action on Anticipated Quality Problems	Does not expose quality problems or resolve them as soon as recognized.	Exposes potential quality problems but is slow to develop resolution.	Keeps customer posted on quality problems, resolves independently meets all requirements.	Anticipates in good time, advises customer, resolves independently, exceeds all requirements.

Table 10. Sample Contract Performance Evaluation Criteria for Perfect Condition. [145]

In the military context, the condition metric is very important and thus when completing a supply chain performance evaluation it should be weighted heavily depending on the urgency of the particular requirement. For example, building on the previous examples given in MIL.RL.2.1 and MIL.RL.2.2, the condition of HUMVEE spares may be far more important than the condition of tank spares in a given operation (e.g. providing humanitarian aid vs. quelling an insurgency). Within the context of providing humanitarian aid the MIL.RL.2.4 metric for HUMVEE spares should be weighted more heavily than for tank spares as one could assume the demand for HUMVEEs would be greater in this type of operation than for tanks.[146]

[145] Office of the Secretary of Defense, (2011).
[146] Note: The specific weighting for the components of this metric should always be applied based on the requirements identified by senior military planners.

Supply Chain Reliability Perfect Condition Case: Body Armor

For a soldier, body armor means life or death. When deployed in a hostile environment, the integrity of a warfighter's body armor can provide the

confidence needed to achieve mission success and ensure the warfighter comes home safe. When it was reported in 2008 that DoD had purchased billions of dollars in body armor that had not been properly tested and may not meet performance specifications, the integrity of the supply chain was in question. In a recent Department of Defense Inspector General Report, it was found that inconsistent testing of body armor ultimately permitted inadequate armor to make it into the field—potentially risking lives of American soldiers. In this case, because the good was directly responsible for saving lives, it was imperative that a cross-sectional analysis of body armor integrity was undertaken by an independent third-party to ensure adherence to performance specifications prior to deployment on the battlefield.[147] This type of analysis would have fulfilled the requirements for evaluating a good for the Perfect Condition (MIL.RL.2.4) metric to ensure the product met full military specifications prior to delivery.

[147] Inspector General of the United States Department of Defense. (2011). Ballistic testing and product quality surveillance for the interceptor body armor – Vest components need improvement. Retrieved from http://www.dodig.mil/audit/reports/fy11/11-030.pdf.

MILSCOR Performance Attribute: Supply Chain Responsiveness

The average actual cycle time consistently achieved to fulfill customer orders. For each individual order, this cycle time starts from the order receipt and ends with customer acceptance of the order.

MILSCOR Metric: Order Fulfillment Cycle Time (MIL.RS.1.1)

Hierarchical MILSCOR Supply Chain Responsiveness Metric Structure

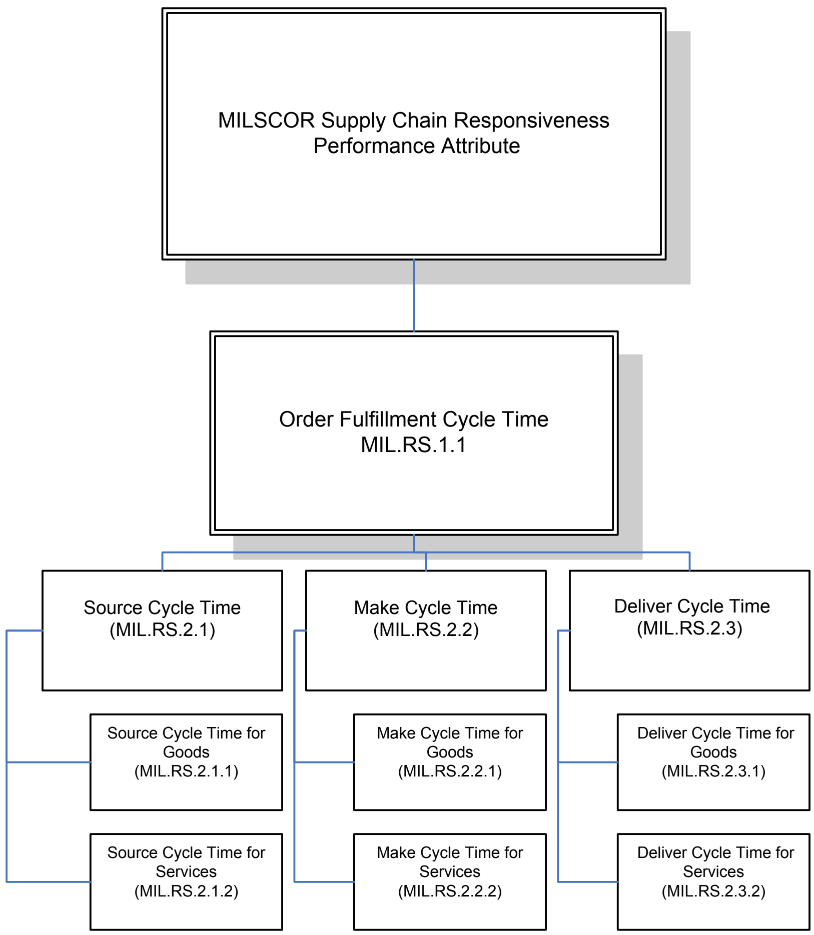


Figure 5. MILSCOR Responsiveness Metric Structure.

Definition: The average actual cycle time consistently achieved to fulfill customer orders. For each individual order, this cycle time starts from the order receipt and ends with customer acceptance of the order.

Calculation: [Sum Actual Cycle Times For All Orders Delivered] / [Total Number Of Orders Delivered]

Order Fulfillment Cycle Time (MIL.RS.1.1) = Source Cycle Time (MIL.RS.2.1) + Make Cycle Time (MIL.RS. 2.2) + Deliver Cycle Time (MIL.RS.2.3).

Calculation: The following components should be included in the aggregate calculation of supply chain cycle time.

Source Cycle Time (MIL.RS.2.1)	Make Cycle Time (MIL.RS.2.2)	Deliver Cycle Time (MIL.RS.2.3)
For goods and services: Time required to identify sources of supply (organic or contractor). Time required to select supplier (hold competition if contractor). Time required to coordinate and schedule delivery of good/service. Time required to receive good/service Time required to verify good/service. Time required to transfer good/service. Time required to pay invoice for good/service.	For goods: Time required to engineer good. Time required to schedule production of good. Time required to issue material/product. Time required to produce product. Time required to test product. Time required to stage finished product. Time required to release finished product. For services: Time required to train personnel (if necessary). Time required to recruit personnel (if necessary). Time required to set up services – (e.g. telephone services, internet services, etc.)	For goods: Time required to receive, configure, enter and validate. Time required to reserve resources and determine delivery date. Time required to consolidate orders (if applicable) and schedule installation/integration. Time required to build loads. Time required to route shipments, select carriers and rate shipments. Time required to receive product from Make/Source. Time required to pick product. Time required to pack product in compliance with military requirements and to load vehicle. Time required to generate shipping documentation. Time required to ship product. Time required to receive & verify product and install product. For services: Time required to reserve resources and determine delivery date. Time required to receive service from Source/Make. Time required to evaluate service level for compliance with contractual requirements/customer needs.

Table 11. MILSCOR Supply Chain Cycle Time Components.

Data Collection: Data for the components that are used to drive the calculation of responsiveness are taken from the Source, Make, and Deliver process elements found in SCOR 10.0. Data should be collected at multiple points throughout the supply chain and can be collected manually or through the preferred method of using advanced information technology systems predicated upon Enterprise Resource Planning (ERP) applications such as SAP or Oracle. In some cases, such as in contingency operations, this information is recorded and maintained manually leaving significant opportunities for incorrect data collection and delayed reporting. This data should then be used to identify the poorest performing parts of the chain to generate lessons learned and best practices so leadership and management can improve the various elements required for organizational change (e.g. culture, organizational structure, processes, policies, strategy, incentives, etc.).

Discussion: "Gross" order fulfillment cycle-times are captured from the moment a customer places the order (through a requisition, contract, etc.) to the moment the order is fulfilled (customer takes delivery). This metric includes ***all*** time that occurs in-between order placement and final delivery even if that includes built-in and agreed upon delays (such as dwell time). Dwell time occurs when a customer places an order well in advance of the time necessary for delivery. As a result of this factor, it is important that this metric is not misconstrued as being representative of organizational responsiveness. Accordingly, the "Net" order fulfillment cycle-time would be the actual number of days between order placement and final delivery without any additional dwell time included.

In the military context, capturing a cycle-time metric in isolation is fairly meaningless. For example, if cycle time has been reduced by 30 percent for delivery of a given good or service, but DoD readiness is still negatively impacted, the improvement in cycle-time alone is not meaningful. Ultimately, the amount of cycle-time that it takes for a good/service to work its way through the supply chain needs to be measured against its impact on operational readiness. This factor also has a direct impact on weighting. For example, the Army's recent effort to acquire portable battle networks based upon existing commercial technology has experienced major difficulties with respect to issuing contracts. One recent review noted that while it only took the Army roughly six months to evaluate potential technologies for compliance, testing/certification, etc. Once a decision was made on what the Army wanted to buy, it has taken nearly 30 months to award the contract to buy it.[148] In this example, cycle-time for the contract award process (which would fall under Source Cycle Time (MIL.RS.2.1)) should receive additional weight and consideration because it can be identified as a major impediment to rapidly acquiring a key system for the warfighter and getting it into the field.

[148] Erwin, S. I. (2012). Army's acquisition of battle network slowed down by red tape. Retrieved from http://www.nationaldefensemagazine.org/archive/2012/March/Pages/Army%E2%80%99sAcquisitionofBattleNetworkSlowedDownbyRedTape.aspx.

For those goods/services that are not deemed to be critical for operational readiness, their weighting with respect to cycle-time may be reduced. Thus the weight of the cycle-time metric should be adjusted as a function of the urgency of the requirement and its impact on operational readiness overall. As this metric is composed of the sum of the Source, Make and Deliver metrics, each of these might be also be weighted differently depending on the type good/service being evaluated. For example, sourcing for some items may occur years in advance of their need on the battlefield making cycle-time for sourcing of low importance for readiness. However, once the item is sourced and produced, delivery time from the warehouse to the warfighter may become incredibly important thus requiring additional weighting for importance at this point in the chain.[149]

In all cases, data collected for cycle-time should be cross-referenced against contractual and/or policy provisions for delivery timeline requirements. When goods and services are provided by industry, data for cycle time can be used as a contractual incentive to set against best-in-class targets for contractors to try and achieve. For example, if a given contract required the goods and/or services to be delivered in no more than 10 days, the Government could provide an award fee in cases where the items were delivered in 7 days or less—thus incentivizing the contractor to reduce cycle-time. However, a reduction in cycle-time should *only* be incentivized if this improvement will

---

[149] Note: The specific weighting for the components of this metric should always be applied based on the requirements identified by senior military planners.

have a positive impact on overall military readiness. For example, in some cases, a reduction in cycle-time for a given good/service may not be preferred if the customer is unwilling or unable to receive the good/service earlier (e.g. where delivery at an exact date/time is preferred).

MILSCOR Performance Attribute: Supply Chain Agility

Definition: The agility of a supply chain in responding to changes in customer demand.

Hierarchical MILSCOR Supply Chain Agility Metric Structure

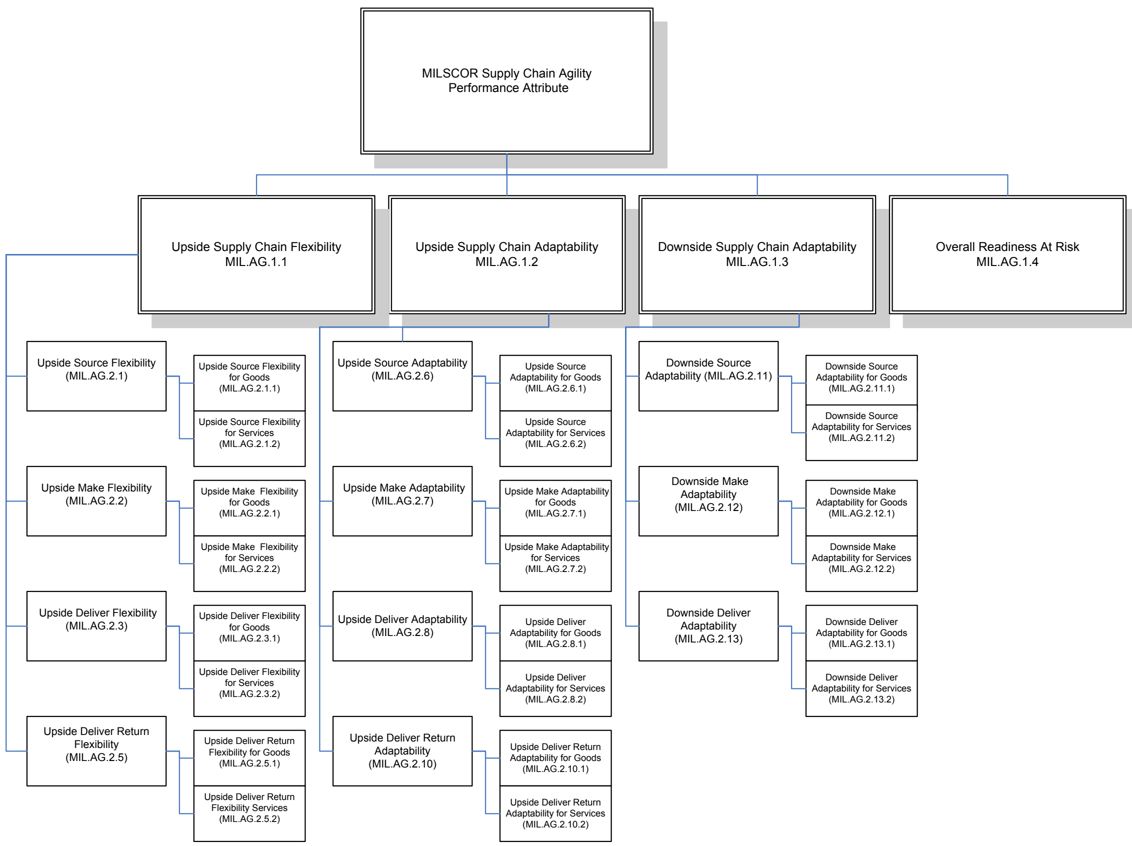


Figure 6. MILSCOR Agility Metric Structure.

MILSCOR Performance Attribute: Supply Chain Agility

MILSCOR Metric: Upside Supply Chain Flexibility (MIL.AG.1.1)

Definition: The number of days required to achieve an unplanned sustainable 20 percent increase in quantities (for goods) or level of effort (for services) delivered.[150]

Calculation: Upside Supply Chain Flexibility (MIL.AG.1.1) = The number of days required to Source (MIL.AG.2.1) + Make (MIL.AG.2.2) + Deliver (MIL.AG.2.3) + Deliver Return (MIL.AG.2.5) an unplanned sustainable 20 percent[151] increase in quantities (for goods) or level of effort (for services) delivered. The following components should be included in the aggregate calculation of Upside Supply Chain Flexibility (MIL.AG.1.1).

Upside Source Flexibility (MIL.AG.2.1)	Upside Make Flexibility (MIL.AG.2.2)	Upside Deliver Flexibility (MIL.AG.2.3)	Upside Deliver Return Flexibility (MIL.AG.2.5)
The number of days required to achieve an unplanned sustainable 20 percent increase in quantity for goods and/or capacity required for services.	The number of days required to achieve an unplanned sustainable 20 percent increase in production with the assumption of no raw material or personnel constraints.	The number of days required to achieve an unplanned sustainable 20 percent increase in quantity of goods or services delivered with the assumption of no other constraints.	The number of days required to achieve an unplanned sustainable 20 percent increase in the return of goods/services.

Table 12. MILSCOR Flexibility Components.

[150] Note 20 percent is an arbitrary number provided for benchmarking purposes.
[151] Note 20 percent is an arbitrary number provided for benchmarking purposes.

Data Collection: Data collected for this metric should be collected as the number of days required for each phase (Source, Make, Deliver, and Deliver Return) for responding to the an unanticipated increase in demand of 20 percent. This data can be collected at each link in the chain and should be reported both upstream and downstream. Because agility metrics go to responsiveness, any delays in potential deliveries downstream must be communicated as early as possible to permit military planners to make alternative arrangements if necessary. This information could be collected through contractor self-reporting requirements, with estimated data coming as a result of responses to the initial request for proposal (RFP) during the sourcing phase.[152] Data can be collected manually or through the preferred method of using advanced information technology systems predicated upon Enterprise Resource Planning (ERP) applications such as SAP or Oracle.

Once the data is collected, it should then be used to identify the poorest performing parts of the chain (e.g. those which took the greatest number of days to respond to a 20 percent increase in demand when benchmarked against themselves, other DoD entities, and/or world-class performance standards). This data should then be used to generate lessons learned and best practices to make organizational improvements in areas required for improved performance (e.g. organizational structure, processes, policies, strategy, incentives, etc.). While it is incredibly important to collect this data for

[152] For the purposes of evaluating supply chain performance, DoD could potentially require contractors who provide to report data on the amount of time it would take to increase supply of goods and/or services by 20 percent as a requirement for responding to an RFP.

benchmarking purposes, it should be collected in a seamless manner that does not interfere with the timeliness of the response.

The following components are the minimum factors that should be considered when collecting data for this metric and are divided between those which are the baseline “Input” measures and those which are the “Resource Availability Assessment & Ramp-up/Lead Time” measures that represent the difference in level of effort required over the “Input” (e.g. baseline prior to the unanticipated increase in demand).

	Source (MIL.AG.2.1)	Make (MIL.AG.2.2)	Deliver (MIL.AG.2.3)	Deliver Return (MIL.AG.2.4)
ıput	Current elements needed to fully understand future requirements to meet Source requirements for 20% surge in current demand, seeks to answer the question…"How long will it take for the DoD (or its contractors) to sustain a 20% increase in quantities of goods or services sourced?." Current inventory for goods or level of effort/service level on hand for services. Number of staff and the associated types and volumes of skills required to fulfill current demand. Productivity information for staff for current level of effort for goods and/or services. Current funding status: Is funding in place? Does it require reprogramming or other change request? Is a supplemental appropriation request necessary?[153] All resources required to sustain current order fulfillment? Current sourcing/supplier constraints: Is the requirement a Joint Urgent Operational Need (JUON)? Nature of items: Are these items commercial in nature or military specific? For services, are the services "inherently governmental" in nature? Current procurement cycle time to place a purchase order and required supplier lead time? Is an ID/IQ in place or will the service be sourced from scratch? What is the nature of the current marketplace for the good or service being sourced? Is it competitive?	Current elements needed to fully understand future requirements, to establish 20% gap, based on the question "How long will it take for the DoD (or its contractors) to sustain a 20% increase in quantities of goods or services produced?" Current make volumes: Amount of each good or service acquired. Labor needed to meet current make demand. For goods this includes productivity information For Services: this includes units/orders per FTE and/or service level. Internal and External (private sector) capacity needed for current demand for the good/service. Current funding status: Is funding in place? Does it require reprogramming or other change request? Is a supplemental appropriation request necessary? All resources required to sustain current order fulfillment?	Current elements needed to fully understand future requirements, to establish 20% gap, based on the question "How long will it take for DoD (or its contractors) to sustain a 20% increase in quantities delivered?" Current deliver volume for goods and/or services. Number of staff and the associated types and volumes of skills required to fulfill current demand. Productivity information for staff for current level of effort for goods and/or services. For goods, Internal and External (3PL) capacity needed for current demand throughput including facilities, space fleet equipment, outside carrier loads, materials handling equipment, etc. Current funding status: Is funding in place? Does it require reprogramming or other change request? Is a supplemental appropriation request necessary? All items required to sustain current order fulfillment? Current logistics order cycle time (all else equal including procurement order cycle time, supplier lead time, etc.). For goods and services, customer order processing cycle time. For goods, dock-to-stock cycle time. For goods, pick-to-ship cycle time. Transit time.	Current elements needed to fully understand future requirements, to establish 20% gap, based on the question "How long will it take for DoD (or its contractors) to sustain a 20% increase in quantities returned?" Current return volume for goods and/or services – number of orders returned. Labor needed to meet current deliver return demand including productivity information such as units/orders per FTE. Productivity data such as items returned per FTE. For goods, Internal and External (3PL) capacity needed for current demand throughput including facilities, space fleet equipment, outside carrier loads, materials handling equipment, etc. Current funding status: Is funding in place? Does it require reprogramming or other change request? Is a supplemental appropriation request necessary? Alternative source status: is another vendor able to respond with the good/service being required to minimize delay in military "readiness"? Have contingency plans been formalized for any returned good/service? Current customer return order cycle time. Customer return order processing cycle time (customer service and logistics). Return processing and disposition cycle time.

Table 13. MILSCOR Upside Supply Chain Flexibility Input Components.

[153] In the Government supply chain environment, the status of funding is key as this may significantly delay progress for planning, sourcing, making and/or delivering a given good or service.

	Source (MIL.AG.2.1)	Make (MIL.AG.2.2)	Deliver (MIL.AG.2.3)	Deliver Return (MIL.AG.2.4)
Resource Availability Assessment & Ramp-up/Lead Time	Elements needed to establish 20% delta in resources and what is required to meet the 20% delta based on the question “How long will it take for the DoD to sustain a 20% increase in quantities sourced?” Number of staff, the associated types and volumes of skills required, and additional capacity required to fulfill additional demand (taking into account potential underutilized FTEs and/or IT resources). Amount of time needed to recruit/hire/train additional staff and/or acquire additional services to fill gap between underutilized (note if possible must assess cost/benefits of acquiring additional resources organically versus through contractor support). FTE’s, staff, and IT resources needed to sustain 20% increase in quantities of goods/services delivered. Current funding status: If additional funding or reprogramming is required, how much additional time is needed? Current sourcing/supplier constraints: Is the requirement a Joint Urgent Operational Need (JUON)? Time required in negotiating new source/volume contracts/terms (if necessary) Time required to find/obtain additional sources (if necessary) Time needed to obtain, deliver and phase in goods/services to sustain 20% increase in quantities sourced. Time to place a task order and/or award a contract. Supplier lead time to respond to task order and/or request for proposal.	Elements needed to establish 20% delta in resources and what is required to meet the 20% delta based on the question “How long will it take for the DoD (or its contractors) to sustain a 20% increase in quantities made?” Number of staff, the associated types and volumes of skills required, and additional capacity required to fulfill additional demand (taking into account potential underutilized FTEs and/or IT resources). Amount of time needed to recruit/hire/train additional staff and/or acquire additional services to fill gap between underutilized (note if possible must assess cost/benefits of acquiring additional resources organically versus through contractor support). Current funding status: If additional funding or reprogramming is required, how much additional time is needed? All items required to sustain additional order fulfillment.	Elements needed to establish 20% delta in resources and what is required to meet the 20% delta based on the question “How long will it take for DoD (or its contractors) to sustain a 20% increase in quantities delivered?” Number of staff, the associated types and volumes of skills required, and additional capacity required to fulfill additional demand in logistics (taking into account potential underutilized FTEs and/or IT resources). Amount of time needed to recruit/hire/train additional staff and/or acquire additional services to fill gap between underutilized (note if possible must assess cost/benefits of acquiring additional resources organically versus through contractor support). Current capacity utilization including but not limited to: facilities, space, IT systems, bandwidth, etc.) and amount of time needed to obtain assets/capacity to fill gap between underutilized asset capacity and assets needed to sustain 20% increase in quantities delivered Current funding status: If additional funding or reprogramming is required, how much additional time is needed? Amount of time needed to obtain resources to fill gap between underutilized asset capacity and assets needed to sustain 20% increase in quantities delivered. Amount of time needed to obtain supplemental contractor provided resources or facilities to sustain 20% increase in quantities delivered. For goods, amount of time needed to increase finished inventory for order fulfillment to sustain 20% increase in quantities delivered. For goods and services, customer order processing cycle time. For goods, dock-to-stock cycle time. For goods, pick-to-ship cycle time. Transit time.	Assuming no customer constraints, elements needed to establish 20% delta in resources and what is required to meet the 20% delta based on the question “How long will it take DoD to sustain a 20% increase in quantities returned?” Labor needed to meet additional deliver return demand including productivity information such as units/orders per FTE. Amount of time needed to recruit/hire/train additional staff to fill gap between underutilized (note if possible must assess cost/benefits of acquiring additional staff organically versus through contractor support). Current capacity utilization facilities, space, fleet equipment, materials handling equipment, etc.) and amount of time needed to obtain assets/capacity to fill gap between underutilized asset capacity and assets needed to sustain 20% increase in quantities returned. Current funding status: Is funding in place? Does it require reprogramming or other change request? Is a supplemental appropriation request necessary? If additional funding or reprogramming is required, how much additional time is needed? Amount of time needed to obtain capital to fill gap between underutilized asset capacity and assets needed to sustain 20% increase in quantities returned from customers. Outsourcing Alternatives including: Supplemental Outsource; 3PL facilities, lease building, etc.; full service lease fleet, materials handling, etc. equipment outside carriers for quantities deliver return. Amount of time needed to obtain supplemental outsourced resources or facilities to sustain 20% increase in quantities deliver return. Customer return order processing cycle time (customer service and logistics). Return processing and disposition cycle time.

Table 14. MILSCOR Upside Supply Chain Flexibility Resource Availability Assessment & Ramp-up/Lead Time Components.

Discussion: Upside supply chain flexibility is about measuring a supply chain's responsiveness to risk…in essence it asks the question: How well is the supply chain prepared to respond to an unanticipated increase in demand? In the military context, this response capability can be the difference in the war as it goes directly to the question of military readiness—Does the warfighter have whatever he/she needs, whenever he/she needs, it to achieve mission success? Through the so-called "fog of war", uncertainty in the battlefield environment undoubtedly makes flexibility and agility metrics of the utmost importance as very rarely does something on the battlefield go precisely according to plan. Unlike the private sector, where failure to respond to a change in demand can result in lost sales…on the battlefield, lives are at stake.

Supply chain flexibility is incredibly important as the battlefield can create a significant amount of unpredictability. Accordingly, this metric should be measured as the total number of days between the occurrence of an unplanned event (e.g. the unanticipated increase in demand for a particular good or service) and the amount of time required for achievement of sustained plan, source, make, deliver and return performance required to fulfill that unanticipated increase in demand. It should also be noted that the Deliver Return metric is used specifically in the context of where a weapons system (or associated component) would require repair and/or maintenance and have to be returned upstream through the supply chain. Once these systems arrive at the proper location for repair, the Plan, Source, Make, and Deliver cycle would be initiated again unless the item would require complete disposal. This metric may also be adapted for use when services are "returned" in cases where either the service is no longer needed or the service provider does not fulfill a customer requirement.

Depending on the capabilities of the supply chain and the particular good or service for which demand has unexpectedly increased, it may be possible that some amount of overlap in time required for response may exist. For example, if it is a Joint Urgent Operational Need (JUON)[154] requirement, the time required for some aspects of sourcing and making may be significantly reduced (and may in fact occur in tandem) as these can be addressed outside the complexity of DoD's traditional acquisition process which typically requires a sequential completion of requirements. Furthermore, in some cases, the resources used to fulfill existing demand may in fact be underutilized and have additional capacity available to help meet the surge demand requirements. All items should be assessed for current capacity vs. maximum capacity requirements prior to adding additional resources to support any demand increase.

[154] Joint Urgent Operational Needs (JUONs) as defined by DoD Chairman of the Joint Chiefs of Staff Instruction (CJCSI) 3470.01, July 15, 2005 is an urgent operational need that 1: Falls outside of the established Service processes; and 2: If not addressed immediately, will seriously endanger personnel or pose a major threat to ongoing operations.

As noted by SCOR 10.0, when potential risk can be anticipated (either through predictive analytics or through real time supply-chain visibility innovations such as Automated Identification Technology (AID)), it should be easier for the supply chain to respond accordingly; thus, the amount of time required to respond to an unplanned 20 percent increase in demand *should* be shortened if these types of technological advancements can be implemented. The challenge at DoD is trying to implement this technology effectively across the massive complexity of the defense enterprise and its network of over 2,000 unique business systems.

For the military, upside supply chain agility is very important, and thus when completing a supply chain performance evaluation it should be weighted heavily depending on the specific requirement. For example, building off of the examples given in MIL.RL.2.1, MIL.RL.2.2 and MIL.RL.2.4, the ability for the supply chain to respond quickly to an unplanned 20 percent increase in demand for HUMVEE spares is an example requirement that could be weighted very heavily if the military operation demanded more HUMVEEs. Likewise, in the same operation, the ability for the supply chain to respond to a similar increase in demand for tanks may be less important and should thus be weighted accordingly.[155] As this metric is composed of the sum of the Source, Make, Deliver, Source Return and Deliver Return metrics, each of

[155] Note: The specific weighting for the components of this metric should always be applied based on the requirements identified by senior military planners.

these might also be weighted differently depending on the particular good/service being evaluated.[156]

Finally, contracting incentives for improved performance can provide precisely the impetus needed to boost responsiveness to unanticipated demand for contractors in DoD's supply chain. Upon contractor achievement of performance improvement, a set of award fees or additional award terms can be given. The table below provides sample performance evaluation criteria which could be used to evaluate contractor performance for Upside Supply Chain Flexibility (MIL.AG.1.1).

[156] Note: The specific weighting for the components of this metric should always be applied based on the requirements identified by senior military planners.

		Submarginal	Marginal	Good	Excellent
Upside Supply Chain Flexibility	***Action on Changes in Demand***	Is not responsive to changes/ provides no effort to address them.	Responds to changes, but is slow to develop resolution, takes several days to respond with plan, meets some or all revised requirements with moderate/long delay.	Has contingency plans already in-place for changes in demand, resolves independently meets all revised requirements with minimal delay (e.g. very few days).	Anticipates changes in demand and has plans to respond, resolves independently, no delay in meeting revised requirements (e.g. 0 days).

Table 15. Sample Contract Performance Evaluation Criteria for Upside Supply Chain Flexibility.[157]

[157] Office of the Secretary of Defense. (2011).

Supply Chain Agility: Upside Supply Chain Flexibility Case: Mine Resistant Ambush Protected Vehicle (MRAP)

Recent operations in Iraq demonstrate the importance for supply chain flexibility when it comes to increased demand for a particular good—in this case the Mine Resistant Ambush Protection Vehicle. As roadside bomb production in Iraq rose to devastating levels during Operation Iraqi Freedom (OIF), traditional military Humvee's were simply no match for the new threat environment. A Washington Post study revealed that from March 2003 to September 2007 some 69 percent of solider injuries in Iraq were a result of Improvised Explosive Devices (IEDs). Likewise, of those killed in action, IEDs were responsible for some 63 percent of deaths.[158] As a result, the United States military quickly responded with the rapid acquisition, production, and delivery of the Mine Resistant Ambush Protected Vehicle (MRAP).

As noted by DoD's Under Secretary of Defense for Acquisition, Technology, and Logistics, the effort to respond to this crisis displayed a level of cooperation between DoD and industry "not seen since World War II". In this case, production of these life saving vehicles was increased from 100 a month to 1200 a month in less than one year—an increase of 12x over normal

[158] Washington Post. (2007). More attacks, mounting casualties. Retrieved from http://www.washingtonpost.com/wp-dyn/content/graphic/2007/09/28/GR2007092802161.html.

production. Two key factors that contributed to this success in rapid supply chain mobilization were: 1. the inclusion of technology from the commercial heavy truck industry into the vehicle design; and, 2. a streamlined acquisition process that permitted rapid source selection and contracting processes outside of DoD's normal bureaucratic structure. Both of these factors greatly improved the supply chain's ability to quickly respond to the major increase in warfighter demand and highlight the importance of being able to forecast how flexible a supply chain may be. [159]

[159] Office of the Assistant Secretary of Defense for Acquisition. (2012). Civil military integration of the industrial base. Retrieved from http://www.acq.osd.mil/asda/initiatives/factsheets/civil_military_integration/index.shtml.

MILSCOR Performance Attribute: Supply Chain Agility

MILSCOR Metric: Upside Supply Chain Adaptability (MIL.AG.1.2)

Definition: The maximum sustainable percentage increase in quantity of goods or level of effort for services delivered that can be achieved in 30 days through Source, Make, Deliver and Deliver Return.[160]

Calculation: Upside Supply Chain Adaptability (MIL.AG.1.2) = Upside Source Adaptability (MIL.AG.2.6) + Upside Make Adaptability (MIL.AG.2.7) + Upside Deliver Adaptability (MIL.AG.2.8) + Upside Deliver Return Adaptability (MIL.AG.2.10). The following components should be included in the aggregate calculation of Upside Supply Chain Adaptability (MIL.AG.1.2).

[160] 30 days is an arbitrary number provided for benchmarking purposes. For some industries and some organizations 30 days may be in some cases unobtainable or in others too conservative. Likewise for the provision of services in a contingency environment, the benchmark may be measured anywhere from hours to weeks.

Upside Source Adaptability (MIL.AG.2.6)	Upside Make Adaptability (MIL.AG.2.7)	Upside Deliver Adaptability (MIL.AG.2.8)	Upside Deliver Return Adaptability (MIL.AG.2.10)[161]
The maximum sustainable percentage increase in goods and/or capacity required for services that can be acquired/received in 30 days.	The maximum sustainable percentage increase in production that can be achieved in 30 days with the assumption of no of no raw material or personnel constraints.	The maximum sustainable percentage increase in quantities of goods or services delivered that can be achieved in 30 days with the assumption of no other constraints.	The maximum sustainable percentage increase in returns of goods or services from customers that can be achieved in 30 days.[162]

Table 16. MILSCOR Upside Supply Chain Adaptability Components.

Data Collection: Data collected for this metric should be gathered during the planning and execution phases as a measure of the amount of additional output generated (as a percentage) over a 30-day period of time. Data should be collected at multiple points throughout the supply chain and can be collected manually or through the preferred method of using advanced information technology systems predicated upon Enterprise Resource Planning (ERP) applications such as SAP or Oracle. This information could be collected through contractor self-reporting requirements, with initial estimated data for Make, Deliver and Return coming as a result of responses to the initial request for proposal (RFP) during the Source phase.[163] In some cases, such as in contingency operations, this information is recorded and maintained manually leaving significant opportunities for incorrect data

[161] Note this metric was labeled 2.10 to remain consistent with its SCOR counterpart.
[162] Note services would be returned where either the additional service is no longer needed (e.g. demand has been reduced) or where the particular service being provided does not meet an acceptable standard for quality, performance, etc.
[163] For the purposes of evaluating supply chain performance, DoD could potentially require contractors to report data on their estimated maximum surge capacity to provide a sustainable increase in supply of goods and/or services over a 30 day surge period as a requirement for responding to an RFP.

collection and delayed reporting. Once collected, this data should be used to generate lessons learned and best practices for leadership and management to make the appropriate improvements as identified. Finally, while it is incredibly important to collect this data for benchmarking purposes, it should be collected in a seamless manner that does not interfere with the timeliness of the response. The following specific should be collected at a minimum for calculation of the Upside Supply Chain Adaptability Metric (MIL.AG.1.2):

	Upside Source Adaptability (MIL.AG.2.6)	Upside Make Adaptability (MIL.AG.2.7)	Upside Deliver Adaptability (MIL.AG.2.8)	Upside Deliver Return Adaptability (MIL.AG.2.10)[164]
ıput	Current elements needed to fully understand future requirements, to establish the volume delta that can be sustained based on the question…How much of an increase in quantities sourced (expressed as a percentage) can the DoD (or its contractors) sustain, given 30 days? Current inventory for goods or level of effort/service level on hand for services. Number of staff and the associated types and volumes of skills required to fulfill current demand. Productivity information for staff for current level of effort for goods and/or services. Current funding status: Is funding in place? Does it require reprogramming or other change request? Is a supplemental appropriation request necessary?[165] All resources required to sustain current order fulfillment? Current sourcing/supplier constraints: Is the requirement a Joint Urgent Operational Need (JUON)? Nature of items: Are these items commercial in nature or military specific? For services, are the services "inherently governmental" in nature? Current procurement cycle time to place a purchase order and required supplier lead time? Is an ID/IQ in place or will the service be sourced from scratch?	Current elements needed to fully understand future requirements, to establish the volume delta that can be sustained based on the question…How much of an increase in quantities made (expressed as a percentage) can the DoD (or its contractors) sustain, given 30 days? Current make volumes: Amount of each good or service acquired. Labor needed to meet current make demand. For goods this includes productivity information For Services: this includes units/orders per FTE and/or service level. Internal and External (private sector) capacity needed for current demand for the good/service. Current funding status: Is funding in place? Does it require reprogramming or other change request? Is a supplemental appropriation request necessary?[166] All resources required to sustain current order fulfillment?	Current elements needed to fully understand future requirements, to establish the volume delta that can be sustained based on the question…How much of an increase in quantities delivered (expressed as a percentage) can the DoD (or its contractors) sustain, given 30 days? Current deliver volume for goods and/or services. Number of staff and the associated types and volumes of skills required to fulfill current demand. Productivity information for staff for current level of effort for goods and/or services. For goods, Internal and External (3PL) capacity needed for current demand throughput including facilities, space fleet equipment, outside carrier loads, materials handling equipment, etc. Current funding status: Is funding in place? Does it require reprogramming or other change request? Is a supplemental appropriation request necessary?[167] All items required to sustain current order fulfillment? Current logistics order cycle time (all else equal including procurement order cycle time, supplier lead time, etc.). For goods and services, customer order processing cycle time. For goods, dock-to-stock cycle time. For goods, pick-to-ship cycle time. Transit time.	Current elements needed to fully understand future requirements, to establish the volume delta that can be sustained based on the question…How much of an increase in quantities deliver returned (expressed as a percentage) can the DoD (or its contractors) sustain, given 30 days? Current return volume for goods and/or services – number of orders returned. Labor needed to meet current deliver return demand including productivity information such as units/orders per FTE. Productivity data such as items returned per FTE. For goods, Internal and External (3PL) capacity needed for current demand throughput including facilities, space fleet equipment, outside carrier loads, materials handling equipment, etc. Current funding status: Is funding in place? Does it require reprogramming or other change request? Is a supplemental appropriation request necessary?[168] Alternative source status: is another vendor able to respond with the good/service being required to minimize delay in military "readiness"? Have contingency plans been formalized for any returned good/service? Current customer return order cycle time. Customer return order processing cycle time (customer service and logistics). Return processing and disposition cycle time.

164 Note this metric was labeled 2.10 to remain consistent with its SCOR counterpart.
165 In the Government supply chain environment, the status of funding is key as this may significantly delay progress for planning, sourcing, making and/or delivering a given good or service.
166 IBID.
167 IBID.
168 IBID.

	Upside Source Adaptability (MIL.AG.2.6)	Upside Make Adaptability (MIL.AG.2.7)	Upside Deliver Adaptability (MIL.AG.2.8)	Upside Deliver Return Adaptability (MIL.AG.2.10)[169]
nput **Continued)**	What is the nature of the current marketplace for the good or service being sourced? Is it competitive?			

Table 17. MILSCOR Upside Supply Chain Adaptability Input Components.

[169] Note this metric was labeled 2.10 to remain consistent with its SCOR counterpart.

	Upside Source Adaptability (MIL.AG.2.6)	Upside Make Adaptability (MIL.AG.2.7)	Upside Deliver Adaptability (MIL.AG.2.8)	Upside Deliver Return Adaptability (MIL.AG.2.10)[170]
Resource Availability Assessment & Ramp-up/Lead Time	Elements needed to establish delta in resources and what can be ramped up and sustained within 30 days based on the question "How much of an increase in quantities sourced (expressed as a percentage) can the DoD (or its contractors) sustain, given 30 days". Number of staff, the associated types and volumes of skills required, and additional capacity required to fulfill additional demand (taking into account potential underutilized FTEs and/or IT resources). Amount of time needed to recruit/hire/train additional staff and/or acquire additional services to fill gap between underutilized (note if possible must assess cost/benefits of acquiring additional resources organically versus through contractor support). FTE's and staff needed to sustain increase in quantities delivered for 30 days. Current funding status: If additional funding or reprogramming is required, how much additional time is needed? Current sourcing/supplier constraints: Is the requirement a Joint Urgent Operational Need (JUON)? Time required in negotiating new source/volume contracts/terms (if necessary) Time required to find/obtain additional sources (if necessary) Time needed to obtain, deliver and phase in goods/services to sustain increase in quantities sourced for 30 days. Time to place a task order and/or award a contract.	Elements needed to establish delta in resources and what can be ramped up and sustained within 30 days based on the question "How much of an increase in quantities made (expressed as a percentage) can the DoD (or its contractors) sustain, given 30 days". Number of staff, the associated types and volumes of skills required, and additional capacity required to fulfill additional demand (taking into account potential underutilized FTEs and/or IT resources). Amount of time needed to recruit/hire/train additional staff and/or acquire additional services to fill gap between underutilized (note if possible must assess cost/benefits of acquiring additional resources organically versus through contractor support). Current funding status: If additional funding or reprogramming is required, how much additional time is needed? All items required to sustain additional order fulfillment.	Elements needed to establish delta in resources and what can be ramped up and sustained within 30 days based on the question "How much of an increase in quantities delivered (expressed as a percentage) can the DoD (or its contractors) sustain, given 30 days". Number of staff, the associated types and volumes of skills required, and additional capacity required to fulfill additional demand in logistics (taking into account potential underutilized FTEs and/or IT resources). Amount of time needed to recruit/hire/train additional staff and/or acquire additional services to fill gap between underutilized (note if possible must assess cost/benefits of acquiring additional resources organically versus through contractor support). Current capacity utilization including but not limited to: facilities, space, IT systems, bandwidth, etc.) and amount of time needed to obtain assets/capacity to fill gap between underutilized asset capacity and assets needed to sustain an increase in quantities delivered for 30 days. Current funding status: If additional funding or reprogramming is required, how much additional time is needed? Amount of time needed to obtain capital to fill gap between underutilized asset capacity and assets needed to sustain an increase in quantities delivered for 30 days. Outsourcing Alternatives including: Supplemental Outsource; 3PL facilities, lease building, etc.; full service lease fleet, materials handling, etc. equipment outside carriers. Amount of time needed to obtain supplemental outsourced resources or facilities to sustain increase in quantities delivered for 30 days.	Elements needed to establish delta in resources and what can be ramped up and sustained within 30 days based on the question "How much of an increase in quantities deliver returned (expressed as a percentage) can the DoD (or its contractors) sustain, given 30 days". Labor needed to meet additional deliver return demand including productivity information such as units/orders per FTE. Amount of time needed to recruit/hire/train additional staff to fill gap between underutilized (note if possible must assess cost/benefits of acquiring additional staff organically versus through contractor support). Current capacity utilization facilities, space, fleet equipment, materials handling equipment, etc.) and amount of time needed to obtain assets/capacity to fill gap between underutilized asset capacity and assets needed to sustain an increase in quantities returned for 30 days.. Current funding status: Is funding in place? Does it require reprogramming or other change request? Is a supplemental appropriation request necessary? If additional funding or reprogramming is required, how much additional time is needed? Amount of time needed to obtain capital to fill gap between underutilized asset capacity and assets needed to sustain an increase in quantities returned from customers for 30 days. Outsourcing Alternatives including: Supplemental Outsource; 3PL facilities, lease building, etc.; full service lease fleet, materials handling, etc. equipment outside carriers for quantities deliver returned. Amount of time needed to obtain supplemental outsourced resources or facilities to sustain an increase in quantities deliver returned for 30 days. Customer return order processing cycle time (customer service and logistics).

[170] Note this metric was labeled 2.10 to remain consistent with its SCOR counterpart.

	Upside Source Adaptability (MIL.AG.2.6)	Upside Make Adaptability (MIL.AG.2.7)	Upside Deliver Adaptability (MIL.AG.2.8)	Upside Deliver Return Adaptability (MIL.AG.2.10)[171]
Resource Availability Assessment & Ramp-up/Lead Time (Continued)	Supplier lead time to respond to task order and/or request for proposal.		For goods, amount of time needed to increase finished inventory for order fulfillment to sustain an increase in quantities delivered for 30 days. For goods and services, customer order processing cycle time. For goods, dock-to-stock cycle time. For goods, pick-to-ship cycle time. Transit time.	Return processing and disposition cycle time.

Table 18. MILSCOR Upside Supply Chain Adaptability Resource Availability Assessment & Ramp-up/Lead Time Components.

[171] Note this metric was labeled 2.10 to remain consistent with its SCOR counterpart.

Discussion: A similar metric to MIL.AG.1.1 (Upside Supply Chain Agility), MIL.AG.1.2 (Upside Supply Chain Adaptability), uses the amount of time available for an increase in demand to evaluate how much additional supply can be produced as opposed to defining a certain amount of supply and evaluating the time required by the chain to respond. The combination of the Supply Chain Flexibility and Adaptability metrics (both under the Agility MILSCOR performance attribute) provide a window into the true responsiveness of the supply chain—focused on either maximizing output during a given period of time *or* minimizing amount of time for a specified increase in output. For warfighting, such metrics are incredibly valuable—particularly for items where demand far outpaces supply as noted in the MRAP case noted previously.

When completing a supply chain performance evaluation, Upside Supply-Chain Agility, MIL.AG.1.2 should be weighted heavily depending on level of sustained demand for the given requirement and the urgency. For example, in the MRAP example provide previously, the DoD identified a sustained urgent operational requirement for ground vehicles that could protect soldiers against roadside bombs.[172] Because of the threat environment, it was important for DoD to provide as many of these vehicles through the supply chain in as short a time as possible.[173] Upside Adaptability exhibited by a DoD supply chain

[172] Washington Post. (2006). Left of boom. Retrieved from http://www.washingtonpost.com/wp- srv/world/specials/leftofboom/index.html.

[173] Note: The specific weighting for the components of this metric should always be applied based on the requirements identified by senior military planners.

thus must be measured against its impact on warfighter readiness. For those goods/services that are not deemed to be critical for readiness, their weighting with respect to importance for upside supply chain adaptability may be reduced—therefore the weight of the upside adaptability metric should be adjusted as a function of the urgency of the requirement and its impact on readiness overall. As this metric is composed of the sum of the Source, Make, Deliver, and Deliver Return metrics, each of metric might be weighted differently depending on the particular good/service being evaluated.[174]

[174] Note: The specific weighting for the components of this metric should always be applied based on the requirements identified by senior military planners.

MILSCOR Performance Attribute: Supply Chain Agility

MILSCOR Metric: Downside Supply Chain Adaptability (MIL.AG.1.3)

Definition: The sustainable reduction in quantities (for goods) or level of effort (for services) ordered (Sourced, Made and Delivered) at 30 days prior to delivery without penalty.[175]

Calculation: Downside Supply Chain Adaptability (MIL.AG.1.3) = Downside Source Adaptability (MIL.AG.2.11) + Downside Make Adaptability (MIL.AG.2.12) + Downside Deliver Adaptability (MIL.AG.2.13).

The calculation of downside supply chain adaptability requires the calculation to be based on the least reduction sustainable when considering Source, Make, and Deliver components.

Downside Source Adaptability (MIL.AG.2.11)	Downside Make Adaptability (MIL.AG.2.12)	Downside Deliver Adaptability (MIL.AG.2.13)
The goods and/or services quantity reduction sustainable at 30 days prior to delivery without penalty.	The production reduction sustainable at 30 days prior to delivery without penalty.	The reduction in delivered quantities of goods or services sustainable at 30 days prior to delivery without penalty.

Table 19. MILSCOR Downside Adaptability Components.

[175] 30 days is an arbitrary number provided for benchmarking purposes. For some industries and some organizations 30 days may be in some cases unobtainable or in others too conservative. Likewise for the provision of services in a contingency environment, the benchmark may be measured anywhere from hours to weeks.

Data Collection: Data should be collected at multiple points throughout the supply chain and can be collected manually or through the preferred method of using advanced information technology systems predicated upon Enterprise Resource Planning (ERP) applications such as SAP or Oracle. For services, this information could be collected through contractor self-reporting requirements.[176] In some cases, such as in contingency operations, this information is recorded and maintained manually leaving significant opportunities for incorrect data collection and delayed reporting. Once collected, this data should then be used to identify the poorest performing parts of the chain to generate lessons learned and best practices.

[176] For the purposes of evaluating supply chain performance, DoD could potentially require contractors who provide services to report data on the amount of time and level of effort required to navigate through the initial order through final service delivery.

	Downside Source Adaptability (MIL.AG.2.11)	Downside Make Adaptability (MIL.AG.2.12)	Downside Deliver Adaptability (MIL.AG.2.13)
Input	Current elements needed to fully understand future requirements, to establish the volume delta that can be sustained based on the question "How much of a reduction in quantities sourced (expressed as a percentage) can the DoD (or its contractors) sustain, given 30 days?" Current inventory for goods or level of effort/service level on hand for services. Number of staff and the associated types and volumes of skills required to fulfill current demand. Productivity information for staff for current level of effort for goods and/or services. Current funding status: Is funding in place? Does it require reprogramming or other change request? Is a supplemental appropriation request necessary?[177] All resources required to sustain current order fulfillment? Current sourcing/supplier constraints: Is the requirement a Joint Urgent Operational Need (JUON)? Nature of items: Are these items commercial in nature or military specific? For services, are the services "inherently governmental" in nature? Current procurement cycle time to place a purchase order and required supplier lead time? Is an ID/IQ in place or will the service be sourced from scratch?	Current elements needed to fully understand future requirements, to establish the volume delta that can be sustained based on the question "How much of a reduction in quantities made (expressed as a percentage) can the DoD (or its contractors) sustain, given 30 days?" Current make volumes: Amount of each good or service acquired. Labor needed to meet current make demand. For goods this includes productivity information For Services: this includes units/orders per FTE and/or service level. Internal and External (private sector) capacity needed for current demand for the good/service. Current funding status: Is funding in place? Does it require reprogramming or other change request? Is a supplemental appropriation request necessary?[178] All resources required to sustain current order fulfillment?	Current elements needed to fully understand future requirements, to establish the volume delta that can be sustained based on the question "How much of a reduction in quantities delivered (expressed as a percentage) can the DoD (or its contractors) sustain, given 30 days?" Current deliver volume for goods and/or services. Number of staff and the associated types and volumes of skills required to fulfill current demand. Productivity information for staff for current level of effort for goods and/or services. For goods, Internal and External (3PL) capacity needed for current demand throughput including facilities, space fleet equipment, outside carrier loads, materials handling equipment, etc. Current funding status: Is funding in place? Does it require reprogramming or other change request? Is a supplemental appropriation request necessary?[179] All items required to sustain current order fulfillment? Current logistics order cycle time (all else equal including procurement order cycle time, supplier lead time, etc.). For goods and services, customer order processing cycle time. For goods, dock-to-stock cycle time. For goods, pick-to-ship cycle time. Transit time.

Table 20. MILSCOR Downside Adaptability Input Components.

[177] In the Government supply chain environment, the status of funding is key as this may significantly delay progress for planning, sourcing, making and/or delivering a given good or service.
[178] IBID.
[179] IBID.

	Downside Source Adaptability (MIL.AG.2.11)	Downside Make Adaptability (MIL.AG.2.12)	Downside Deliver Adaptability (MIL.AG.2.13)
Resource Availability Assessment & Ramp-up/Lead Time	Elements needed to establish delta in resources and what can be ramped down and sustained at 30 days prior to delivery based on the question "How much of a decrease in quantities sourced (expressed as a percentage) can DoD sustain without readiness or cost penalties, given 30 days notice prior to delivery"? Number of staff, the associated types and volumes of skills required, and additional capacity (if any) required to fulfill reduced demand. If necessary, amount of time needed to recruit/hire/train additional staff and/or acquire additional services to fill gap between underutilized (note if possible must assess cost/benefits of acquiring additional resources organically versus through contractor support). FTE's and staff needed to sustain decrease in quantities delivered for 30 days. Current funding status: If additional funding or reprogramming is required, how much additional time is needed? Current sourcing/supplier constraints: Is the requirement a Joint Urgent Operational Need (JUON)? Time required in negotiating new source/volume contracts/terms (if necessary) Time required to find/obtain additional sources (if necessary) Time needed to obtain, deliver and phase in goods/services to sustain decrease in quantities sourced for 30 days. Time to place a task order and/or award a contract.	Elements needed to establish delta in resources and what can be ramped down and sustained at 30 days prior to delivery based on the question "How much of a decrease in quantities made (expressed as a percentage) can DoD sustain without readiness or cost penalties, given 30 days notice prior to delivery"? Number of staff, the associated types and volumes of skills required, and additional capacity (if any) required to fulfill reduced demand. If necessary, amount of time needed to recruit/hire/train additional staff and/or acquire additional services to fill gap between underutilized (note if possible must assess cost/benefits of acquiring additional resources organically versus through contractor support). Current funding status: If additional funding or reprogramming is required, how much additional time is needed? All items required to sustain reduction in order fulfillment.	Elements needed to establish delta in resources and what can be ramped down and sustained at 30 days prior to delivery based on the question "How much of a decrease in quantities delivered (expressed as a percentage) can DoD (or its contractors) sustain without readiness or cost penalties, given 30 days notice prior to delivery"? Number of staff, the associated types and volumes of skills required, and additional capacity (if any) required to fulfill reduced demand. If necessary, amount of time needed to recruit/hire/train additional staff and/or acquire additional services to fill gap between underutilized (note if possible must assess cost/benefits of acquiring additional resources organically versus through contractor support). Current funding status: If additional funding or reprogramming is required, how much additional time is needed? Amount of time needed to obtain capital to fill gap between underutilized asset capacity and assets needed to sustain a decrease in quantities delivered for 30 days. Outsourcing Alternatives including: Supplemental Outsource; 3PL facilities, lease building, etc.; full service lease fleet, materials handling, etc. equipment outside carriers. Amount of time needed to obtain supplemental outsourced resources or facilities to sustain decrease in quantities delivered for 30 days.

Table 21. MILSCOR Downside Adaptability Resource Availability Assessment & Ramp-up/Lead Time Components.

Discussion: Above are the minimum elements that should be considered when evaluating downside supply chain adaptability for Source, Make, Deliver. These items are used to estimate the impact on delivery time (e.g. number of days) required for an unplanned decrease in demand for a 30-day period. These metrics are essentially the opposite of the upside supply chain adaptability metrics (MIL.AG.2.6, MIL.AG.2.7, and MIL.AG.2.8).

For goods, the downside metric may be used in cases where the weapons chain is drawing down a force presence in a current military operation such as the recent withdraw from Iraq in 2011.[180] Further, this metric may also be used in cases where an existing contract is being re-competed and a new vendor has been selected. In these cases, the drawdown is really a transition from the outgoing supplier to the new supplier. Finally, this metric may also be applicable in cases where DoD has decided to severely reduce production or cancel a weapons program altogether. For example, since 1996 the Army has spent $1 billion per year on canceled endeavors including major programs such as the Crusader howitzer, the Non-Line of Sight (NLOS) cannon, the Comanche attack helicopter and the Future Combat System.[181] For services, the Deliver Return metric could be used in cases where service providers are not qualified and need to be replaced, or where the requirement for the service

[180] Dwoskin, E. & Ratnam, G. (2011). U.S. military rushes to ship out eight years of Iraq war gear. Retrieved from http://www.bloomberg.com/news/2011-12-15/u-s-military-rushes-to-ship-out-eight-years-of-iraq-war-gear.html.

[181] Sledge Jr., N. (2012). Pentagon resource wars: Why they can't be avoided. Retrieved from http://www.nationaldefensemagazine.org/archive/2012/February/Pages/PentagonResourceWarsWhyTheyCan%E2%80%99tBeAvoided.aspx.

is no longer needed for the same three reasons noted above: 1. withdrawing from a current contingency operation; 2. selection of a new vendor; or, 3. reduction/cancellation in weapons program.

In the military context, this metric can be very important, and thus when completing a supply chain performance evaluation it should be weighted according to the urgency of the requirement. For example, if a current program is being canceled altogether, the speed of the drawdown may not be very important and thus could have its weighting reduced. Alternatively, in the context of a contingency operation, the drawdown in troops at one location may in fact be part of a redeployment effort to a new location (such as the shift in resources from Iraq to Afghanistan).[182] In these cases, weighting for the drawdown capability may be incredibly important. Accordingly, in these types of redeployment situations, additional weight should be given to the downside adaptability metric because it has a direct impact on current warfighter readiness.[183]

---

[182] USA Today. (2008). U.S. Marines will shift to Afghanistan. Retrieved from http://www.usatoday.com/news/washington/2008-12-08-marine-afghanistan_N.htm.

[183] Note: The specific weighting for the components of this metric should always be applied based on the requirements identified by senior military planners.

Supply Chain Agility: Downside Supply Chain Adaptability Case: F-22 Fighter

The F-22 Raptor was designed to be next generation of Air Force fighter replacing legacy aircraft such as the F-15. Initially developed by Lockheed Martin (LM) with an anticipated production run of 339 aircraft, design delays

in conjunction with heavy debates about the platform's functionality in a post-Cold-War era led to significant cuts in funding. Ultimately, the program had its production capped at 187 planes—a little more than half of the initial quantity. The impact of this reduction on production is significant both in terms of expected military capabilities as well as additional costs of shutting down production. First, the decision to pursue the F-22 had driven multiple parallel acquisition decisions for other programs over many years—including decisions on what to buy and/or upgrade as a function of the expected capabilities of some 339 F-22's. Second, DoD must now address the added cost impacts of its decision to reduce production. For example, since the production line is shutting down prematurely, in the event that it needs to re-started in the future for additional aircraft, the time and cost to ramp production back up may become enormous. Accordingly, LM's F-22 program manager noted that the Air Force desired to save all of the tooling for the plane and had Lockheed film and document production procedures so they can be recreated in the future if necessary. As a result, some 30,000 tools will be saved and stored at a government-owned facility for several years, at great time and expense for the Government.[184] The MILSCOR metric on downside supply chain adaptability is one tool that could potentially provide important data on the impact of a reduction in production for future programs like the F-22.

[184] Tirpak, J. (2010). Raptor final steps. Retrieved from http://www.airforce-magazine.com/DRArchive/Pages/2010/October%202010/October%2004%202010/Raptor%E2%80%99sFinalSteps.aspx.

MILSCOR Performance Attribute: Supply Chain Agility

MILSCOR Metric: Overall Readiness at Risk (RaR) (MIL.AG.1.4)

Definition: The sum of the cycle-time impact for risk events in Source, Make, and Deliver on readiness.

Calculation: Supply Chain Risk RaR = RaR Days (Source) + RaR Days (Make) + RaR Days (Deliver).

Data Collection: RaR data would be collected and analyzed at both the unit level and Joint level consistent with the Joint Chiefs of Staff definition for readiness.[185] The data would be collected as identified "risk" events that have occurred or may occur and would be recorded as the amount of cycle-time (hours, days, weeks, etc.) that the given "risk" event may negatively impact the readiness for cycle-time Source, Make, and Deliver.

The RaR calculation can be generated using current data, historical data, and/or predictive modeling such as advanced analytics. This data should be used to identify the links in the chain where risk has the greatest impact on readiness to generate lessons learned and best practices for risk mitigation.

---

[185] Joint Chiefs of Staff. (2012). The dictionary of military and associated terms. JCS Publication 1-02. Retrieved from www.dtic.mil/doctrine/new_pubs/jp1_02.pdf.

Further, this information can be used by leadership and management to make the appropriate risk mitigation improvements as identified.

Discussion: Most military experts define readiness in terms of rigid technical indicators with no context, examples include mean time between failure or days of stock on hand. Without having these metrics discussed in terms of readiness, their value becomes diminished in the military environment.[186] Readiness, as defined by the Joint Chiefs of Staff (JCS), is:

> *The ability of US military forces to fight and meet the demands of the national military strategy. Readiness is the synthesis of two distinct but interrelated levels. a. unit readiness--The ability to provide capabilities required by the combatant commanders to execute their assigned missions. This is derived from the ability of each unit to deliver the outputs for which it was designed. b. joint readiness--The combatant commander's ability to integrate and synchronize ready combat and support forces to execute his or her assigned missions.*[187]

Betts, who has done extensive work on military readiness, defines readiness as capability in time.[188] Within the context of training, Moore et al. has defined readiness by the attribute of time as well. More specifically, using training as a backdrop for military readiness, this research supported the notion that "train-up" time would measure readiness more accurately than input measures such as volume of personnel or material.[189] The RaR metric uses this same logic as applied to weapons systems sustainment within the context of the cycle-time Source, Make, and Deliver metrics in the MILSCOR model. The purpose of RaR metric is thus to help identify the impact of a risk event (as time) on readiness. In short, which parts of the supply chain are having the

[186] Betts, R. K. (1995). Military readiness. The Brookings Institution,
[187] Joint Chiefs of Staff, (2012).
[188] Betts, (1995).
[189] Moore, S. C. et. al. (1995). A framework for characterization of military unit training status. technical report. National Defense Research Institute, RAND Corp.

greatest negative impact on readiness. This metric is important to help drive where transformation efforts and resources should be focused to maximize performance improvement through a variety of techniques like dual-sourcing.[190]

RaR can be used in the supply chain to evaluate the different aspects of risk for goods or services that could impact overall readiness. Both Government and industry can be evaluated based on RaR performance measures. Suppliers can be evaluated based upon RaR and ranked according to the risk of negatively impacting readiness given their level of performance. Alternatively, DoD can be evaluated based on its ability to effectively plan for anticipated risks and limit potential negative consequences on readiness. Data collection and analysis for this metric at DoD will likely be challenging as current raw data collection capabilities across the military supply chain are inconsistent.

Risk at DoD can have multiple definitions as it can effect the range of MILSCOR process elements. For example, during the Source phase, risk might be identified by using Technology Readiness Levels (TRL). TRLs are used to assess the maturity of a technology prior to making a final decision to incorporate it into a system, subsystem, component. The less mature the technology is on the 1-10 TRL scale, the greater the risk.[191] Likewise, during the Make phase, risk might be defined using DoD's series of Manufacturing

---

[190] Gansler, J.S. (1999). Defense conversion. MIT Press: Cambridge, MA.
[191] Department of Defense. (2009). Technology readiness assessment (TRA) deskbook. Retrieved from: http://www.dod.mil/ddre/doc/DoD_TRA_July_2009_Read_Version.pdf.

Readiness Levels (MRLs), which help to identify manufacturing risks on a scale of 1-10 that is directly comparable to the TRL scale noted above.[192]

For delivery, risk events may be defined in a variety of forms. For example, the wide use of RFID to track delivery of assets is an emergent modernization initiative across DoD. Recent research has demonstrated that this RFID technology may pose a risk to DoD's supply chain integrity because it is vulnerable to attacks—particularly cyber attacks. These types of risks could severely delay the delivery of key items in DoD's weapons chain, thus negatively impacting readiness. In the event such an event would happen, the RaR metric could provide insight into the potential negative impact on readiness.[193]

For the military, the RaR metric is very important and should thus be weighted the heaviest of all MILSCOR metrics. Weighting for the RaR value should not be changed based on the particular mission as DoD's expectation should be that it is *always* ready to undertake any mission, at any time and place of it's choosing.

---

[192] Government Accountability Office. (2010). Best practices: DoD can achieve better outcomes by standardizing the way manufacturing risks are managed. Retrieved from http://www.gao.gov/new.items/d10439.pdf.

[193] Xiao, Qinghan, et. al. (2007). RFID security issues in military supply chains. availability, reliability and security. Retrieved from http://ieeexplore.ieee.org/Xplore/login.jsp?url=http%3A%2F%2Fieeexplore.ieee.org%2Fiel5%2F4159773%2F4159774%2F04159853.pdf%3Farnumber%3D4159853&authDecision=-203.

MILSCOR Performance Attribute: Supply Chain Cost

Definition: The sum of the costs associated with operating the supply chain.

Hierarchical MILSCOR Supply Chain Cost Metric Structure

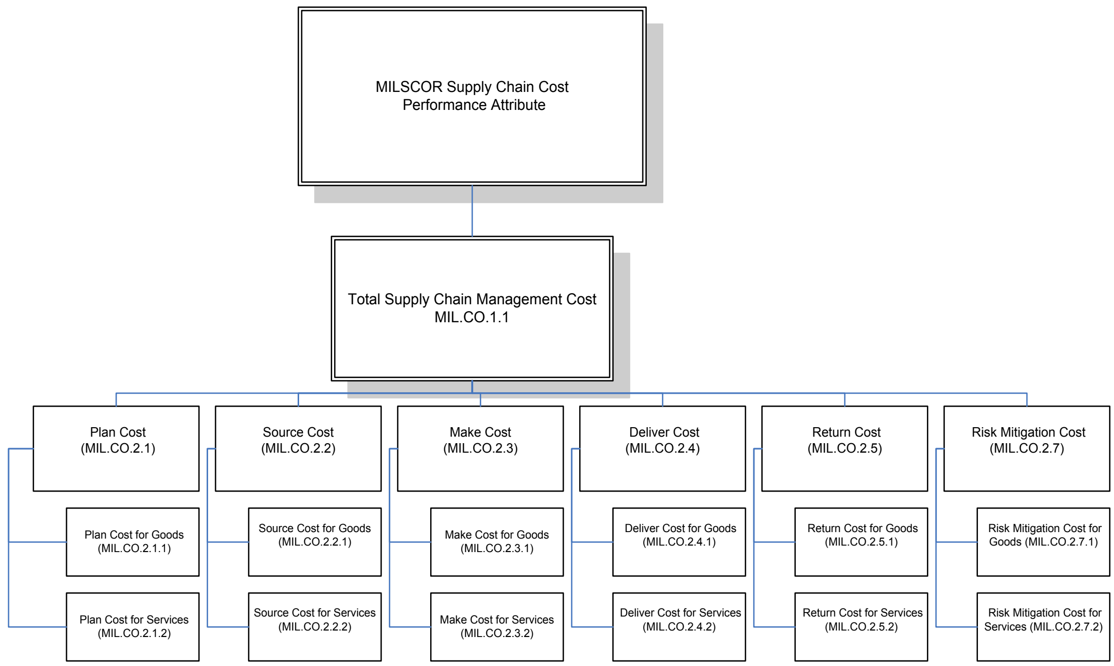


Figure 7. MILSCOR Cost Metric Structure.

MILSCOR Metric: Total Supply Chain Management Cost (MIL.CO.1.1)

Definition: Total Supply Chain Management Cost equals the sum of the costs associated with the MILSCOR Level 2 processes to Plan, Source, Make, Deliver/Install, and Return. Total Supply Chain Management Cost (MIL.CO.1.1) = Cost to Plan (MIL.CO.2.1) + Cost to Source (MIL.CO.2.2) + Cost to Make (MIL.CO.2.3) + Cost to Deliver and/or Install (MIL.CO.2.4) + Cost to Return (MIL.CO.2.5):

Calculation: The sum of all costs a supply chain's Plan, Source, Make Deliver and/or Install, and Return. Note: these costs must be calculated as all costs borne by *both* Government and Contractors.

Cost to Plan (MIL.CO.2.1)	Cost to Source (MIL.CO.2.2)	Cost to Make (MIL.CO.2.3)	Cost to Deliver and/or Install (MIL.CO.2.4)	Cost to Return (MIL.CO.2.5)
Cost of requirements process for either goods or services; Cost of undertaking Defense Acquisition System Processes (Acquisition Framework from DoD 5000 series)[194] for sustainment; Cost of Planning, Programming, Budgeting, Execution (PPBE);[195] Service/Agency planning costs as required.	For goods: Cost of material planning For goods and services: Cost for procurement staff, supplier negotiation and qualification, etc. Acquisition management costs. Cost of bidding and quotations, ordering, receiving payment authorization + sourcing business rules and requirements. + etc.	For goods: Sum of Direct Material, Direct Labor, and Direct non-Material product-related Cost (equipment) and indirect product-related cost. For services: Sum of Direct Labor, Direct Material (if necessary), Direct-non-Material service-related Cost (equipment if necessary), and indirect service-related cost.	For goods and services: Cost of inquiry, quotations, order entry, order fulfillment, customer invoicing / accounting For goods: Cost of maintenance channel management, distribution, transportation, outbound freight, and duties installation, new product release / phase-in, etc. Customer Management costs for goods and services: Financing, post-sales customer service, handling disputes, field repairs for goods/site visits for services + enabling technologies + etc.	Cost to Return to Source: For goods and services: Verify defective good/service costs, disposition of defective good/service. For goods: Identify Maintenance, repair, operating (MRO) Condition Costs, Request MRO Return Authorization Costs, Schedule MRO Shipment Costs, Return MRO Product Costs, etc. Cost to Return From Customer: For goods and services: Authorization Costs Schedule Return Costs, Receive Costs For goods: Authorize MRO Return Costs, Schedule MRO Return Costs, Receive MRO Return Costs, Transfer MRO Product Costs, etc.

Table 22. MILSCOR Cost Components.

[194] Additional information on the acquisition framework can be found at https://acc.dau.mil/CommunityBrowser.aspx?id=332375&lang=en-US
[195] Additional information on PPBE can be found at https://dap.dau.mil/aphome/ppbe/Pages/Default.aspx.

Data Collection: For accurate data collection of supply chain costs two major requirements must be discussed. First, DoD must be able to quickly and accurately share financial data across the enterprise. While on the surface this seems relatively easy in the commercial environment, for DoD the task is much more challenging. For example, as of October 2010, the Government Accountability Office identified only 1 of 10 Enterprise Resource Planning (ERP) systems across DoD which had been fully implemented. As a result, the GAO concluded that a failure to fully implement such systems in a timely manner would jeopardize DoD's self-imposed target of enterprise-wide audit-readiness by 2017.[196] In short, DoD is currently unable to withstand an enterprise-wide financial audit because it doesn't have enterprise-wide visibility into all of its data thus making data collection on end-to-end supply chain costs virtually impossible.

Second, even in the event that this type visibility into actual cost data existed in the current environment, a lack of cost standardization for goods and services would make accurate reporting and comparison incredibly difficult—this is especially true with respect to services. For example, when examining support provided by either Government or contractor personnel for a given task/activity, adherence to activities-based costing must be undertaken to ensure accurate cost reporting. More specifically, DoD would have to define

[196] Government Accountability Office. (2011). DoD financial management: Ongoing challenges in implementing the financial improvement and audit readiness plan. Retrieved from http://www.govexec.com/pdfs/091611cc2.pdf.

and collect the cost per time unit for a supplying resource; and, the volume of consumption for a given resource by service.[197]

Of additional concern is the difficulty in gaining access to costing information for Government vs. contractor personnel. In many cases, costs for Government processes are unknown or cost estimates are inaccurate because of difficulty in calculating government overhead costs.[198] On the industry side while it may be easy to get data for certain types of goods (e.g. we ordered X spare parts for Y dollars), it is much more difficult to tabulate costs for services. While DoD has developed a high-level a uniform taxonomy for services it buys from Contractors across the Department, standards for what these services should consist of, what they should cost, and how they should be performed widely vary.[199] In sum, while it has long been DoD policy to utilize these types of ABC techniques in support of activities based management—adoption across the enterprise has been inconsistent and difficult to implement making data collection for this MILSCOR metric incredibly difficult.

---

[197] Kaplan, R. S. & Anderson, S. R. (2005). Rethinking activity-based costing. Retrieved from http://hbswk.hbs.edu/item/4587.html.

[198] Congressional Research Service. (2012). Circular A-76 and the moratorium on DoD competitions: Background and issues for Congress. Retrieved from http://www.fas.org/sgp/crs/misc/R40854.pdf.

[199] Under Secretary of Defense for Acquisition, Technology and Logistics. (2010). Memorandum for acquisition professionals. Retrieved from http://www.acq.osd.mil/docs/USD_ATL_Guidance_Memo_September_14_2010_FINAL.PDF.

Discussion: Reduced costs for improved performance is key to implementing any supply chain transformation at DoD, thus the Supply Chain Cost metric should be weighted heavily. To support this, DoD is currently undertaking a major efficiencies initiative under the umbrella of "Better Buying Power."[200] The premise of this initiative is to improve DoD's acquisition outcomes to achieve improved performance at reduced costs. "Will Cost - Should Cost" management is a major component of this initiative that may have a positive impact on demand for and use of a MILSCOR cost metric. Will-Cost can be defined as the cost of a good/service if the status quo is maintained. Should-Cost on the other hand, identifies the expected cost if current program execution is changed somehow for the purposes of reducing costs—e.g. adding competition, improving efficiency, etc. As noted in the DoD memo on Better Buying Power by DoD's Under Secretary of Defense for Acquisition, Technology & Logistics (USD AT&L); DoD now requires that the following be implemented:

> *During contract negotiation and program execution, our managers should be driving productivity improvement in their programs. They should be scrutinizing every element of program cost, assessing whether each element can be reduced relative to the year before, challenging learning curves, dissecting overheads and indirect costs, and targeting cost reduction with profit incentive – in short, executing to what the program should cost.*[201]

Given the current downward pressure on the DoD budget and the anticipated major reductions in future military spending, this type of initiative should drive DoD organizations to try and better understand the costs they bare. These forces should contribute to greater access to data for supply chain costs

[200] IBID.
[201] IBID.

and ultimately greater visibility into the true cost of goods and services in support of weapons systems across the life cycle.

MILSCOR Performance Attribute: Supply Chain Cost

MILSCOR Metric: Supply Chain Management Risk Mitigation Cost (MIL.CO.2.7)

Definition: Total costs incurred to mitigate identified supply chain risks.

Calculation: Mitigation Costs (Cost to Mitigate Non-Systemic Supply Chain Risk) = Sum of Supply Chain Risk Mitigation Costs (Source + Make + Deliver)

Data Collection: Accurate data collection for supply chain management risk mitigation cost can only occur if risk can be properly identified. It is the responsibility of everyone in the military supply chain to perform the function of data collection to identify potential sources of supply chain risk for this metric and the Readiness at Risk (RaR) metric. Once identified, potential risks can then be evaluated using an accepted risk methodology such as the CARVER tool noted below. Once the types of risk and probabilities of their occurrence are identified, DoD and its industry partners can evaluate the most effective and efficient strategies for mitigating these risks and the associated costs for mitigation. Data can be collected manually or through the preferred method of using advanced information technology systems predicated upon Enterprise Resource Planning (ERP) applications such as SAP or Oracle.

Discussion: Supply chain risk can be subdivided into numerous high-level categories including: financial risk, market variability risk, quality risk, natural disruptions, accidental disruptions, man-made disruptions and malicious disruptions (such as physical or cyber attacks).[202] Each of these different types of risks may have a given impact of military readiness. Accordingly, this metric serves to identify the costs which may be required to mitigate a given risk event for the purposes of minimizing negative impact on military readiness. Different types of risk can be evaluated using the CARVER tool for risk identification. CARVER is an acronym for Criticality; Accessibility; Recuperability; Vulnerability; Effect; Recognizability.[203]

- Criticality: Identification of critical weaknesses in one's supply chain.
- Accessibility: Identification of the openness of the target or event.
- Recuperability: The time required for a component of the supply chain to recover
- Vulnerability: Measures how easy a threat can potentially impact a target.
- Effect: A measure of the level of the amount productivity impacted.
- Recognizability: The degree to which a vulnerability can be recognized (goes to understanding probability of a potential threat).

[202] Boyson, S., Corsi, T., & Harrington, L. (2011). *X-SCM*. Routledge.
[203] IBID.

Once identified using the CARVER tool, DoD may develop potential steps required to mitigate risk. Costs associated with these various mitigation steps can be identified using a time-based activity based costing model as noted previously.[204] Because this metric addresses direct negative impacts on readiness, DoD should allocate resources to these needs first. As a result, the Supply Chain Cost Risk Mitigation metric should be weighted as the most important Supply Chain Cost metric.

---

[204] IBID.

Supply Chain Cost: Supply Chain Management Risk Mitigation Cost Case: Fuel

The importance of understanding the impact of risk on readiness in the military environment cannot be underemphasized. In a wartime setting, supply chain risk has a tremendous impact on identified requirements and planning. Ultimately, any risk that is discounted or ignored could have catastrophic consequences including mission failure and/or loss of life. DoD's supply chain for fuel represents one extraordinary example

of the impact of supply chain risk on readiness and why this type of information must be collected to help DoD planners identify the resources necessary for risk mitigation. In 2008, DoD supplied more than 68 million gallons of fuel each month in support of American military forces serving in Iraq and Afghanistan. Significant risk is faced by all components of the supply chain for fueling troops who are in theater. Some risks typically faced by fuel re-supply convoys include enemy attacks, severe weather, traffic accidents, and pilferage. For example, as noted by GAO, in June 2008 alone, some 44 trucks and 220,000 gallons of fuel were lost due to attacks or other events while in route to Bagram Air Field in Afghanistan alone. A major example of the cost borne for risk mitigation in this example is the fully burdened cost of fuel—that is, the total ownership cost (TOC) of buying, moving, and

protecting fuel throughout the supply chain during wartime. In such a high-risk environment, the cost associated with risk mitigation has been reported to be several factors higher than the actual price per gallon of fuel alone.[205] Understanding these costs through a Cost of Risk Mitigation metric can be incredibly valuable to understanding where best to apply DoD's limited resources to minimize risk.

[205] Government Accountability Office. (2009). Increased attention on fuel demand management at DoD's forward-deployed locations could reduce operational risks and costs. Retrieved from http://www.gao.gov/products/GAO-09-388T.
Dipetto, C. (2008). DoD energy demand: Addressing unintended consequences. Retrieved from http://www.acq.osd.mil/se/briefs/20080912-ODUSD-AT-Energy-Demand-Brief-DiPetto.pdf.

MILSCOR Performance Attribute: Supply Chain Asset Management

Definition: The ability for the supply chain to use assets efficiently.

Hierarchical MILSCOR Supply Chain Asset Management Metric Structure

Figure 8. MILSCOR Asset Management Metric Structure.

MILSCOR Metric: Return on Program/Initiative Investment (MIL.AM.1.1)

Definition: A measurement which assesses the magnitude of DoD's investment relative to the improvement in performance generated from program/initiative undertaken.

Calculation: Return on program/initiative investment can be measured as any improvement in performance that has resulted from a particular investment in supply chain modernization.

Return on Program/Initiative Investment = (Total Cost of Program or Initiative)/(Improvement in Performance).

Data Collection: Data collection for return on investment should be captured as a function of MILSCOR Cost metrics noted previously and from any of the other performance metrics of the MILSCOR model (cycle time, agility, flexibility, etc.).

For example, for an initiative that reduced Source Cycle-Time by 10 days at a cost of $10m, the return on investment could be defined as $1m per day using the MIL.AM.1.1 metric. Data for this metric can be collected manually or through the preferred method of using advanced information technology systems predicated upon Enterprise Resource Planning (ERP) applications such as SAP or Oracle.

The data collected should then be used to identify the specific programs and/or initiatives where little to no return on investment was generated (e.g. no significant improvement in performance for dollars invested). These findings can be used to determine if programs/initiatives are having the desired effect on the supply chain performance improvement and if further investment is warranted or if investment should be re-allocated to programs or initiatives with higher probable ROI. Furthermore, for those initiatives that have the highest ROIs, DoD may be able to use this information to help identify additional repeatable across the greater DoD-enterprise.

Discussion: The Return on Investment metric is very important for application of the MILSCOR model at DoD. As a result of the current budget environment, DoD must be able to definitively recognize the expected improvements in performance associated with any supply chain transformation effort—a focus on this metric will help DoD articulate this point.

Traditionally ROI statistics at DoD have been very hard to define. First, DoD does not treat its programs as "investments" to be valued across traditional military Service boundaries. Instead, the acquisition system is set up to reward those who have individual or unique requirements with additional funding as opposed to identifying how current investment could be leveraged across the enterprise through Joint efforts. Further, Return on Investment data is difficult to collect for the supply chain as the chain encompasses many different entities which are disconnected in their overall management and administration (i.e. military vs. civilian vs. contractor).

Finally, even in the event that accurate data could be collected, quantifying expected Return on Investment may prove incredibly difficult as benefits may be qualitative in nature (such as improved customer satisfaction). In these cases, benefits are difficult to define in terms of concrete benefits in return for dollars invested. As a result, consideration of such uncertainty should be given in the particular weight applied to this metric.

Supply Chain Asset Management: Return on Program/Initiative Investment

Case: DoD's Corrosion Prevention Program

Corrosion is a major problem for DoD's weapons systems and is a key part of sustainment required for many of DoD's ships, aircraft, strategic missiles, and ground combat and tactical vehicles. DoD estimated that it spends roughly $80 billion each year to maintain these vehicles overall with roughly 24

percent (or $19.4 billion) going toward corrosion-related maintenance. A Defense Science Board Task Force examined the subject in 2004, and concluded that some 30 percent of this corrosion-related maintenance cost could be mitigated with requisite investment in corrosion prevention during the design, manufacturing and sustainment of weapons systems.[206] Given the current fiscally constrained operating environment, one of DoD's major challenges moving forward is to identify which corrosion prevention projects it wants to fund—a key factor being which of those projects will provide the greatest return on investment.

[206] Defense Science Board. (2004). Corrosion control. Retrieved from http://www.acq.osd.mil/dsb/reports/ADA428767.pdf.

For example, the GAO noted that in 2010 that DoD's Corrosion Prevention Office only had funding for 63 percent of the projects it approved. This fiscal reality makes an accurate assessment of Return on Investment vitally important for senior officials to make funding allocation decisions across the Department. [207] This case exemplifies the importance of identifying Return on Investment for DoD programs to aid in making wise resource distribution decisions.

[207] Government Accountability Office. (2010). Defense management: DoD has a rigorous process to select corrosion prevention projects, but would benefit from clearer guidance and validation of returns on investment. Retrieved from http://www.gao.gov/new.items/d1184.pdf.

Chapter 4: Transformational Elements for Organizational Change at DoD

The twenty-first century security environment is defined by uncertainty. It is DoD's capacity to respond to this uncertainty that will ultimately determine its success or failure. Supply Chain Management has been on GAO's "High Risk" list for over twenty years. During this period, GAO has consistently made recommendations regarding specific organizational changes that DoD must undertake to improve performance, efficiency, and reduce costs.[208] Gansler & Luby 2004[209], Tuttle 2005[210], Gansler 2011[211] among numerous others have also identified barriers to improvement and made recommendations for overcoming these barriers. To expand upon the work done by GAO and others in this arena, this portion of the research seeks to use this framework to evaluate barriers to supply chain modernization at DoD and provide recommendations for improvement.

DoD's supply chain transformation efforts and use of metrics must be elevated beyond a simple calculation of cost, reliability and wait time to include metrics that assess adaptability, flexibility, risk mitigation and return on program/initiative investment (e.g. how much performance is DoD acquiring for the money spent). These metrics are more difficult to calculate

---

[208] Government Accountability Office. (2012). DoD supply chain management. Retrieved from http://www.gao.gov/highrisk/risks/dod-management/supply_chain_management.php.

[209] Gansler, J. S. & Luby, R. (2004).

[210] Tuttle Jr., W. G. (2005). Defense logistics for the twenty-first century. Naval Institute Press.

[211] Gansler, J. S. (2011). *Democracy's arsenal*. MIT Press.

and require a foundation of data collection that is rooted in coordination of essential data on supply chain costs, customer wait time, and reliability (e.g. probability this wait time target is achieved) across the DoD enterprise for a range of goods and services. DoD must set high level targets for achieving enterprise-wide visibility as a means to optimize the supply chain otherwise DoD risks potential failure of achieving its stated mission in the twenty-first century security environment. As noted in the DoD's recent strategy update entitled, Sustaining U.S. Global Leadership: Priorities for 21st Century Defense, the DoD will be transforming itself by becoming "smaller and leaner, but will be agile, flexible, ready and technologically advanced. It will have cutting edge capabilities, exploiting our technological, joint, and networked advantage."[212] This new strategy will have a direct impact on how DoD's approaches transformation of its supply-chain and puts a greater emphasis on performance-based logistics approaches to achieve greater performance at lower costs.

Even without the presence of automatic cuts from the looming sequestration process, the military services have begun to trim personnel in supply chain fields in an effort to reduce costs. For example, the Air Force recently announced cuts of over 13,000 positions including 2,100 from its Air Force Material Command. Likewise the Army is cutting 8,500 civilian positions by the Fall of 2012 with half of those cuts coming from both the Installation

[212] Department of Defense. (2012). Sustaining U.S. global leadership: Priorities for twenty-first century defense. Retrieved from http://www.defense.gov/news/Defense_Strategic_Guidance.pdf.

Management Command and Army Material Command (AMC). These cuts are generating questions regarding the short-term and long-term impact on military readiness, responsiveness and flexibility for future operations.[213]

Introduction of a new strategy alone is not sufficient for meaningful organizational transformation. Large organizations in both the public and private sectors often introduce major changes and hold high expectations of improving performance through the introduction of a new technology, reformulating a business process or revising the organizational structure. When the entity fails to achieve its desired changes, in many cases it perpetuates a series of "spirals" where high expectations are followed by even more changes in technology, process and/or organizational structure—which, eventually fail as well. This repetitive process typically results in management's continued frustration and widespread cynicism across the workforce. To overcome this "spiral", organizations much recognize the importance of managing the change effort is equally important as other areas of focus.[214]

A framework for organizational change that addresses both transformational and transactional elements is required for substantive organizational

[213] Reilly, S. (2011). Experts : DoD could slash 150k jobs. Federal Times. Retrieved from http://www.federaltimes.com/article/20111204/BENEFITS01/112040307/.

[214] Schneider, B. et. al. (1996). Creating a climate and culture for sustainable organizational change. In Organizational Change: A Comprehensive Reader. Retrieved from http://media.wiley.com/product_ancillary/64/04702605/DOWNLOAD/chapter41.pdf

change.[215] Transformational elements are defined as those elements which are directly impacted by the external environment[216] (political, economic, social, etc.) and require substantial amounts of effort to change. On the other hand, transactional elements are those which require less effort to change and can be altered over a shorter duration; ultimately these elements are directly impacted by the noted transformation elements. This chapter of the research will provide a framework that addresses transformational elements as applied to the Department of Defense. The transactional elements of the framework will be addressed in the chapter to follow. The three transformational elements which will be described in greater detail in this chapter include: 1. Vision, Mission, and Strategy; 2. Leadership; and, 3. Culture.

[215] Burke & Litwin. (1992).
[216] These external elements have been previously addressed in Chapter 1.

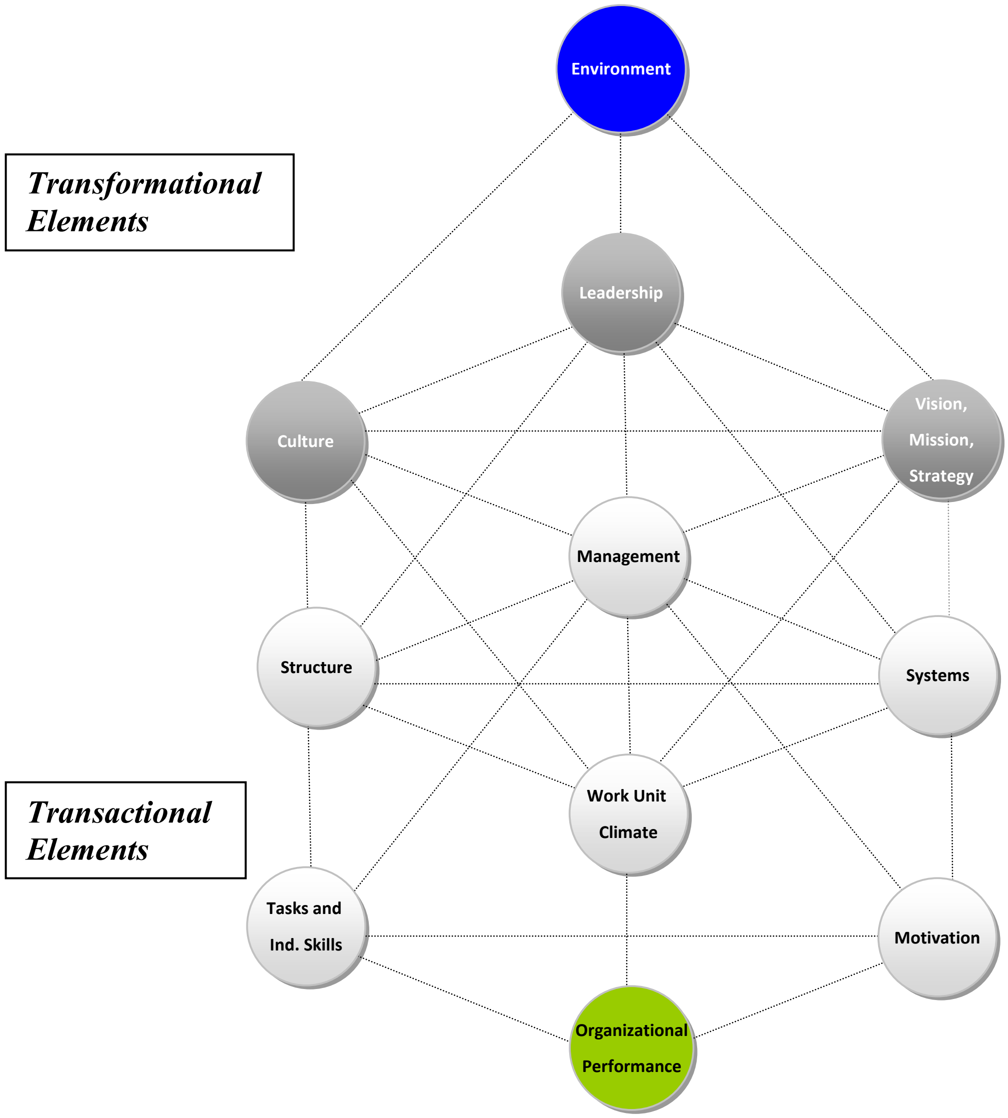


Figure 9. MILSCOR Framework for Organizational Change.[217]

[217] Adapted from Burke and Litwin, (1992).

The pages to follow will provide a discussion of each transformational element supported by the literature. This discussion will give a general overview of the element and supporting theories regarding how the element is to be successfully implemented to achieve organizational change. Following this general discussion, each element will be specifically applied to the case of implementation barriers for an enterprise-wide tool such as MILSCOR to aid in supply chain modernization at DoD. Following a discussion of the barriers, a series of recommendations to overcome these barriers will be provided. Development of barriers and recommendations for improvement for both transformational and transactional elements were partially generated by using results of a brief survey given to 24 defense acquisition professionals. The survey consisted of 16 short answer and multiple choice questions. Full survey descriptive statistics, questions, and results are found in Appendix A.

Leadership

A cornerstone of any organizational transformation effort must start with leadership who can set the vision for change and develop and implement a strategy for achieving that vision.

Leadership in the Literature

The literature is full of multiple theories on leadership. The "Great Man" approach to leadership is based upon the notion that successful leaders possess key personality traits or characteristics. Historians used this theory to explain key events in history. Typical traits associated with the "Great Man" approach include Charisma or Intelligence.[218]

An alternative approach to leadership theory in the literature can be found in the "behavioral" approach to leadership. This methodology was borne out of McGregor's work in the Human Side of Enterprise, where he noted that leadership is influenced by assumptions regarding the behavior and motivation of employees. McGregor's Theory X and Theory Y provided two competing theories on employee motivation, which were then used by leadership to effectively run the organization. Theory X asserts that most

---

[218] Carlyle, Thomas. (1888). *On heroes, hero-worship and the heroic in history*. Fredrick A. Stokes & Brother.
Woods, F. A. (1913). The influence of monarchs: steps in a new science of history. Macmillan.

people dislike work, have little ambition, and value their own security. As a result, leaders must coerce their employees through carrots and sticks in order to get them to work toward achievement of the organization's objectives. Alternatively, Theory Y asserts that work is something that people are capable of independently taking responsibility for, without coercion, to achieve an organization's stated objectives. Theory Y presupposes that individuals are capable of accomplishing this because they possess qualities of self-motivation, discipline, and control to complete a task for which they were assigned.[219]

On another front, Burns' groundbreaking work on leadership addresses the distinction between transformational leadership and transactional leadership. In short, Burns rejects the notion that coercive power alone (the kind of forcible power that is held by dictators from the "Great Man" approach) can be considered a parallel to true leadership. Thus, he contends, a leader must have a sense of morality in order to fit within either the transformational or transactional category.[220]

Transformational leadership is when a leader engages others while raising them to a higher level of motivation and morality.[221] In this case, it is the inspirational capacity of the leader to motivate a person that occurs by creating a vision that followers can get behind (either ideologically or

---

[219] McGregor, Douglas. (1985). *The human side of enterprise*. McGraw-Hill/Irwin.
[220] Burns, J.M. (1978). *Leadership*. Harper & Row.
[221] IBID.

morally). One major component of transformational leadership is the ability to convince people (by encouragement and inspirational influences) to follow your lead, whereby follows have a so-called "buy-in" to leadership's vision and dedicate themselves to helping the leader pursue it. Bass and Avolio's work on transformational leadership note the importance of culture, communication, and empowerment for successful transformational leadership and highlight the fact that leaders are in fact developers of others including followers, superiors and colleagues.[222] More recent work by DeCelles, Tesluk, and Taxman also suggest a connection between transformational leadership and development of positive employee attitudes to create a climate that is supportive of organizational change efforts.[223]

Alternatively, transactional leadership requires modal values. These values include honesty, responsibility and fairness. Transactional leaders essentially seek success by approaching followers for the purpose of exchanging things of economic, political or psychological value—consistent with McGregor's Theory X. These leaders focus on rewards or punishments that are to be traded in exchange for obedience or support. This leadership is little more than a bargaining or negotiating transaction for the purposes of furthering the interests of both parties without any greater motivating factors that tie the two

---

[222] Bass, Bernard M. and Bruce J. Avolio. (1994). Improving organizational effectiveness through transformational leadership. Sage Publications.

[223] DeCelles, Katherine A., Tesluk, Paul, E. and Faye S. Taxman. (2012). A field investigation of multilevel cynicism toward change. *Organization Science, Articles in Advance:* 1-18.

parties together.[224]

Directly related to the notion of creating strong relationships between Leaders, Nye's work has discussed the notion of "shared leadership" or "distributed leadership" where instead of a leaders role being atop a hierarchy, the leader instead occupies the center of a circle. This approach to leadership has recently emerged, in part, due to the explosion of information technology. In this context, it has been found that traditional hierarchical command-and control approaches that were heavily dependent upon hard power and legal authority are no longer efficient or productive because they impede information flows and limit collaboration. The result of such activities has been an increased importance on soft power in those highly networked and technologically advanced organizations.[225]

Another school of leadership thought is predicated upon the notion that leadership requires the ability for an individual to respond to different situations with different leadership styles. In this vein, Fiedler developed a contingency model that is predicated upon the notion that different situations will demand very different leadership style requirements. Fiedler examined three characteristics, which would have an impact on the style required: 1. Leader-member relations; 2. Task structure; and 3. Position power.[226] Another

[224] IBID.
[225] Nye, J. (2008). *The powers to lead*. Oxford University Press.
[226] Fiedler, F. (1964). A contingency model of leadership effectiveness. *Advances in Experimental Social Psychology,* 1, 149-190.

variant of this model of leadership is the Hersey-Blanchard model. This model is based upon the assumption that it is the subordinates that dictate which leadership style is most appropriate for a given situation. In this context, the Hersey-Blanchard model is centered on an examination of: 1. Task behavior; 2. Relationship behavior; and 3. Maturity. Once these three elements are examined and defined for the given situation, they direct the type of leadership style that should be utilized: 1. Directing; 2. Coaching; 3. Supporting; or 4. Delegating.[227]

Finally, the importance of followers cannot be understated. Without followers, leaders are not capable of being successful. Followers can decide to follow for different reasons including fear, payment or some type of attraction. Followers hold an important level of power over leaders because of their ability to rebel and simply withhold their support. Such a decision could severely undermine the effectiveness of any leader.

Leadership Barriers at DoD

DoD faces several leadership barriers to implementing a framework such as MILSCOR across the enterprise; these include: 1. A high number of turnovers and vacancies for leadership positions; 2. A failure to convey the imperative for change; and 3. A Lack of empowerment to influence change.

---

[227] Hersey, P. and Blanchard, K.H. (1982). *Management of organizational behavior: utilizing human resources*, 4th ed. Prentice-Hall.
Irgens, O,M. (1995). Situational leadership: a modification of Hersey and Blanchard. *Leadership & Organization Development Journal,* 16 (2), 36-39.
Bolden, R. et. Al. (2003). A review of leadership theory and competency frameworks. Retrieved from http://centres.exeter.ac.uk/cls/documents/mgmt_standards.pdf.

Turnovers and Vacancies for Leadership Positions Plague DoD

A major hurdle to achieving any enterprise-wide change at DoD are the sheer amount of turnovers and vacancies, which seem to persist across the Department. These gaps in key personnel make implementing a leader's vision for change nearly impossible. First and foremost, there have been an incredibly high number of vacancies in recent years for senior positions across the Federal Government and particularly within DoD. As the political environment has become more and more combative, delaying Senate confirmations has become commonplace as a means to undermine the opposing political party's agenda. At DoD, senior leadership positions that require political appointment are vacant approximately 20 percent of the time. For example, following the election of President Obama, a rash of political nominations were strategically held up in the Senate as "playing politics" created a severe roadblock to the business of leading and managing the Department of Defense. Some 17 months after President Obama's election 13 of total 54 nominations for senior positions at DoD (nearly 25 percent) were still awaiting Senate confirmation. Another tactic that has recently emerged is the placing of "holds" on political appointments to create bargaining leverage for a particular member.[228]

Turnover in key leadership positions is another major problem that has been endemic to the Department for quite some time. For example, from 1949 to

[228] Gansler, J., Lucyshyn W. and Arendt, M. (2010).

1999 the average tenure for the Secretary of Defense and Deputy Secretary of Defense were 30 months and 23 months respectively. Comparatively, the average tenure among other senior DoD offices was between 11 and 20 months.[229] Given such a rapid pace of change at the highest levels of the Department, it becomes incredibly difficult for leaders to take their positions; thoughtfully develop a vision/mission/strategy; become fully acclimated to the unique organizational culture; and, fully implement the changes necessary for lasting change—change in most cases they will not actually be around to see. One major consequence of this high rate of turn over is a strategy by subordinates to "wait leadership out," thereby reducing likelihood of any changes in the short run that may yield resistance.[230]

Leadership Hasn't Made the Imperative for Change

Senior leadership must be the members of an organization to communicate the imperative for change. These members of the organization must not only "talk the talk" regarding the importance of the change effort, but also "walk the walk" through their actions. A major problem that DoD faces when trying to implement MILSCOR as an enterprise-wide tool is the widespread complacency that has persisted across DoD for some time. Kotter noted this factor as "establishing a sense of urgency."[231] Without urgency, the "status quo" seems acceptable because there is no reason for change to occur. In the

[229] IBID.
[230] IBID.
[231] Kotter, John. (2007). Why transformation efforts fail. Retrieved from http://hbr.org/2007/01/leading-change-why-transformation-efforts-fail/ar/.

survey which was conducted as part of this research, 47 percent of respondents noted that they felt leadership had not adequately made the imperative to change.

At DoD, complacency is especially troublesome as national defense is a major political issue. As a result, any effort to reform defense that involves reducing resources or canceling programs is often portrayed as weakening American national security. This approach reinforces the point that business as usual (e.g. the status quo), is why America is currently safe, and any change to the current approach might just be catastrophic. For example, following President Obama's recently released military strategy calling for a leaner, more flexible and responsive force, some members of Congress responded with statements about how the new approach would only weaken U.S. defense, not make it stronger—ultimately putting American lives at risk.[232]

One consequence of this political pressure to maintain the status quo is that leadership may be forced to give mixed messages regarding any defense reform efforts— further undermining the "urgency" for change. For example, In May 2009, President Obama discussed the desperate need to reform the Department of Defense as a result of America's skyrocketing debt, the economic collapse of 2008, and, widespread data on acquisition and procurement waste. During the Weapons System Acquisition Reform Act

[232] Cole, T. (2012). Cole statement on defense strategy announcement. Retrieved from http://cole.house.gov/news/press-releases/2012/01/cole-statement-on-defense-strategy-announcement.shtml.

signing ceremony, President Obama noted that the WSARA effort would “better protect our nation, and better protect our troops.” [233] Ironically, in the very same speech President Obama also stated “As Commander-in-Chief, I will do whatever it takes to defend the American people, which is why I’ve increased funding for the best military in the history of the world”.[234] This type of mixed message is precisely what makes it difficult for followers to recognize the “urgency” of the effort. If the President and Congress will continue to fund DoD for whatever is needed to keep America safe, then why should there be any urgency to change behavior?[235]

As leadership is responsible for setting the vision, mission and strategy for the organization, they are also responsible for convincing the organization that change is required—that the “status quo” is unacceptable.[236] An important factor here is that leadership must not only inform the organization that it must change, but it must compel the organization to understand why it must change and how accountability for accomplishing such changes will be addressed. Accountability and communication of transformation progress is precisely where the MILSCOR framework could help leadership articulate an imperative for change—if this need were recognized by the larger DoD

---

233 Obama, B. H. (2009). Remarks by the president at signing of the weapons systems acquisition reform act of 2009. Retrieved from http://www.whitehouse.gov/the_press_ office/Remarks-by-the-President-at-signing-of-the-Weapons-Systems-Acquisition-Reform-Act.

234 IBID.

235 Eide, P. and Allen, C. (2012). The more things change acquisition reform remains the same. Retrieved from http://www.carlisle.army.mil/usawc/dclm/The%20More%20Things%20Change%20Acq%20Reform%20Remains%20the%20Same%20%28Eide,%20Allen,%20DARJ%2061%29.pdf.

236 Kotter, (1995).

community. Specifically, collection and dissemination of enterprise-wide data on the current state of supply chain agility, flexibility, cost etc. could highlight just how much room for improvement exists and why DoD must change how it does business. [237]

Lack of Empowerment to Make Change

In some cases, DoD leaders lack empowerment to affect change as the bureaucratic structure and processes of the defense establishment hamper their ability to act. Empowerment can be defined as involvement in the decision-making process, a sharing of "appropriate" decision-making responsibility, and a sharing of power.[238]

In the survey which was conducted as a part of this research, over 83 percent of respondents agreed that in their experience DoD leaders were not empowered to make change.

DoD's Chief Information Officer, Teri Takai, recently noted that this lack of empowerment exists even at her level:

> *"It isn't like I can sort of sit in my office and put a directive out and everybody goes, 'Oh, that's a really great idea, Teri. I better run back to my office and do that.'* [239]

Part of this problem is directly tied to the complex, bureaucratic organizational structure of the Department.[240] Where the power to lead is

---

[237] IBID.
[238] Gansler and Luby. (2004).
[239] Johnson, N.B. (2012). Empower DoD's CIO, panel urges Panetta. Retrieved from http://www.federaltimes.com/article/20120122/DEPARTMENTS01/201220303/.
[240] To be addressed specifically in the section on Structure.

divided between Military and Civilian leaders and further complicated by the massive number of contractors who support DoD's daily activities. While some of these bureaucratic hurdles were originally designed into the system in order to provide checks and balances, they limit flexibility for leaders take the steps required to implement short and long-term changes. Ultimately, this lack of empowerment may have a negative impact on the effectiveness of one as a leader in part because pride of ownership is a key factor to job satisfaction.[241] This lack of empowerment may also have a direct impact on organizational commitment thus negatively impacting rates of employee turnover.[242]

Kotter notes the need to create a guiding coalition to help influence change—in part because this group can help to empower leadership through their support and participation in the change effort.[243] This notion is consistent with Nye's assertions regarding the rise of shared or distributed leadership due to the complex nature of modern organizations and the rise of information technology.[244] The Switch framework introduced by Chip and Dan Heath also provide support for the need to create a guiding coalition for change. The keys

---

[241] Moss, Charmaine. (2011). Empowerment and its roll in leadership. Retrieved from http://www.goodfellow.af.mil/news/story.asp?id=123255506.

[242] Avolio, B.J., Zhu, W., Koh, W., & Bhatia, P. (2004). Transformational leadership and organizational commitment: Mediating role of psychological empowerment and moderating role of structural distance. *Journal of Organizational Behavior*, 25, 951-968.

Koberg, C. S., Boss, W., Senjem, J. C., & Goodman, E. A. (1999). Antecedents and outcomes of empowerment: Empirical evidence from the health care industry, *Group and Organization Management*, 34 (1), 71-91.

[243] Kotter, (1995).

[244] Nye, (2008).

to this, they state are to: 1. “direct the rider.” (e.g. ensure the vision for change is crystal clear; 2. “motivate the elephant” (e.g. leadership by force will only be effective for so long, thus at some point followers must be motivated to participate willingly); and most importantly the need to 3. “shape the path” (e.g. make sure that the situation and surrounding environment are supportive of the change effort). [245] Unfortunately for the DoD, the highly rigid, militaristic structure of the Department lends itself to a more formal top-down, command-and-control type of leadership—a factor that makes “shaping the path” an incredibly difficult if not impossible task.

Recommendations for Improvement

Consider fixed appointment terms for key DoD leadership positions

Lengthy timeline for appointment confirmations and high turnover rates makes it difficult for DoD maintain sustained leadership for change over time in key positions. This turnover contributes to difficulty in articulating a lasting vision for change and long-term implementation of a strategy to support that vision. For implementation of the MILSCOR framework across the DoD enterprise, senior leadership must recognize the importance of the MILSCOR and convey this importance to the workforce. If senior leadership does not remain consistent to help drive the implementation of the MILSCOR performance framework across the enterprise, success will likely be unachievable. To overcome this barrier, DoD should consider implementing fixed appointment terms for key acquisition and supply chain positions. Fixed

[245] Heath, Chip and Dan Heath. (2010). *Switch*. Crown Business.

appointment terms would allow for additional consistency at the top level when implementing a large-scale change across the enterprise such as the MILSCOR framework. Further, these fixed appointment terms could have reappointment tied to the accomplishment of specific goals and objectives. In terms of MILSCOR, this would translate to progress on implementation of the framework across the enterprise and its use to help drive supply chain performance improvement at lower costs.

Realign organizational processes and structures to support empowered leadership.

The current hierarchical/command and control organizational structure at DoD does not effectively empower leaders across boundaries. As a result, leaders are unable to effectively influence change because of prohibitive organizational structures and processes dictate a hierarchical chain-of-command in an environment with a matrixed organizational structure. This is goes directly to an inability of leadership to influence change as the purview of their responsibilities are beyond the scope of their control. MILSCOR implementation requires leadership across the enterprise to work together in support of the common vision of supply chain transformation. If the current organizational structure doesn't permit cross-boundary empowerment, MILSCOR implementation will be unsuccessful. For example, leaders should be assigned a dedicated set of stand-alone responsibilities and a set of collaborative responsibilities that span traditional stove-piped organizational boundaries. Those responsibilities that are outside of their direct control can be jointly controlled across the enterprise—with ultimate control for success/failure being held at the Under Secretary of Defense for Acquisition, Technology and Logistics (USD AT&L) level.

Vision, Mission, and Strategy

Leadership is responsible for setting the vision, mission and developing the strategy for how an organization will undertake a transformation effort. It is the vision, which dictates the organization's mission and ultimately determines its strategy. If DoD is to implement MILSCOR, each organization's vision, mission, and strategy must be supportive of this type of performance-based framework.

Vision in the Literature

Organizational vision can be defined as: "A realistic, credible, attractive future for the organization."[246] As noted by Nanus, vision provides a meaning for everyone in the organization by creating a worthwhile challenge, which energizes the organization. In short, the vision creates a common identity which all members of the organization share.[247] For DoD, the vision for supply chain transformation should be to create an supply chain that is: cost effective; efficient; accurate; anticipatory; responsive; and, ultimately serves as a battlefield advantage.

Collins and Porras note that a well-conceived vision should include an envisioned future, which provides a 10 to 30 year audacious goal, and descriptions of what it will be like to achieve such a goal. They also note that

[246] Nanus, B. (1992). *Visionary leadership*. Jossey-Bass.
[247] IBID.

it is important that this audacious goal have a clearly defined finish line that can be measured against to ensure the organization can recognize its accomplishment.[248] A key point here is that the vision must be able to be broken down into achievable milestones which can be articulated in the strategy.

Examples of vision statements from Government include President Kennedy's vision for landing a man on the moon:

> *I believe that this nation should commit itself to achieving the goal, before this decade is out, of landing a man on the Moon and returning him safely to the Earth. No single space project in this period will be more impressive to mankind or more important for the long-range exploration of space; and none will be so difficult or expensive to accomplish.*[249]

This statement was truly groundbreaking at the time and set the stage for the events to follow to fulfill such a vision. This vision provided a new mission for NASA and more importantly helped provide the framework necessary to create a strategic roadmap for its accomplishment.

In the private sector, former GE CEO Jack Welch was widely known for his fondness of laying out highly aggressive vision statements for his company as a means to raise the bar for achievement. In Welch's 1981 report to shareholders he noted his vision was:

> *For GE to become the most profitable, highly diversified company on earth, with world quality leadership in every one of its product lines.*[250]

---

[248] Collins, Jim, and Jerry I. Porras. (1996). Building Your Company's Vision. *Harvard Business Review*, Sept./Oct, 65-77.

[249] NASA. (2009). Human Space Flight. Retrieved from http://spaceflight.nasa.gov/history/.

[250] George Mason University. (2001). Biography of a leader: Jack Welch. Retrieved from http://mason.gmu.edu/~vdoherty/Portfolio/Products/jwelch.html.

Accordingly, GE has become one of the largest, most successful companies in American history.

In Kotter's classic work, "Why Transformation Efforts Fail" he provides two keys for organizational transformation, which is related specifically to vision.[251] First, Kotter notes that you must create a vision, which is designed to direct the change effort; the vision thus becomes the guiding light for an organization's mission and ultimate strategy for accomplishment. Second, Kotter notes that every possible mechanism must be used to vigorously communicate the vision across the organization; he posits that in most failed transformation efforts, the vision is under-communicated by a factor of 10. Per Kotter, the key to successful transformation is that every member of the organization must understand the vision they are trying to achieve and leadership must consistently work to engrain the vision throughout the organization.

The case of President Kennedy's vision for landing a man on the moon can be used to highlight this importance. It has been noted by many that the strength of this vision, to land a man on the moon and return him safely to Earth, permeated so strongly throughout NASA that every single employee recognized it was their responsibility to contribute to this vision. As the story goes, in one case a reporter was walking the NASA halls trying to find

---

[251] Kotter, (1995).

someone to interview about the upcoming space launch, eventually he came across a man who was vacuuming the floor. When the reporter asked the man what he did for NASA, the man (who happened to be a janitor) replied "My job is to put a man on the moon."[252]

Mission in the Literature

Scholars and management professionals alike have developed a considerable literature on the subject of organizational mission. Much of the research has been dedicated to defining organizational missions and comparing missions across various organizations (Pearce and David 1987[253], O'Hallaron 2000[254], Wall, Sobol and Solum 1999[255], Abrams 1999[256], Jones 1995[257] Graham and Havalick 2007[258]).

A mission (conveyed through a mission statement) is a broadly defined, but enduring statement of purpose that distinguishes one organization from other organizations of its type and identifies the scope of its operations in product and market terms.[259] More specifically, the mission statement addresses the

[252] Hennman, L. (UD) foundations of strategy: mission, vision, and values. Retrieved from http://www.henmanperformancegroup.com/articles/Foundations-of-Strategy.pdf.

[253] Pearce II, John A. and Fred David. (1987). Corporate mission statements: the bottom line. *The Academy of Management Executive*, 1 (2), 109-115.

[254] O'Hallaron, Richard, and David O'Hallaron. (2000). *The mission primer: four steps to an effective mission statement*. Mission Incorporated.

[255] Wall, Bob, Mark R. Sobol, and Robert S. Solum. (1999). *The mission-driven organization.* Prima Publishing.

[256] Abrahams, Jeffrey. (1999). *The mission statement book: 301 corporate mission statements from America's top companies.* Ten Speed Press.

[257] Jones, Patricia, and Larry Kahaner. (1995). *Say It and Live It: The 50 Corporate Mission Statements That Hit the Mark*. Currency/Doubleday.

[258] Graham, John W. and Wendy C. Havlick. (2007). *Mission statements: A guide to the corporate and non-profit sectors*. Taylor and Francis.

[259] IBID.

purpose of the organization and is more focused on present than future (the future state is addressed in the aforementioned discussion on vision). The vision should inform the mission. The vision sets the stage for the organization's desired future state, while the mission defines the current purpose and function of the organization in its pursuit of the vision.

As noted by Graham and Havlick, a mission statement provides a basis for a culture that will drive the decision-making for organizational leadership.[260] The mission statement provides the foundation for priorities, strategies, plans, and work assignments. The mission statement should thus be considered the starting point for development of an overall management and organizational structure.[261]

As further noted by Graham and Havlick, mission statements should avoid "jargon" or "buzzwords" or other terms which are so broadly defined they appear carry relatively little weight across the organization. Terms like "continuous improvement" leave much room open for interpretation. Likewise mission statements should not be so overly complex that they cannot be readily identified by all members of the organization. If they contained highly specialized terms such as "Six Sigma quality" it is likely that many members of the organization will be unable to clearly identify with the mission. Lastly, a mission statement is something that must be backed up with action

[260] IBID.
[261] Pearce and David, (1987).

(implemented through a strategy which is to be addressed in the following section).[262]

Effective mission statements can most typically be found with many of the world's most successful companies, such as those, which are ranked on the Fortune 500. An example of a highly effective mission statement can be found in that of Southwest Airlines:

> *The mission of Southwest Airlines is dedication to the highest quality of Customer Service delivered with a sense of warmth, friendliness, individual pride, and Company Spirit.*

This statement has helped drive Southwest to be consistently rated with one of the highest customer satisfaction rates in the industry. Moreover, Southwest was recently ranked fourth on the list of the world's most admired companies.[263] The key to achievement of the vision and mission however lies in having a clear path toward achievement. The clear path enables personnel to focus on working towards the end-state, instead of wasting time on the intermediate roadblocks that might be preventing change.[264]

Strategy in the Literature

Just like the subjects of vision and mission, there are a considerable number of resources in the literature on subject of strategy. The subject of strategy is typically divided up into multiple subcategories such as business strategy

---

[262] Graham, John W. and Wendy C. Havlick, (2007).
[263] Southwest Airlines. (2012). Fact sheet. Retrieved from http://www.southwest.com/html/about-southwest/history/fact-sheet.html#distinctions.
[264] Heath and Heath, (2010).

(Hoskisson, Hitt and Ireland 2009[265], Campbell, Stonehouse and Houston 2002[266], Kourdi 2003[267], Ulwick 2000[268], etc.); competition strategy (Porter 1979, 1980, 1998, 2008[269], Walker 2003[270], Day, Reibstien and Gunther 2004[271]); public sector strategy (Moore 1995[272], Joyce 2000[273], Scholes and Johnson 2001[274]), and others. Each of these subcategories carries a wide array of definitions, which generally address the same high-level components of strategy in general.

For the purposes of this research, the definition of strategy used is an adaptation of the definition provided by Daniell:

> *Strategy is the art and science of informed action to achieve a specific vision, an overarching objective, or higher purpose for an organization. The strategy is communicated through an organization's strategic plan.*[275]

---

[265] Hoskisson, Robert, Michael Hitt, and R. Duane Ireland. (2009). *Business strategy: theory.* South-Western.
[266] Campbell, David, George Stonehouse, and Bill Houston. (2002). *Business Strategy*. Butterworth-Heinemann.
[267] Kourdi, Jeremy. (2003). *Business strategy: a guide to effective decision making.* Profile.
[268] Ulwick, Anthony W. and John Greenwood. (2000). *Business strategy formulation: theory, process and the intellectual revolution.* IAP.
[269] Porter, M.E. (1979). How competitive forces shape strategy. *Harvard Business Review*, March/April.
Porter, M.E. (1980). *Competitive strategy.* Free Press.
Porter, M.E. (2008). The five competitive forces that shape strategy. *Harvard Business Review*, Jan.
[270] Walker, Gordon. (2003). *Competitive strategy.* McGraw-Hill International.
[271] Day, George S., David J. Reibstein, Robert E. Gunther. (2004). *Wharton on dynamic competitive strategy.* John Wiley and Sons.
[272] Moore, Mark Harrison. (1995). *Creating public value: strategic management in Government.* Harvard University Press.
[273] Joyce, Paul. (2000). *Strategy in the public sector: a guide to effective change management.* John Wiley.
[274] Scholes, Kevan and Gerry Johnson. (2001). *Exploring public sector strategy.* Prentice Hall.
[275] Daniell, Mark Haynes. (2004). *Strategy: a step-by-step approach to the development and presentation of world class business strategy.* Palgrave Macmillan.

When applied more specifically within the public sector domain, effective strategy should be based upon a three-pronged approach. At a minimum, a public sector strategy should detail the following three components:

1. The "public value" the organization is supposed to produce;
2. The "sources of legitimacy and support" which are to be relied upon to authorize the organization to take action and provide the resources necessary to sustain the effort to create that value;
3. The operational capabilities (including new investments, innovations, and alliances) that the organization would require to deliver the desired results.[276]

Accordingly, the literature recommends an equivalent three-part test to evaluate potential effectiveness for a public sector organization's strategy:

1. Is the strategy substantively valuable in the sense that the organization produces things of value to its key stakeholders?
2. Is the strategy legitimate and politically sustainable?
3. Is the strategy operationally and administratively feasible?[277]

In the event that a public sector strategy passes each of these three tests, the overwhelming challenge then becomes translating strategy into action. Kaplan and Norton's work on performance scorecards has become a highly valuable resource when public sector organizations seek to transform themselves. This approach at a minimum requires:

[276] Moore, Mark, and Khagram, Sanjeev. (2004). On creating public value. Retrieved from http://www.hks.harvard.edu/m-rcbg/CSRI/publications/workingpaper_3_moore_khagram.pdf.
[277] Moore, Mark Harrison, (1995).

1. Clarifying and translating the organizational vision and strategy into specific strategic objectives;
2. Communicating these strategic objectives throughout the organization, establishing goals, and aligning rewards with performance measures;
3. Planning and setting specific targets for identified scorecard measures (such as best-in-class standards) and aligning strategic initiatives to accomplish these defined targets; and,
4. Capitalizing on strategic feedback and learning to improve the previously defined strategic objectives, improve communication, align rewards to performance measures, and recalibrate targets and initiatives accordingly.[278]

By undertaking these steps to translate strategy into action, an organization can use its strategy to both fulfill its mission and achieve its vision.

Vision, Mission and Strategy Barriers at DoD

When seeking to develop organizational change, a clearly identified vision, mission and strategy are key. This portion of the research seeks to identify the particular barriers and strategies for overcoming these barriers that are required for implementing a performance-based evaluation tool such as MILSCOR. Vision, Mission and Strategy, barriers identified include: a lack of strong vision statements by some DoD organizations; overlap in organizational missions across the enterprise; and, strategic plans which lack key elements that are necessary for success.

[278] Kaplan, Robert S. and David P. Norton. (1996).

Some Supply Chain Organizations Lack Strong Vision Statements

As noted previously, a good vision statement is one that sets a high bar for achievement within a defined period of time—in short it must be measurable. The survey of DoD professionals conducted in support of this research found that just 41.7 percent of respondents felt their vision statements were in-fact measurable. The vision statement is intended to be a rallying cry for everyone within an organization to try and accomplish an incredible goal (such as President Kennedy's vision for sending a man to the moon or Jack Welch's vision for GE to become the world's best company across all of its product lines). If a vision is not clearly articulated, it becomes very difficult for an organization to define its mission and associated strategy. Consequently, any effort to implement a performance-based tool to guide transformation efforts becomes stymied. If the vision (e.g. the direction) for the organization has not been set and universally recognized by all, it becomes incredibly difficult for leadership to effectively communicate the direction of the organization, develop a clear strategy, and track performance improvement. To demonstrate these concepts below are two vision statements from supply chain organizations within DoD.

Strong Vision Statement	Weak Vision Statement
DLA Land and Maritime Directorate Right Item, Right Time, Right Place, Right Price. Every Time ... Best Value Solutions for America's Warfighters.[279]	***DLA Aviation Directorate*** Our vision is to deliver value-added products and services to the leadership and customer, by providing teaming relationships and timelines that are useable by the decision-makers.[280]

A strong vision statement such as that for DLA's Land and Maritime Directorate sets a clear direction for the organization, it has established an audacious goal of being perfect in everything it does, it is measurable, and it can be easily communicated and understood across the organization.

Alternatively, the DLA Aviation Directorate's vision statement is highly generic and doesn't contain an "Everest-like" goal. It notes that that organization desires to provide "value-added" products but doesn't define what value they will add. Further, it fails to set a clearly measurable standard of performance by stating that it seeks to provide "teaming relationships and timelines that are *useable* by the decision-makers." The "usable" standard of performance is rather low when compared against the 100 percent right item, right time, right place, etc. standard set by the Land and Maritime Directorate.

These examples are provided to highlight the type of alignment that must exist across each organization throughout DoD's supply-chain. While some

[279] Defense Logistics Agency. (2012). DLA land and maritime mission, vision and values. Retrieved from http://www.dscc.dla.mil/About/vision_mission.asp.

[280] Defense Logistics Agency. (2012). DLA aviation mission and vision. Retrieved from http://www.aviation.dla.mil/ExternalWeb/UserWeb/aviationengineering/missionandvision.asp.

organizations across DoD have provided strong vision statements, others have confused vision statements with mission statements or failed to provide a vision statement at all. Because the vision sets the direction for improvement, it is an important first step for change at DoD. If the Department's overarching objective is to make its supply-chain world class, each organization in the chain must have identified its vision accordingly. Without this type of alignment, implementation of a performance-based evaluation tool to gauge enterprise-wide improvement such as MILSCOR will be highly ineffective.

Overlap Exists in Missions across the Enterprise

Another major challenge with implementing a supply-chain performance evaluation tool such as MILSCOR is the amount of overlap that exists in missions for various organizations at DoD. Because of this overlap, it becomes incredibly difficult to ascertain who is truly responsible for accomplishing a particular mission and thus whose activities (positive or negative) are impacting outcomes across the larger enterprise. In short, measurement without accountability for performance fails to provide any tangible value to the organization.

Defense business system modernization is one area that has been recognized as having significant overlap in organizational missions across the enterprise. Since 2005, the Government Accountability Office (GAO) has highlighted

DoD's approach to transforming its business operations being an area of "High Risk". Accordingly, GAO found that across the Department there was a general need for "more clearly define roles and responsibilities, as well as relationships among key positions and governance entities."[281] The root cause of this problem can be traced to the sheer volume of business systems that exist across the numerous organizational stove-pipes, as noted in the table below:

Number of Systems	**Financial Management**	**Human Resources**	**Other Systems**	**Total**
Army	97	253	397	*747*
Navy	93	111	269	*473*
Air Force	43	103	343	*489*
Agencies	102	234	275	*611*
Total	335	701	1284	*2320*

Table 23. Inventory of DoD's Discrete Business Systems as of 2011.[282]

These systems provide the backbone of DoD business operations and are a vital component of DoD's supply-chain. These systems are responsible for tracking resources, making payments, processing orders, etc. In most cases, each of the organizational entities across DoD have isolated, stand-alone business systems for accomplishing these functions. Because these systems are disintegrated, it often means they are unable to communicate with one-another and share data across the enterprise. With respect to supply-chain visibility, the inability to communicate and share data across the enterprise is

[281] Government Accountability Office. (2012). DoD approach to business transformation. Retrieved from http://www.gao.gov/highrisk/risks/dod-management/business_transformation.php.

[282] For more information see: http://dcmo.defense.gov/

a major hindrance improving efficiency and effectiveness. While the Department clearly recognizes that business transformation is a priority, confusion over precisely which organization's mission is dedicated to this effort has persisted due to three conflicting federal laws on the subject; the Goldwater-Nichols Act, the Clinger-Cohen Act, and the National Defense Authorization Act (NDAA) of FY 2008.

Specifically, Goldwater-Nichols provided authority for all acquisitions including defense systems (both national security systems and business systems) to the Under Secretary of Defense for Acquisition, Technology and Logistics. Likewise passage of the Clinger-Cohen Act required all Federal agencies to assign a Chief Information Officer (CIO) to oversee acquisition of all information systems. At DoD this resulted in the creation of both a DoD-level CIO[283] as well as independent CIOs at each of the component Services. Finally, in 2008, passage of the NDAA established yet another point of accountability within the Department for business system modernization in the Deputy Chief Management Officer (DCMO).[284]

As noted in the table below, each of these organizations have a mission function with respect to business system modernization that clearly overlaps with the other.[285] Such overlap makes accountability for both success and

[283] For more information see: http://cio-nii.defense.gov/
[284] For more information see: See http://dcmo.defense.gov/
[285] Gansler, Jacques S. and William Lucyshyn. (2009). Defense business transformation. Retrieved from

failure incredibly difficult as well as high level strategic planning for business system investment decisions across the DoD-Enterprise.

---

http://www.ndu.edu/CTNSP/docUploaded/Defense%20Business%20Transformation%20Report.pdf.

	Under Secretary for Acquisition Technology and Logistics (USD AT&L)	Deputy Chief Management Officer[286]	Department of Defense CIO[287]
Organizational Mission	Responsible for all acquisitions as defined by the Goldwater-Nichols Department of Defense Reorganization Act of 1986 Pub.L. 99-433.[288]	*"The Office of the Deputy Chief Management Officer leads and integrates enterprise-wide performance improvement and business operations to enable and support the Warfighter."*	*"Information is one of our Nation's Greatest sources of power. Our first and greatest goal is to bring that power to the achievement of mission success in all operations of the Department; warfighting, business, and intelligence."*

Table 24. Organizational Missions Related to Business System Modernization at DoD.

Without clearly defined swim-lanes for each of these organizations, implementation of a performance evaluation tool such as MILSCOR would have minimal impact on supply-chain improvement, as traceability for responsibilities across the organization could not be clearly identified.

Strategic Plans Lack Key Elements Necessary for Success.

A final barrier to implementation of a performance-based tool such as MILSCOR to evaluate supply-chain improvement at DoD is the general lack of several key performance evaluation elements in DoD's strategic plans. As noted previously, work by Norton and Kaplan demonstrates the vital importance of linking or mapping strategy to processes and outcomes for successful organizational transformation. Government has made great strides

---

[286] Department of Defense Office of the Deputy Chief Management Officer. (2012). Mission and vision. Retrieved from http://dcmo.defense.gov/mission-vision.html.

[287] Department of Defense Chief Information Officer. (UD). The DoD CIO mission and vision. Retrieved from http://cio-nii.defense.gov/docs/card.pdf.

[288] Locher, James R. (2002). *Victory on the Potomac: the Goldwater–Nichols Act unifies the pentagon.* Texas A & M University Press.

in attempting to link strategic plans for its organizations to performance improvements—however, not all organizations have embraced these standards. For example, through the Government Performance and Results Act (GPRA) of 1993, agencies across the Government are required to develop strategic plans for accomplishing their specified visions and missions.[289] Specifically the GPRA noted that the following specific components were to be included in each annual agency strategic plan:

> 1. Establish performance goals to define the level of performance to be achieved by a program activity;
>
> 2. Express such goals in an objective, quantifiable, and measurable form unless authorized to be in an alternative form under subsection (b);
>
> 3. Briefly describe the operational processes, skills and technology, and the human, capital, information, or other resources required to meet the performance goals;
>
> 4. Establish performance indicators to be used in measuring or assessing the relevant outputs, service levels, and outcomes of each program activity;
>
> 5. Provide a basis for comparing actual program results with the established performance goals; and
>
> 6. Describe the means to be used to verify and validate measured values.[290]

These components were included in GPRA because of recognition that they are key foundational elements that would be the basis of any truly valuable strategic plan—the link between objectives, strategy for achievement of objectives, and clearly defined performance measures for tracking of progress.

---

[289] Office of Management and Budget. (1993). Government Performance Results Act of 1993. Retrieved from http://www.whitehouse.gov/omb/mgmt-gpra/gplaw2m.
[290] IBID.

Despite such widely recognized guidance on what is required to generate and implement a strategic plan successfully, supply-chain leadership at DoD has been hesitant to include specific requirements for performance accountability in its strategic plans for quite some time.

In 1996, GAO addressed the Department's Logistics Strategic Plan and noted that several improvements could be made if DoD simply implemented the requirements set forth in the GPRA. These identified improvements include:

> 1. Linking its action plans to resources so that both DOD managers and Congress can make more informed decisions on the value and priority of logistics system improvements;
>
> 2. Better linking the services' and the Defense Logistics Agency's (DLA) plans to DOD's plan; and
>
> 3. Identifying interim approaches that can be developed and implemented when milestones of a priority strategy, aimed at achieving the plan's overall goals and objectives, have been extended.291

In 2001, GAO highlighted failures by both the DLA and TRANSCOM in their efforts to support a Department-wide logistics strategic plan that sought to appropriately implement basic requirements found in GPRA. More specifically it was found that neither DLA or TRANSCOM's strategic plan:

1. Were consistent with the actions in the Defense-wide plan;
2. Were directly related to the Defense-wide plan or to each other, and

[291] General Accounting Office. (1996). Logistics planning: opportunities for enhancing DoD's logistics strategic plan. Retrieved from http://www.fas.org/man/gao/ns97028.htm.

3. Did not contain some key management elements as outlined in the GPRA such as performance measures and specific milestones.[292]

In 2008, GAO undertook a comprehensive review of DoD's Logistics Roadmap (LR) and noted yet again that several fundamental requirements for implementing an effective transformation strategy were missing. Accordingly, GAO found that the LR failed to articulate the scope and impact of DoD's current logistics deficiencies such as what areas of DoD's supply-chain would require the most improvement and how much improvement would be necessary. Further, the LR did not contain any actual performance measures for evaluating achievement of its goals and objectives.

Another major issue identified with the 2008 LR was that the plan did not trace who was responsible for its implementation across the Department and how any such implementation would occur—a key component of Kaplan and Norton's strategy mapping exercise.[293] GAO noted in its report that DoD had acknowledged these concerns and assured them that in the follow-on Logistics Roadmap (scheduled for release in 2009), updates to the outstanding items would be completed. Unfortunately, as of the date of this research, DoD has yet to publish the promised follow-on Logistics Roadmap.

---

[292] General Accounting Office. (2001). Defense logistics: strategic planning weaknesses leave economy efficiency and effective of future support systems at risk. Retrieved from http://www.gao.gov/new.items/d02106.pdf.

[293] Government Accountability Office. (2009).
Kaplan, Robert S. and David P. Norton. (2000). Having trouble with your strategy? Then map It. *Harvard Business Review*, Sept/Oct.

In 2010, DoD did publish what was termed its Logistics Strategic Plan, noted to be an equivalent update to the 2008 Logistics Roadmap despite its greatly reduced size and scope. This document again lacked specific performance measurement information and included undefined concepts such as a precise definition of "optimized" supply chain costs. Further, the plan again did not contain any specific information about DoD's current baseline performance, capability gaps, or how much improvement was desired. Finally, the plan did not address what resources (time and money) would required to achieve its stated vision and mission statements.[294]

Before DoD can effectively implement a performance-based framework to evaluate supply-chain improvement efforts, it must commit to specific and measurable factors of evaluation, understand its current baseline performance, and define specific levels of performance improvement that it desires. The failure to include several fundamental components required for accountability within DoD's strategic plans for the past fifteen years highlights what appears to be a general resistance to rigid performance evaluation frameworks on the whole.

---

[294] Government Accountability Office. (2010). DoD's high risk areas: observations on DoD's progress and challenges in strategic planning for supply chain management. Retrieved from http://www.gao.gov/new.items/d10929t.pdf.

Recommendations for Improvement

DoD should undertake an enterprise-wide review of organizational visions and missions to ensure alignment with strategic plans.

A failure to coordinate across organizational stove-pipes has led to unclear visions and missions which are often overlapping and not aligned to enterprise-wide strategic planning efforts. In short, while each leader may have developed his/her own vision for change, organizational mission, and a strategy for achieving that vision, these items may or may not necessarily be directly tied to enterprise-wide strategic planning. MILSCOR is by definition an enterprise-wide framework—it is designed to have participation from all facets of DoD's supply chain. The only way this participation can occur and lead to successful implementation of MILSCOR is if all pertinent organizational visions, missions and strategies are supportive of this effort. To ensure this, senior level DoD officials from USD AT&L should review all requisite DoD Department and agencies organizational visions, missions and strategies to ensure the following:

- Each Department/agency has a clearly defined and measurable vision/mission to be accomplished within a defined period of time—the vision/mission must be understood by all within the organization and measurable to ensure that successful achievement can be clearly identified.

- Visions/missions are discretely owned by a single entity across the enterprise to minimize overlap of roles/responsibilities for achieving vision/mission;

- Alignment of organizational strategies at all levels to ensure enterprise-wide coordination of strategic goals and supporting objectives as well as Department/agency specific goals objectives.

Culture

While leadership sets the vision, mission and strategy of an organization; the culture determines if (and how) these will be executed. Typically organizational cultures (in both the public and private sector) are resistant to change. Key factors to overcome this resistance include a combination of transformational leadership and alignment of incentives to compel significant motivation for behavior change. The following section will address cultural barriers to implementation of MILSCOR at DoD—including this severe resistance to change.

There are fundamental differences between the *transformational* element of culture and the *transactional* element of climate.[295] This distinction is influenced by Burns' discussion of transformational and transactional leadership and expanded to address the elements required for change within an organization.[296] While climate is considered to be those perceptions which individuals possess regarding their individual work unit (e.g. "the way they doing things around there"), culture is much more complex. Culture can be defined as "an enduring set of values and norms that underlie a social system."[297] Within the context of DoD's supply chain, the difference between these two could be described as the difference between the culture of DoD's

---

[295] Burke and Litwin, (1992).
[296] Burns, (1978).
[297] Burke and Litwin, (1992).

supply-chain on the whole vs. the differences that exist between a specific link—such a single office—in the chain.

Military Organizational Culture

Organizational culture is a set of shared values, beliefs and assumptions that prevail across an organization and are validated over time.

Handy introduced an early way to model culture in terms of power structure. This work led to the development of four approaches to culture: power; task; person; and role.[298] Deal and Kennedy's model of organizational culture was focused on external forces. Specifically their model contained four specific cultural types predicated on risk and feedback: the tough-guy, macho culture (high risk/quick feedback); the work-hard/play-hard culture (low risk/quick feedback); the bet-your-company culture (high risk/slow feedback); and the process culture (low risk/slow feedback).[299] Quinn and McGrath's competing values framework (discussed in more detail in the pages to follow) charted organizational culture based on the nature of power and information sharing.[300]

As one begins to drill down to specific applications of culture across varied types of organizations, it becomes evident that the cultural dynamics such as the types of beliefs and assumptions that prevail may be very different

---

[298] Handy, C. (1978). *Gods of management: The changing work of organizations.* Oxford University Press.

[299] Deal, Terrence E. and Allan A. Kennedy. (1982). *Corporate cultures: the rights and rituals of corporate life.* Addison-Wesley Publishing Company.

[300] Quinn, R. E. and M.R. McGrath. (1985). *The transformation of organizational cultures, in organizational culture.* Sage.

depending on the kind of organization being examined. For example, significant differences exist in organizational culture when comparing public sector vs. private sector organizations or military vs. civilian ones. Furthermore, in addition to the discussion of organizational culture, various subcultures frequently emerge in large, bureaucratic organizations. Subcultures within an organization can be developed based on relationships that are developed either within or outside one's own work group. Typical subcultures that are developed include those centered on specific occupations, job skills, or educational background. Likewise it is possible for subcultures to emerge on basic demographic similarities among group members such as age, race or gender.[301]

In the private sector, the underlying cultural dynamics support a performance-based culture because private sector entities are by definition also profit seeking. As a result, performance can easily be measured by evaluating a balance sheet as a means to determine the relative performance of one organization against another. It is the mutual agreement among all involved that profit maximization is the end goal; this goal is quantifiable and can be directly tied to employee compensation—thus driving continuous performance improvement. This has a major impact on the organizational

---

[301] Ouchi, W. (1980). Markets, bureaucracies and clans. *Administrative Science Quarterly* 25,129-141.

Ashforth, B.E., and F. Mael. (1989) Social identity theory and the organization. *Academy of Management Review,* 14 (1), 20-39.

culture of private sector entities on the whole when comparing them to their public sector counterparts.

Alternatively, public sector organizations are traditionally tasked with providing a "public good" which either cannot or should not be provided by the private sector—thus negating the so-called "profit" motive to incentivize performance. A prime example of a traditional public sector function is national defense or environmental protection. This discussion brings rise to a long standing debate over which functions should be considered to be "inherently governmental" and which are suitable for performance by the private sector.[302] Although the Federal Acquisition Regulations (FAR) make an attempt to define what functions should be deemed "inherently governmental," DoD has struggled to effectively implement a universal approach across the enterprise—particularly for those non-inherently governmental functions which have been historically performed by Government.[303]

The size of the organization is an additional difference, which has an impact on organizational culture and prospects for change. As the size of an organization changes, its culture may differ greatly as well, such as the

[302] Gansler, Jacques S., William Lucyshyn and Michael Arendt. (2009). Competition in defense acquisitions. Retrieved from http://acquisitionresearch.net/index.php?option=com_content&task=view&id=350&Itemid=41.

[303] See Federal Acquisition Regulations (FAR). Available at https://www.acquisition.gov/far/html/Subpart%207_5.html.

difference between a small private sector business and the corporate culture of a massive private sector business. Likewise, these types of differences could also be applied in the public sector context; like the differences, which exist between a local government agency and a Federal government one.

In short, addressing the broad subject of culture alone without specifying the particular dynamics of how cultures differ within various types of organizations would be disingenuous. Given this, the culture of a military organization should be highlighted specifically as being a very unique type of culture with a vast collection of sub-cultures. Cameron and Quinn provide a valuable cultural framework that can be used to effectively assess military culture and may be readily applied to the current U.S. Department of Defense's efforts to modernize its supply chain.[304] Cameron and Quinn have developed what is known as the "competing values framework." This framework can be used to highlight the differences that exist in cultures across a wide variety of organizational settings. An application of the competing values framework to assess culture within DoD can be visualized in the figure below.

[304] Cameron, K. S., & Quinn, R. E. (1999). *Diagnosing and changing organizational culture: based on the competing values framework.* Addison-Wesley.

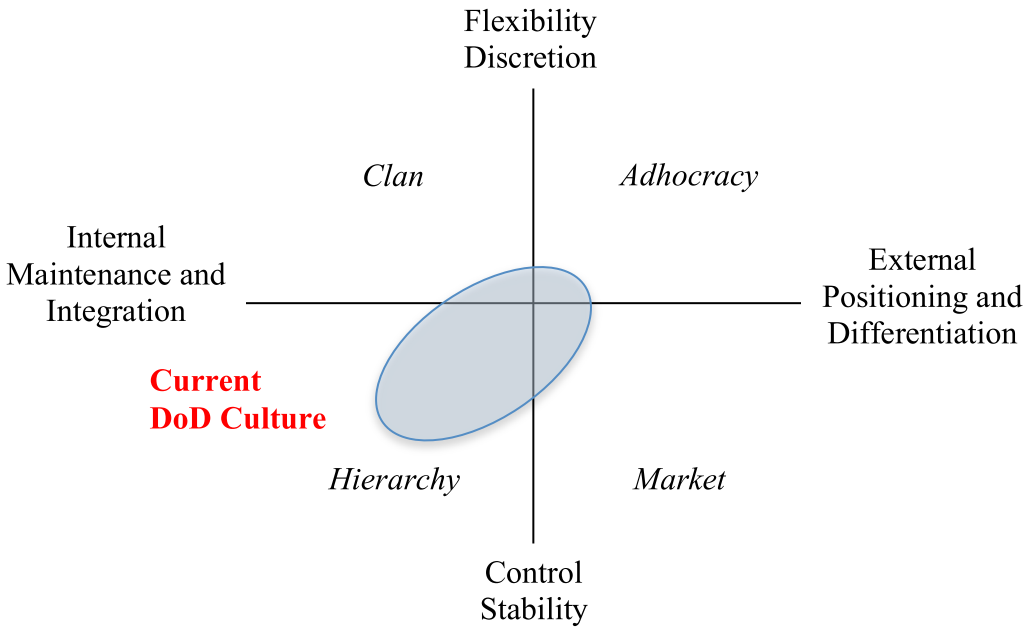


Figure 10. Competing Values Framework Adapted for DoD.[305]

The competing values framework provides four quadrants to describe organizational culture. The framework is presented on an X and Y axis which form the quadrants. The X axis is a continuum that represents the focus of the organizations cultural view—internal or external. The Y axis is a continuum that represents varied levels of the organization's cultural view of rigidity vs. flexibility. The axes create four quadrants, which represent four different competing cultural outlooks: the Clan; Adhocracy; Hierarchy; and the Market.

DoD's current culture is a combination of all four quadrants with a primary concentration in the *hierarchy*. The *hierarchy* can be defined as a traditional

---

[305] Adapted from Gerras, Steven J., Leonard Wong, Charles D. Allen. (2008). Organizational culture: applying a hybrid model to the U.S. Army. Retrieved from http://www.carlisle.army.mil/usawc/dclm/Organizational%20Culture%20Applying%20a%20Hybrid%20Model%20to%20the%20U%20S%20%20Army%20Nov%2008.docx.

chain-of-command based culture with a ridged structure leading upwards toward a central figure of authority. The hierarchy approach is one that is rooted in a deep-seeded adherence to this chain-of-command value system and lends itself to authoritative control and stability. This approach is consistent to Wilson's view of Bureaucracy. For instance, Wilson notes that within the military bureaucracy, this hierarchy is required as a means to allow coordination between the thousands of personnel (soldiers, sailors, airmen, and marines) across the component Services. He argues the reason for this is because it is the only way to ensure that each unit that performs specialized tasks can be managed as part of the larger, overarching battle plan.[306] The only way a plan can be successful is if all involved strictly follow the orders given throughout command hierarchy—this is what allows the Commander in the field to have confidence that his orders will be carried out all the way down to the lowest level in the chain. In short, this approach and outlook is directly tied to the Department's hierarchical structure, one that is deliberately designed to embody a strict chain-of-command so that orders may be given and followed without question. While this type of culture may be highly beneficial in the battlefield environment, the fact that it permeates through DoD's business operations is a tremendous hurdle to achieving significant organizational change.[307] Specifically, this tightly controlled hierarchical approach limits prospects for the flexibility and creativity required to

---

[306] Wilson, James Q. (1991). *Bureaucracy: what government agencies do and why they do it*. Basic Books.
[307] Gerras, et. al. (2008).

encourage innovation across the Department—innovation which could directly contribute to better performance for the warfighter at lower costs.

Alternatively, the *clan* culture can be defined as being the opposite of the *hierarchy*. The *clan* cultural approach has less structure and rigidity and more flexibility than the *hierarchy* to achieve outcomes based on sharing a vision and goals. Expanding on the outcome based focus, the *market* cultural approach is structured and organized similar to the *hierarchy* but is focused on outputs as means to gain positioning in the marketplace.[308]

Finally, the *adhocracy* cultural approach is distinguished by large degrees of independence and flexibility that is driven by a rapidly changing external climate. Firms that fall into this framework would likely be those who are creating highly innovative technology. Mobile phone application development organizations would fall under this category as their culture is highly flexible and supports creativity and independence to respond to market demand. The *adhocracy* cultural approach is effective because it doesn't have any of the traditional rigid barriers, which are fundamental components of the *hierarchy* or *market* cultures.[309]

Cultural Barriers at DoD

Culture within the Department of Defense has long been identified as being a major impediment to undertaking significant organizational reform. DoD has

[308] IBID.
[309] IBID.

recognized the cultural barrier as being an impediment to change, but has failed to adequately overcome a series of cultural obstacles which still remain in effect today. The three most prevalent high-level cultural barriers at DoD include: 1. Parochialism and Distrust; 2. Transactions vs. Outcomes; and; 3. Resistance to Change. Each of these factors will be discussed further in the pages to follow.

Parochialism Contributes to a Culture of Distrust

Parochialism is a direct consequence of the numerous subcultures that exist across the component Services. In this regard, each component military Service (Army, Navy, Air Force and Marine Corps) have their own unique subcultures which exist within the greater DoD organizational culture construct.[310] For example, for the Army and Navy and Marine Corps, their unique subcultures have been developed over a period of some 200 years. Given this history, it makes significant cultural changes very difficult to achieve. Within each component Service or agency, it should be recognized that *additional* subcultures and their influence also emerge when examining specific occupational specialties (such as fighter pilots) or particular organizational units (such as those members of the Special Forces). While these types of distinctions may highlight lower level differences within the organization, because they are all subcultures within the same larger DoD

---

[310] Builder, C.H. (1989). *The masks of war: American military styles in strategy and analysis.* The John Hopkins University Press.

enterprise, all members of these groups should still believe in the core cultural values and norms of the greater Defense establishment.[311]

The extensive parochialism and the existence of numerous subcultures throughout DoD, has directly contributed to a significant across the greater DoD-enterprise. This distrust occurs at multiple levels within and between military, civilian and contractor personnel. Below is an overview of three typical types of distrust experienced within the defense establishment that can have a negative impact on effective supply chain modernization and implementation of a performance-based framework such as MILSCOR. These types of distrust include: 1) Distrust of anyone who isn't in your own work unit; 2) Distrust of anyone who isn't in your component Service; and, 3. Distrust between Government and industry.

Distrust of anyone who isn't in your own work unit: *"Those guys in the 82rd Airborne don't know what they are doing like we do in the 101st".*

The Department of Defense is a massive organization. With millions of military and civilian personnel and a budget of over $700 billion, the sheer size and scale of the DoD makes it difficult for many to believe that any kind of organizational change would be possible. This attitude is reinforced because at the most basic level, there is widespread distrust of anyone who is

---

[311] National Defense University. (UD). Strategic leadership and decision making: organizational culture. Retrieved from http://www.au.af.mil/au/awc/awcgate/ndu/strat-ldr-dm/pt4ch16.html.

not within one's same work unit. This kind of distrust directly impacts information sharing between units and hinders prospects for change.

This type of distrust stems from fear of giving up the control that is the backbone of the Department's hierarchical culture. This same type of reluctance to give up control can be tied to a general cultural resistance to automate many tasks or processes that have traditionally been done by hand—for fear that somehow the software or system may not be accurate or effective. Within the context of the supply-chain this distrust between work units hinders cooperation and horizontal visibility thus making enterprise-wide supply chain performance tracking and assessment through MILSCOR incredibly difficult. More recently this fear has also been exacerbated by concern of cyber security vulnerabilities which might put the supply chain at risk if increased sharing and cooperation were to take place. [312]

Distrust of anyone who isn't in your component Service: *"Those Marines won't get the job done like the Army, we will have to do it ourselves."*

Consistent with the distrust that exists at the work unit level, widespread distrust also exists of anyone who isn't a member of one's component Service. This kind of distrust impacts the organizational structure, policies and processes of the component Services at a higher level than the individual work units. This kind of distrust has emerged because of the competition for scarce resources. Because of the nature of the Congressional budget process, each of

[312] Gansler, Jacques S. (2011).

the military Departments see each other as rivals. Consequently, each component Service works to undermine cooperative efforts at change as a means to "protect their turf." In some cases this type of distrust can result in leadership failing to acknowledge past mistakes or areas that require improvement when other organizations within DoD have made major improvements. This behavior directly contributes to reinforcing the parochialism that dictates each component Service remain independent.[313]

Just like at the work unit level, this type of distrust results in a failure to adequately share information between component Services and has major consequences for creating an effective, transparent, integrated supply chain.[314] As noted by the Defense Business Board in their study on transforming DoD's culture, organizations within DoD have typically had difficulty trusting other organizations to undertake areas of responsibility which they were previously responsible for completing.[315] This sentiment serves as a longstanding impediment to integrating the business functions, which are vital for end-to-end supply chain visibility across the Defense enterprise.[316]

Distrust between Government and Industry: *"Those contractors just want to make as much profit as they can, they don't care about the warfighter."*

---

[313] Ainsley, J. Robert and James Riordan. (1999). DoD and the change paradigm. Retrieved from http://www.dau.mil/pubscats/PubsCats/AR%20Journal/arq99/ainsley.pdf.
[314] Gansler, (2011).
[315] Defense Business Board. A culture of savings. (2011). Retrieved from http://dbb.defense.gov/pdf/FY11-01-A-Culture-of-Savings-Final-Report_B256.pdf.
[316] Gansler and Luby, (2004).

A final category of cultural distrust that exists across the Department is the general distrust of contractors by Government. This feeling creates tension between public and private sector workers as they are often seen as being in competition as opposed to partners with one another. While leadership often communicates its understanding of the importance of the public-private partnership, those middle and lower tier civilian and military personnel do not typically share this belief. For example, Dr. Ashton Carter, Under Secretary of Defense for Acquisition, Technology, and Logistics (AT&L), has noted he does not believe…

> *"…that the defense industry is the enemy; they are our partners. We can't arm and defend the country without private industry."*[317]

Despite this, a recent Defense Acquisition University (DAU) study of industry program managers (PM) revealed that many believe that those mid-career government employees do not see industry as valued partners. Instead, the PM's noted they believed based on their own personal experiences these government employees see industry as uncommitted and only motivated by profit. This cultural belief directly leads to what can be considered a hostile work environment where Government personnel believe that they must manage contractors harshly. This so-called "we versus they" mentality and is a major barrier to successful partnering and likely contributes to increasing contractual disputes between the two parties.[318] For example, in a recent industry survey by Grant Thornton, LLP, it was found that a total of 22 bid

---

[317] Mills, Steve, Fouse, Scott and Allen Green. (2011). Creating and sustaining effective Partnership between government and industry. Retrieved from http://www.acquisitionresearch.net/_beta/files/FY2011/NPS-AM-11-C8P11R03-047.pdf.

[318] IBID.

protests were filed during the past year by companies surveyed, with half of them sustained by the Government Accountability Office (GAO), or the U.S. Court of Federal Claims. The 50 percent sustainment rate is well above historical averages and suggests there is increasing disagreement between industry and government. [319]

This type of distrust may also lead to inefficient business relationships where DoD may choose to do some things which are not “inherently Governmental” functions itself or to simply withhold or limit access to key information which may be vitally important for a contractor to complete their job. The recent federal “in-sourcing” initiative, which has sought to realign some previously outsourced functions that were performed by Industry, has also contributed to this hostility between industry and government. In the same DAU survey noted previously, nearly half of all contractors interviewed stated that the Government had successfully recruited their employees to perform job functions that were in-sourced.

This type of distrust also contributes to a general dismissal of Commercial Off The Shelf (COTS) solutions, which may be readily available from commercial industry.[320] Specifically, as the military often sees itself as being different and having special or unique needs, this perceived norm reinforces the notion that industry technology that was not developed and controlled by the DoD

---

[319] Brodsky, Robert. (2011). Survey shows growing distrust between industry and federal auditors. Retrieved from http://www.govexec.com/dailyfed/0111/011811rb1.htm.

[320] Gansler, (2011).

acquisition process could not possibly meet the specifications required for military operations. Ironically, in many cases, COTS hardware/software solutions capabilities greatly exceed military design and functionality requirements. For example, in the 1990's the U.S. submarine community faced a crisis when it realized its submarine acoustics capabilities had fallen greatly behind. The Navy's Acoustic Rapid Cots Insertion program (ARC-I) was hugely successful because it replaced legacy custom engineered submarine sonar solutions with COTS hardware. The net result of including COTS in this example permitted the Navy to reduce its maintenance burden thus decreasing life cycle costs, and reduce cycle time while allowing for periodic upgrades to hardware and software that were previously not possible. This flexibility allowed the submarine community to keep pace with technological development, which was occurring outside the defense acquisition framework because the rigid, hierarchical structure of the acquisition process precluded the ability for technology to be acquired and inserted quickly enough. [321]

DoD's Culture Supports Transactions Not Outcomes

DoD's culture is one that is typically focused on completion of transactions as opposed to achievement of outcomes. Transactions can be defined as completing specific tasks with a focus solely on task completion and not how/why these tasks might fit into achieving overall mission success. In short,

---

[321] Boudreau, Michael. (2006). Acoustic rapid COTS insertion: A case study in spiral development. Retrieved from http://www.acquisitionresearch.org/_files/FY2006/NPS-PM-06-041.pdf.

a focus on transactions is a focus on the inputs which is consistent with DoD's hierarchical chain-of-command.

One reason that DoD is not focused on outcomes is a lack of urgency for change throughout the chain. In short, for too long the status quo has been acceptable. Recently, however, an emerging financial crisis has spurred what might serve as a much-needed impetus for change as DoD is now at a critical point in its history which will force many to reexamine their cultural identities. Downward budgetary pressures have forced all Government agencies to undertake substantial budget cuts. Since DoD's budget has consistently been the largest among the Departments in the federal Government, it is expected to bear the brunt of the cuts over the coming decade. In its current state however, the organizational culture is not one that will readily support this transition. [322] As noted by Former Defense Secretary Gates, "what had been a culture of endless money, where cost was rarely a consideration, will become a culture of savings and restraint."[323] This new reality is not one that is being easily accepted by military, civilian and contractor personnel supporting DoD.

Tasked by Secretary Gates, the Defense Business Board recently completed a study on how best to transform the Department towards one that embraces a "culture of savings." One of the major barriers, it concluded, was that DoD's

[322] Gansler and Luby, (2004).
[323] Public Broadcasting Service. (2011). Gates aims for a "culture of savings and restraint". Retrieved from http://www.pbs.org/newshour/bb/military/jan-june11/defensecuts1_01-06.html.

command and control structures are not aligned with its end-to-end processes. More specifically, while the Department has undertaken numerous initiatives to procure business solutions designed to improve performance or reduce costs; these solutions are acquired based on the faulty assumption that all stakeholders involved in implementation are aligned around common approaches, scopes, requirements, and expected outcomes. After a series of interviews, the Defense Business Board concluded that more often than not this assumption is simply not the case.[324] In other words, the hierarchical nature and parochial self-interest of the component Services have precluded them to shifting their internal organizational structures to become aligned with a common enterprise-wide set of performance processes to optimize supply chain performance. As a result, typical metrics for performance across DoD's supply chain include:

Process	**DoD**	**Commercial Firms**		
Distribution	21 days average	1 day Motorola	3 days Boeing	2 days CAT
Repair Cycle Time	4-144 days	3 days Compaq	14 days Boeing Electronics	14 days Detroit Diesel
Repair Shop Time	8-35 days Army tank/truck	1 day Compaq	10 days Boeing Electronics	5 days Detroit Diesel
Procurement Admin Lead Time	88 days DLA	4 days Texas Instruments	.5 day Portland General	Minutes Boeing, CAT

Table 25. Typical DoD and Commercial Supply Chain Performance Metrics.[325]

In some cases, DoD has made efforts to shift a focus on performance outcomes, but these practices have not been widely adopted across the

[324] Defense Business Board, (2011).
[325] Gansler, Jacques S. and Lucyshyn, William. (2006). Evaluation of performance based logistics. Retrieved from from http:// acquisitionresearch.org/index.php?option=com_c ontent&task=view&id=100&Itemid=41.

Department. For example, performance-based logistics (PBL) has been widely documented as the preferred approach providing improved performance at lower costs because it attempts to harness the value of market based forces.

Some examples of successful PBL implementations include:

- **Joint Strike Fighter:** 40 Percent reduction in logistics footprint, 60 percent increase in sorties (e.g. improved readiness/availability); designed-in reliability;[326]
- **J-STARS:** 100 percent sortie rate;
- **Auxiliary Power Unit (APU):** Units in repair from 252 to 0; Improved same-day parts shipping by 50 percent; 92 percent of parts delivered within 4 days world-wide.[327]

As noted by Gansler and Lucyshyn, when properly implemented, "PBL shifts the focus of the government's efforts from transactions to identifying performance outcomes and assigning responsibilities. The objective is to develop accountability, instead of using control."[328] This shift from transactions and control to a new focus on outcomes and performance is consistent with the competing values framework introduced above. Expanding on this framework, the diagram below demonstrates the shift in the competing values framework at DoD that is required to effectively implement a

[326] Defense Business Practice Implementation Board. (2003). Recommendations related to the continued implementation of performance-based logistics (PBL) in the Department of Defense. Retrieved from http://dbb.defense.gov/pdf/Supply-Chain-Report.pdf.
[327] IBID.
[328] Gansler, Jacques S. and William Lucyshyn. (2006).

performance-based logistics approach---a shift from a culture rooted in hierarchy, to a market-based one.

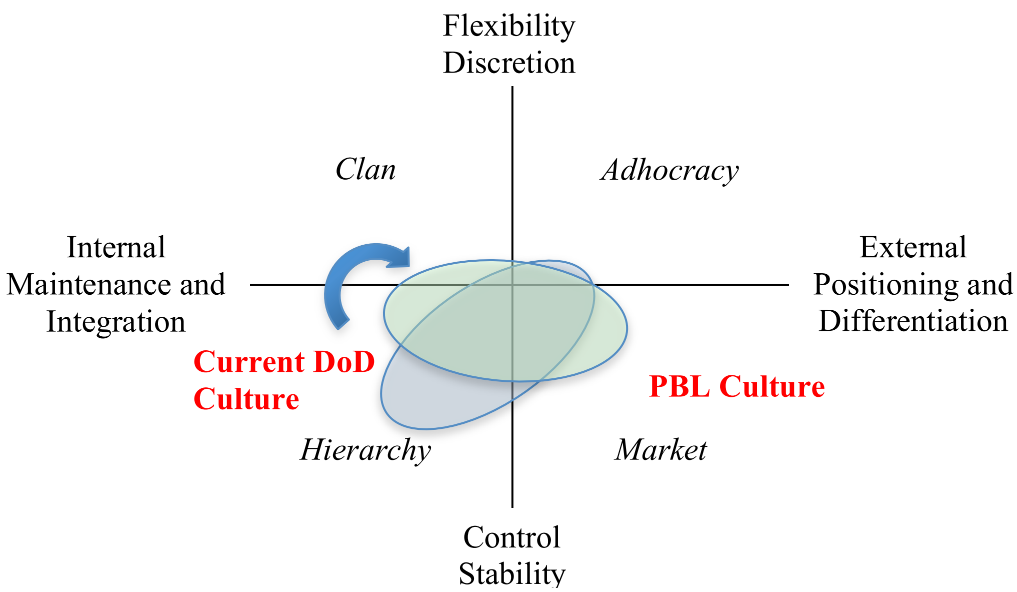


Figure 11. Competing Values Framework Adapted for DoD.[329]

DoD's Culture is Highly Resistant to Change

To successfully accomplish the transition to a culture that is focused on market-based performance, DoD will have to change how it conducts business. Traditionally, the Department has been very resistant to this kind of change—even in cases where these changes might be supremely beneficial. In short, most of this resistance to change can be traced to the military's requirements to maintain consistency, stability and predictability when conducting its operations. DoD's resistance to change can be primarily tied to a systemic belief that innovative changes which are largely the result of technology advancements and/or process improvements will create significant

[329] Gerras, (2008).

organizational disruptions to the status quo.

Resistance to change is hinged upon a fear of the disruption to the roles/responsibilities and the associated identities of those individuals involved. This type of disruptive change is usually systemic in nature. The fear of this disruptive change relates directly back to the concern over circumventing the current chain-of-command, and breaking down the parochialism of the component Services.

As technology has advanced in recent decades, numerous examples highlight resistance to this type of disruptive change. For example, initially, severe resistance to Unmanned Air Vehicles (UAVs) was experienced across the Department. This resistance was predicated on several concerns. First, was a concern about reliability of the aircraft, their accuracy, dependability, and sharing airspace with manned aircraft.[330] This concern harkens back to the previous discussion regarding fear of technology and its reliability. A second concern was the impact of not having an actual pilot to make decisions regarding the use of ordinance on targets and the impact that this might have on the ethics of fighting wars. In short, there was a fear that using UAVs could potentially turn war into a kind of video game, thus minimizing risk to American soldiers and directly increasing the possibility that the United States would feel compelled to participate in armed conflict. This concern is tied to the longstanding cultural belief that wars have been and should be fought by

[330] Bone, Elizabeth and Christopher Bolkcom. (2003). Unmanned aerial vehicles: background and issues for Congress. Retrieved from http://www.fas.org/irp/crs/RL31872.pdf.

people, not machines.[331] A third concern was regarding the long term impact of transitioning to unmanned air systems and the impact this might have on reducing personnel. The Air Force was particularly concerned because of a belief that UAVs would ultimately lead to the marginalization of pilots. This concern was again rooted in an underlying cultural belief that advancements in technology would render traditional pilots obsolete—a difficult reality for an organization such as the Air Force to accept.[332]

As noted by Hoffman, the Air Force's senior and midlevel leadership, who is controlled by the pilot community, could have become a cultural impediment to the UAV "revolution." This type of resistance was similarly experienced during the development of cruise missiles several years ago. [333] However, skyrocketing demand for UAV capabilities to assist the U.S. in conducting anti-terror operations has created a much needed impetuous for change. As a result, DoD now has some 7,000 UAVs, compared with less than 50 just a decade ago. Given their flexibility and relatively low cost of operation, UAVs are now fundamental to the way America wages warfare.[334] New generations of leaders appear to appreciate UAVs for their ability to provide uncompromised performance for only a small fraction of the cost of a single manned aircraft.

---

[331] New York Times. (2011). Predator drones and UAVs. Retrieved from http://topics.nytimes.com/top/reference/timestopics/subjects/u/unmanned_aerial_vehicles/index.html.

[332] Pappalardo, Joe. (2011). The future for UAVs in the Air Force. Retrieved from http://www.popularmechanics.com/technology/aviation/military/4347306.

[333] Hoffman, James C. and Tustin Kamps. (2005). At the crossroads. Retrieved from http://www.airpower.au.af.mil/airchronicles/apj/apj05/spr05/hoffman.html.

[334] New York Times, (2011).

Overcoming this type of resistance to change when critically valuable technology is involved will be crucial for DoD to implement a performance based approach to transforming its supply chain. The next section will provide specific recommendations on how DoD can overcome these barriers to improve supply chain performance by implementing a tool such as MILSCOR.

Recommendations for Improvement

Harness current competition between Services, agencies, and contractors to improve performance at lower costs.

The MILSCOR framework is designed to permit DoD to evaluate it supply chain performance across the enterprise as a means to identify areas where improvements can be made. In a brief survey given to DoD professionals in support of this research, some 75 percent of respondents noted they had experienced competition with other Services/agencies within DoD. To help implement the MILSCOR framework, leadership could harness this competitive spirit that exists in culture drive improvements. Competition in the marketplace is what drives greater performance improvement at lower costs. In this case, competition between the Services for resources to improve programs could be one way to incentivize implementation of the framework. In short, the MILSCOR framework could be implemented on a pilot basis. Targeted programs, depots, or commands could be identified to participate in the pilot, and those who achieve the greatest improvements in supply chain performance at reduced costs as a result of implementing the framework could receive additional resources and Department-wide recognition. Others who failed to participate could be openly identified. Such an effort could drive additional competition between the Services for additional resources and could motivate widespread participation.

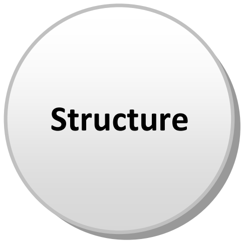
Provide workforce appropriate incentives to unhinge cultural resistance.

MILSCOR implementation will require overcoming vast cultural resistance to change that exists across the Defense enterprise. This resistance exists among military, civilian and contractor personnel. The only effective way to work to overcome such resistance is to create a set of incentives which will "motivate the elephant" to abandon hold behaviors and embrace new ones—to help shift their organization's identity from one which focuses on transactions to one that focuses on outcomes. This can be accomplished through a combination of financial, intrinsic or emotional incentives. First, individuals as well as public/private sector organizations need to feel that they will be rewarded financially for saving DoD money. For individuals, bonuses for identifying cost savings opportunities, waste, or possibilities for improved performance should become commonplace. Intrinsic and emotional incentives such as awards ceremonies, promotions, recognition, etc. should also become the norm for those who go out of their way to ensure the government is getting the best value for the taxpayer and warfighter. In short, an individual has to feel that the endeavor is worth the effort—and proper incentives can certainly accomplish this. For industry, gain-sharing improvements should become standard contract requirements. For example, if the contractor identifies a means to save money, a portion of this savings is awarded back to the contractor. Without these types of incentives, the promise of enterprise-wide performance improvement that might occur as a result of implementing the MILSCOR framework will likely be lost.

Chapter 5: Transactional Elements for Organizational Change at DoD

There are significant differences between those elements of organizational change that are transformational in nature and transactional. The previous section addressed those key underlying transformational elements that are considered to be the foundation of any change effort. All change efforts begin first and foremost with leadership who sets the vision, mission and strategy, and works to change the organization's culture. The following section addresses those transactional elements that are recognized to supplement and support the initial transformational changes required for successful organizational transformation. It should be noted that all of these transactional elements are directly influenced by leadership who must recognize the need to change and drive the change effort to completion. Transactional elements to be addressed in this section include: organizational structure; management practices; systems (policies and procedures); work unit climate; task and individual skills; and motivation.

Structure



Organizational structure is the first of the transactional elements to be examined in this section. In simple terms, organizational structure can be defined as the architecture or arrangement of people and processes within an organization. The structure of an organization has a direct impact on its organizational climate,[335] management practices,[336] systems (policies and processes),[337] and execution of task requirements.[338] Further, the structure of an organization contributes directly to the execution of any organizational change effort that may be undertaken as the result of a MILSCOR implementation.

Organizational Structure in the Literature

The literature contains a wide-array of information on theories of organizational structure. The structure of an organization can generally be defined as the pattern of relationships between roles in an organization and its component parts. More specifically, structure is the arrangement of functions and people into specific areas and levels of responsibility, decision-making

---

[335] Joyce, W.F., & Slocum, J.W. (1984). Collective climate: agreement as a basis for defining aggregate climates in organizations. *Academy of Management Journal,* 27, 721-742.
Schneider, B., and Snyder, R.A. (1975). Some relationships between job satisfaction and organizational climate. *Journal of Applied Psychology*, 60, 318-328.
[336] Lawrence, P.R., & Lorsch, J.W. (1969). *Organization and environment: managing differentiation and integration.* Harvard Business School.
[337] Ouchi, W.G. (1977). The relationship between organizational structure and organizational control. *Administrative Science Quarterly*, 22, 95-113.
[338] Galbraith, J.R. (1973). *Designing complex organizations*. Addison-Wesley.
Galbraith, J.R. (1977). *Organization Design*. Addison-Wesley.

authority, communication, and, relationships to assure effective accomplishment of the organization's vision and mission through the execution of a strategy.[339] The purpose of an organization's structure is to enable leadership and management to distribute work responsibilities to achieve the organization's mission and fulfill its strategy.[340]

Thompson defined structure as the means by which an organization can set the limits or boundaries to enable highly efficient performance. Thus an organization's structure serves to define responsibilities and control over resources to manage organizational output.[341] Alternatively, Katz and Kahn define structure as "an interrelated set of events which return to complete and renew a cycle of activities."[342] Jackson and Morgan define structure "as the relatively enduring allocation of work roles and administrative mechanisms that creates a pattern of interrelated work activities and allows the organization to conduct, coordinate, and control its work activities."[343] From the market perspective, industrial organizational theory dictates that the structure of an industry dictates its conduct which in-turn dictates performance. This approach can also be directly applied to organizational theory.[344] More specifically, how an entity is organized internally (e.g. its

---

[339] Burke and Litwin, (1992).
[340] Mullins, L. J. (1993). *Management and organizational behavior.* Pitman Publishing.
Mabey, C. et. Al. (2001). *Organizational structuring and restructuring* in Salaman, G. ed. *Understanding business organizations.* Routledge.
[341] Thompson J.D., (1966). *Organization in action.* McGraw-Hill.
[342] Katz D. and Kahn R.L. (1978). *The social psychology of organizing,* Wiley.
[343] Jackson J.H. and Morgan C.P. (1982). *Organization theory,* Prentice-Hall.
[344] Tirole, Jean. (1988). *The theory of industrial organization.* MIT Press.

structure) can directly influence how it conducts its mission and executes its strategy both of which directly influence its overall performance.

The current literature on organizational structure and its impact on performance provides an array of perspectives on the subject. In the Department of Defense, the organizational structure is hierarchical in nature; the purpose of this is to reinforce the rigid military chain-of-command. One important point that must be addressed when discussing rigid, hierarchical organizational structure is the notion that there is a difference between "control" and "structure" and the fact that organizational control is not impacted by structure alone.[345] Organizations can have formal or informal structures, and, in many cases there is a distinction between the organizations formal structure and how actual daily activities are conducted (e.g. the organizational climate).[346] Centralization within an organization's structure refers to the degree that decision-making is made at higher levels throughout the organization—up the chain of command. Decentralization refers to amount of distributed decision-making authority that exists throughout the organization.

Organizational structure can also be a tool used to help change the culture and climate of an entity to achieve its mission; for example, during the reorganization of the Federal Emergency Management Agency (FEMA) under

[345] Ouchi, W.G., (1977).
[346] Meyer, J.W. and Rowan, B. (1977). Institutionalized organizations: formal structure as myth and ceremony. *The American Journal of Sociology*, 83 (2), 340-363.

the Clinton Administration. A key change made during this process was a reorganization of the agency to resolve a conflict between a focus on national preparedness and State and local programs. The structural change occurred when the state and local program directorate was replaced with the mitigation and response directorates. This was further supported by a change in employee roles, where every employee, regardless of job function, was assigned a specific role when a response or recovery operation was being executed.[347] The result was a shift from an organizational structure that supported a conflict between two directorates to one that engaged all personnel to support the recovery and response mission whenever the situation necessitated it.

Organizational structure can also have a direct impact on strategic decision-making by leadership and ultimately prospects for innovation.[348] Organizational structure also directly influences the ability to conduct basic administration functions such as cost accounting. More specifically, the structure of an organization may positively (or negatively) influence its capacity to implement various forms of activity management, specifically; those related to activity based costing (ABC).[349] Structure also directly

[347] Daniels, R. Steven and Carolyn L. Clark-Daniels. (2000). Transforming government: The renewal and revitalization of the Federal Emergency Management Agency. Retrieved from http://www.fema.gov/pdf/library/danielsreport.pdf.

[348] Damanpour, F. and S. Gopalakrishnan. (1998). Theories of organizational structure and innovation adoption: the role of environmental change. *Journal of Engineering and Technology Management*, 15 (1), 1-24.

[349] Gosselin, Maurice. (1998). The effect of strategy and organizational structure on the adoption and implementation of activity-based costing. *Accounting, Organizations and Society*. 22 (2), 105-122.

impacts an organization's use of information technology,[350] employee morale,[351] as well as perceptions of organizational climate.[352]

In the public sector context, a bureaucratic structure is the most well known from the work of Woodrow Wilson, Max Weber and James Q Wilson. Per Woodrow Wilson, a bureaucracy is an organization of non-elected officials of a government or organization that implements the rules, laws, and functions of their institution,[353] Weber described the foundations for effective bureaucracy which included: a formal hierarchical structure, management by rules, organizational by functional specialty, an "up-focused" or "in-focused" mission and purposely impersonal employment based on technical qualifications.[354] In Wilson's work, he notes the major differences between bureaucracies and private sector firms as noted below:

> Accountability. Bureaucracies are responsible for achieving multiple goals for multiple constituencies (i.e. healthcare for poor citizens vs. healthcare for older citizens). Private companies tend only to have cost-minimizing strategies for the purposes of achieving profit-maximization.
>
> Equity. Government agencies are responsible for achieving a wide variety of goals, some of which may focus on mandated social justice issues. A

---

[350] Raymond, L. et. Al. (1995). Matching information technology and organizational structure: An empirical study with implications for performance. *European Journal of Information Systems.* 4, 3-16.

[351] Worthy, J. (1950). Organizational structure and employee morale. *American Sociological Review*. 15 (2), 169-179.

[352] Payne, R. and Mansfield, R. (1973). Relationships of perceptions of organizational climate to organizational structure, context, and hierarchical position. *Administrative Science Quarterly*. 18, (4), 515-526.

Lawler III, E. et. al. (1974). Organizational climate: relationship to organizational structure, process and performance. *Organizational Behavior and Human Performance*, 11 (1), 139-155.

[353] Wilson, W. (1887). The study of administration. *Political Science Quarterly*, 2 (2), 197-222.

[354] Weber, Max. (1946). *Bureaucracy*. Oxford University Press.

clear example would be where the government has preferences for hiring veterans or awarding contracts to minority owned businesses regardless of which private sector firm may provide the best value for money or highest level of performance.

Fiscal Integrity. The government has strict guidelines in place to maintain fiscal integrity of tax-payer money. Because of these rules for budgeting, bids for public projects are subject to more intense scrutiny and reduced flexibility than for private sector projects. Additionally, agencies are not free to move money from one program to another without going through reprogramming of funds by Congress.

Efficiency. Government bureaucracies are prevented from keeping any savings due to increasing efficiency or lowering costs, therefore it has no incentive to finish projects ahead of schedule or under budget unlike those firms in the private sector.[355]

Beyond, the traditional bureaucratic organizational structure that widely exists across the public sector, the literature is full of many different types of organizational structures. The table below provides a brief overview of several common organizational structures that can be applied to both pubic and private entities.

[355] Wilson, James Q., (1989).

Functional Structure	A functional structure exists where the organization is designed to support a practical division of tasks across the enterprise. For example, this structure is present when a specialized group, such as lawyers, may only work within an organization's legal department.[356]
Divisional Structure	A divisional structure (also defined as a product structure) is where all necessary resources are contained within a single entity to complete a given function. These divisions may be aligned based on different types of products (e.g. desktops vs. laptops) or even geographic (North America vs. South America).[357]
Matrix Structure	A matrix structure is hybrid organizational structure that divides the work environment by both job functions and products. In this case, each product would have its own sales, customer service, development, production, support, etc.
Team Structure	A team structure is one that capitalizes on groups of people organized either horizontally or vertically within an organization who have a special set of skills required to complete a given project. The team structure typically emerges within the confines of an organization with a bureaucratic structure.[358] For example, at DoD this might be what is called an Integrated Product Team (IPT).
Network Structure	A networked structure capitalizes on information technology and globalization to leverage distributed resources around the world. These resources may or may not be directly controlled by the organization. Apple, for example, doesn't actually own any resources for production, but rather serves the engineering, development, and support role for its products and oversees the activities of a range of partners around the world who supply components and complete final assembly. By following this networked construct, Apple has been able to achieve to greater efficiencies, increased flexibility and lower costs.[359][360]
Virtual Structure	Virtual organizational structures are becoming increasingly popular as a direct offshoot of the internet. These organizations have no defined boundaries as they do not exist in physical space but rather only in a virtual environment created through a network of relationships managed over the internet. Amazon.com is a prime example of a virtual marketplace with no formal organizational structure. Instead, Amazon uses a website for buyers and sellers of goods to conduct transactions directly, saving major resources and overhead in its operations.[361]

Table 26. Types of Organizational Structures.

[356] Robert Duncan, R. (1979). What is the right organization structure? Decision tree analysis provides the answer. *Organizational Dynamics*, Winter.
[357] IBID.
[358] Robbins, S.F., and Judge, T.A. (2007). *Organizational behaviour*. Pearson Education Inc.
[359] Sturgeon, T. J. (2002). Modular Production Networks: A New American Model of Industrial Organization. *Industrial and Corporate Change*. 11 (3), 451-496.
[360] Ashkenas, R. Et. Al. (1998). *The Boundaryless Organization: Breaking the Chains of Organizational Structure.* Prentice Hall.
[361] Werther, W. (1999). Structure-driven strategy and virtual organization design. *Business Horizons*, 42 (2), 13-18.

Structural Barriers at DoD

As described in the table above, there are numerous types of organizational structures. DoD's organizational structure possesses elements of several of these different types but it primarily uses a matrix structure where each Department and/or Agency has stove-piped, duplicative functional responsibilities that are not aligned across the greater enterprise. Consequently, DoD's organizational structure has created barriers to implementing an enterprise-wide performance-based framework rooted such as MILSCOR. These barriers include a stove-piped organizational structure for systems acquisition and support and a lack of internal and external visibility across the enterprise.

Stove-Piped Organizational Structure for Systems Acquisition and Support

The life cycle for most of DoD's major weapons systems are several decades from initiation of the requirements process through system disposal (Acquisition Milestones Pre-A to Post-C). At the extreme end, long-term capital investments in systems such as aircraft carriers are made with the knowledge that these systems will remain active in the fleet for some forty or fifty years after they have been produced (*post milestone C only*).

DoD acquires capability through a requirements process known as the Joint Capability Development System (JCIDS). This process was introduced under the direction of Defense Secretary Rumsfeld in a March 2002 memo that required a study to evaluate alternative processes from the current system to evaluate shortfalls in the DoD requirements generation process, which were recognized by the Joint Chiefs of Staff.[362]

The major driver for the creation of this process was the need to better plan new systems development within the context of emergent combined Service requirements and existing capabilities. The purpose of this process is to reduce prospects of simultaneous development of similar systems across component agencies and Services that often existed under the previous system. However, as related to MILSCOR implementation, one area that is often not given enough attention during this process is the prospect for having joint operations and maintenance for these systems once fielded.

When America's current arsenal was under development, platforms were often designed without long-term planning for streamlined support, cross-service efficiencies, improved performance, and low sustainment costs. Furthermore, DoD doesn't have a centralized "owner" for the supply chain. For example, despite the existence of a Defense Logistics Agency (DLA) which was created by Robert McNamara in the early 1960s to provide centralized logistics support across the DoD. By consolidating eight single-manager agencies be consolidated into one. However, the agency only provides this support for commodities not for weapons spares because of

[362] Department of Defense. (2012). Joint capabilities integration and development system (JCIDS) manual. Retrieved from https://acc.dau.mil/CommunityBrowser.aspx?id=267116&lang=en-US.

resistance to this type of centralization by the Services.[363] As a result, the military acquisition, logistics and maintenance functions for weapons systems are organized by individual Air Force, Army, Marine and Navy components.

Further, the organizational structure further subdivides these entities by various commands within each Service (Army Material Command, Air Force Material Command, etc.) ***and*** by weapons systems (planes for example are divided between C-130's, C-5's, C-17's, etc.) within each command. As a result, the Department has created a highly stove-piped and disintegrated organizational structure. This structure tends to incentivize the success of the "parts" at the expense of the "whole", ultimately resulting in sub-optimization for support and maintenance functions across the greater enterprise. For example, despite some similarities between the F-35 and F-22 aircraft (both developed by Lockheed Martin), support for each of the weapons systems will be conducted completely independently without consideration of sharing the logistics or maintenance burden.[364] Ultimately organizations must be willing to cross traditional boundaries to share information, identify redundancy and waste and collaborate to implement solutions—without this, MILSCOR implementation will likely be unsuccessful.

[363] Defense Logistics Agency. (UD). History of the Defense Logistics Agency. Retrieved from http://www.dla.mil/history/Pages/history.aspx.
[364] Fogarty, K. (2006). Lockheed Martin revs up supply chain ahead of F-35 fighter. Retrieved fromhttp://www.eweek.com/c/a/IT-Management/Lockheed-Martin-Revs-Up-Supply-Chain-Ahead-of-F35-Fighter/.

An example where there is great potential for improving efficiency by transitioning from a matrixed organizational structure to a networked one can be found in Unmanned Aerial Vehicles (UAVs). For UAVs, there is significant overlap in development, production and support across all the military Services, yet because the technology is very new and much of it still in development, the systems are relatively early in their life cycle allowing for the opportunity for change. In many cases, these systems were developed and fielded after 9/11/2001 on a rapid acquisition basis with sustainment becoming a secondary consideration behind operational capabilities.[365] One example of a shift away from this stove-piped organizational structure exists between a pair of independently developed, produced and supported UAV's from the Navy and Air Force. Despite their initial independent acquisitions, the Navy's Broad Area Maritime Surveillance (BAMS) program office and the Air Force's Global Hawk program office have recently begun working together for the purposes of improving supply chain efficiency and performance. The two program offices signed a Memorandum of Understanding (MOU) in June 2010 to "Identify and incorporate every appropriate synergy in basing, maintenance, aircraft Command and Control (C2), training, logistics, and data requirements for Processing, Exploitation, and Dissemination (PED) functions."[366] This is a step in the right direction

---

[365] Stankowski, John. (2011). Unmanned aircraft systems - maintenance support challenges. Retrieved from http://www.sae.org/events/dod/presentations/2011/Unmanned_Aircraft_Systems_Maintenance_Support_Challenges.pdf.

[366] Naylor, Wes. (2011). BAMS UAS & Global Hawk joint efficiencies. Retrieved from http://www.sae.org/events/dod/presentations/2011/BAMS_UAS_AND_Global_Hawk.pdf.

that should be emulated across DoD. Enterprise-wide implementation of a framework such as MILSCOR is likely to identify additional opportunities for eliminating duplicative effort and streamline operations if program offices are willing to reach beyond traditional barriers to collaborate.

Lack of Internal and External Visibility

The lack of structural alignment during systems acquisition and sustainment is a direct impediment to sharing data and information across the enterprise. The lack of transparency in data exists both inside and outside Defense Department boundaries. World class supply chains, such as those operated by Wal-Mart or Fed-Ex, are highly successful because recognize the importance of gathering and sharing data in real-time across their supply chains. When one examines the Fed Ex corporate web page, for example, they find that the company describes itself as "the premier provider of shipping and information services worldwide." The importance of this statement is not that they have identified themselves as a shipping company, but rather that they have recognized that they are also in the information business as well—it's the sharing of this information that is a key driver of Fed Ex's business success.[367]

DoD's failure to share information across the enterprise creates two impediments to effective implementation of MILSCOR. First, there is a general lack of transparency *between* DoD entities with respect to sharing of

[367] FedEx. (2012). FedEx history. Retrieved from http://about.van.fedex.com/our_company/company_information/fedex_history.

data in real-time. Secondly, as a result of this, there is the absence of an enterprise-wide understanding as to "whom provides what" including the composition of DoD's supplier base and what each of these suppliers provide.

To the first point, DoD departments and agencies do not openly share data across internal boundaries (*within* and *between* Services) or with vendors in the same way it is done at Wal-Mart or Fed-Ex. The major DoD policy that promotes data sharing is DoD Directive 8320.2, "Information Sharing in a Net-Centric Department of Defense."[368] DoD Directive 8320.2 states, "It is DoD policy that: …4.3. Data assets shall be made accessible by making data available in shared spaces. All data assets shall be accessible to all users in the Department of Defense except where limited by law, policy, or security classification."[369]

Despite this requirement, there is incredible flexibility in how this policy is interpreted across the military Services, particularly with respect to limitations "by law, policy, or security classification." This policy is typically interpreted to support a cultural resistance to sharing data due to a general distrust of other organizations/agencies within DoD as well as contractors.[370] Across the defense enterprise, this tendency makes it very difficult for any enterprise-

[368] Department of Defense. (2007). Department of Defense Directive 8320.02: Data sharing in a net-centric Department of Defense. Retrieved from http://www.dtic.mil/whs/directives/corres/pdf/832002p.pdf.
[369] IBID.
[370] Shaw, P. (2008). Achieving DoD's net centric vision of information sharing while overcoming cultural biases to control information. Retrieved from http://www.hsdl.org/?view&did=22019.

wide DoD supply chain improvement effort to be successful. With respect to MILSCOR, sharing of data across the enterprise is vital; without it, any SCOR-based framework simply cannot be implemented.

The second problem is the lack of a comprehensive picture illustrating which private sector contractors make up DoD's Defense Industrial Base (DIB), what goods and/or services they provide, and how much. The defense industrial base can be defined as:

> *An extremely diverse set of companies that both provide products and services, directly and indirectly, to national security agencies, including the military. The DIB includes companies of all shapes and sizes resourced from around the globe. Some companies deal directly with the federal government, while the vast majority act as suppliers, subcontractors, and service-providers in a value chain that leads to those prime contractors.*[371]

As of the date of this publication, the DoD's Deputy Assistant Secretary of Defense for Manufacturing and Industrial Base Policy is undertaking an effort to create a high-level mapping of DoD's industrial base. The impetus for this effort is to help DoD planners better understand the composition of their weapons systems suppliers to ensure the defense industrial base has sufficient resources to meet DoD demand. However the mapping effort is only focused on production capabilities to help planners ensure the defense industry is stable. The effort, for example, is not designed to provide information on which suppliers provide the best value, most responsiveness, highest quality, etc. compared to their peers. Or which suppliers might be providing similar

[371] Lambert, B. (2011). Testimony of Brett B. Lambert on Nov. 1, 2011 before the United States House Committee on Armed Services, Defense Business Panel. Retrieved from http://armedservices.house.gov/index.cfm/files/serve?File_id=efff14a7-4cf8-4751-86b7-ed0330c71271.

products across DoD programs that could potentially be consolidated to allow for economies of scale for DoD purchases. Instead, as noted by Mr. Lambert, the exercise is intended to provide individual assessments of the health of the industrial base, and provide guidance for the next chapter of mergers, acquisitions and consolidation across the DIB.[372]

Without visibility within DoD organizations, between DoD organizations, as well as between DoD and the private sector, maximizing supply chain efficiencies and reducing costs through a process improvement framework such as MILSCOR would be incredibly difficult. While the DIB mapping effort is a move in the right direction, the scope of the exercise could be expanded significantly.

Lack of Focus on Public-Private Partnerships

DoD has also typically failed to take full advantage of the benefits afforded by public-private partnerships (PPPs). In part, this failure is due to severe resistance by existing government employees to pursue such arrangements for fear that it will cost them jobs—an argument typical perpetuated by Government unions such as the American Federation of Government Employees (AFL-CIO).[373]

---

[372] Serbu, Jared. (2011). DoD to create map of defense industry. Retrieved from http://www.federalnewsradio.com/?nid=394&sid=2616710.

[373] American Federation of Government Employees. (2011). DoD's efficiency initiative. Retrieved from http://www.afge.org/Index.cfm/2011_10_13_AFGEFactSheetEfficiencyInitiative.pdf?Fuse=document&documentID=2943.

PPPs could be implemented at the first tier level (e.g. with primes), or directly with suppliers. These arrangements can help increase competition in the marketplace by permitting government to compete with industry to provide support. For example, one potential opportunity for increased competition may exist where a military depot could compete against industry for a share of the support work for a given system as exemplified in the Offutt Air Force Base case, where competitive sourcing achieved a 58 percent decrease in manpower costs while having Government employees beat out the private sector for the work.[374] Such a competition could occur on a regular basis to help drive improved performance at lower costs across DoD's supply chain. Furthermore, these arrangements allow additional opportunities for collaboration which may not currently exist in the current defense environment such as with international suppliers or in the commercial marketplace. These additional opportunities become available because the PPP is a highly flexible arrangement allowing for minimized risk.

A recent Aerospace Industries Association (AIA) report estimates that implementing performance-based logistics through a series of expanded public-private partnerships could save DoD anywhere from $25 billion to $30 billion per year.[375] Cost savings from such an arrangement comes in part due to the significantly reduced costs for executing non-inherently governmental

[374] Gansler, J. and Lucyshyn, W., (2004).
[375] Eaglen, M. and Pollak, J. (2011). How to save money, reform processes, and increase efficiency in the Defense Department. Retrieved from http://www.heritage.org/research/reports/2011/01/how-to-save-money-reform-processes-and-increase-efficiency-in-the-defense-department.

tasks functions in the private sector. For example, a Cato Institute study using federal government data concluded that in 2009, the average federal civilian wage was over $30,000 greater than their private sector counterparts.[376]

At the extremes, life cycle support can be viewed as an all or nothing prospect for a program with DoD having to provide all maintenance and support organically, or by contracting it out to the private sector. While both approaches have benefits and drawbacks, most often, the best option is a public-private partnership that allows for a balance between work done in-house and work contracted out. This approach provides an opportunity to maximize the benefits of each individual approach while minimizing their risks. DoD Directive 5000.01, The Defense Acquisition System, requires the use of public-private partnerships in weapons system sustainment to leverage the best of public and private sector capabilities.[377]

PPPs are most frequently discussed within the context of depot-level maintenance operations for weapons systems. These arrangements have also been incredibly successful for vendor-managed inventory of DoD spare parts.[378] For example, DLA was able to achieve a 98 percent reduction in

[376] Goure, David. (2011). In-sourcing and why government costs so much. Retrieved from http://www.nationaldefensemagazine.org/archive/2011/March/Pages/FederalAgencyInsourcingWhyGovernmentCostsSoMuch.aspx.
[377] Department of Defense. (2011) Directive 5000.01: The defense acquisition system. Retrieved from http://www.dtic.mil/whs/directives/corres/pdf/500001p.pdf.
[378] Gansler, J. and Lucyshyn, W., (2004).

consumables for the C-130 through a vendor-managed inventory arrangement.[379]

According to DoD Instruction 4151.21, Public-Private Partnerships for Depot-Level Maintenance:

> *A public-private partnership for depot-level maintenance under 10 U.S.C. §2474 is a cooperative arrangement between an organic depot-level maintenance activity and one or more private sector entities to perform DoD or Defense-related work and/or to utilize DoD depot facilities and equipment. Other government organizations, such as program offices, inventory control points, and materiel/systems/logistics commands, may be parties to such agreements.*[380]

The figure below provides a visual representation of both extremes for depot level maintenance (organic and contractor only) as well as the potential range of PPP options available for a program.

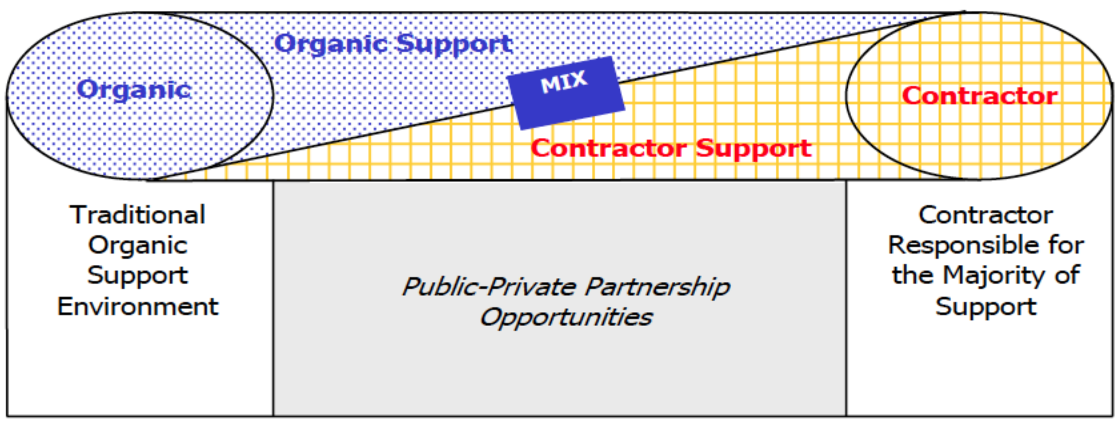


Figure 12. Support Options for Government and Contractors.[381]

Title 10 requirements dictate that not more than 50 percent of the funds made available for depot-level maintenance and repair can be used to contract for

---

[379] IBID.
[380] Department of Defense. (2007). Department of Defense Instruction 4151.21: public-private partnerships for depot-level maintenance. Retrieved from http://www.dtic.mil/whs/directives/corres/pdf/415121p.pdf.
[381] Gansler, Jacques S. and Lucyshyn, William, (2006).

performance by non-federal government personnel.[382] This effectively limits the amount of work that may be awarded to a private sector firm providing depot support, regardless of the potential impact on improving performance and/or reducing costs. Section 2469 of Title 10, requires a competition between DoD depot activities, or the current depot and a contractor, prior to a maintenance or repair workload valued at $3 million or greater is changed from Government to contractor performance.[383]

Interestingly, GAO noted in 2008 that despite strict reporting requirements on DoD's use of public-private partnerships to ensure compliance with statutory requirements, the Department has not established goals or metrics to assess the effectiveness of these public/private arrangements or lack thereof. For example, DoD did not use the data they collected and reported to evaluate the degree to which the partnerships are meeting the stated goals of more responsive product support, better facility utilization, reduced cost of ownership, and more efficient business processes. [384] Undertaking such an effort would be key for successful implementation of a MILSCOR Without this type of analysis, it would be impossible to assess where efficiencies may

---

[382] 10 USC 2466. (2012). Limitations on the performance of depot-level maintenance of materiel. Retrieved from http://www.law.cornell.edu/uscode/usc_sec_10_00002466----000-.html.

[383] 10 USC 2469. (2012). Contracts to perform workloads previously performed by depot-level activities of the Department of Defense: requirement of competition. Retrieved from http://www.law.cornell.edu/uscode/usc_sec_10_00002469----000-.html.

[384] Government Accountability Office. (2008). Depot maintenance: DoD's report to Congress on its public-private partnerships at its centers of industrial and technical excellence (CITEs) is not complete and additional information would be useful. Retrieved from http://gao.gov/assets/100/95570.pdf.

lie and how public-private partnerships could be expanded to achieve greater performance and lower costs.

Recommendations for Improvement

DoD should shift to a networked organizational structure.

DoD's current matrixed organizational structure is not supportive of data sharing and collaboration that is required for implementation of the MILSCOR framework. Furthermore, the structure reinforces competition between the Services and stove-pipes, both of which contribute to decreased communication. Advancements in information technology such as social networking can be used as to help DoD transform its current rigid organizational structure to a networked one. Such a transformation would permit a capabilities-based approach to supply chain modernization (vice a specific military Service/agency approach). In short, this approach would allow DoD to pinpoint accountability for specific supply chain functions and capabilities across the enterprise (regardless of Service/agency affiliation) and identify failure points that could be targets for improvement initiatives that come out of the MILSCOR framework. As it currently stands, a lack of transparency and data sharing across the enterprise makes understanding of the "as-is" state incredibly difficult for implementation of the MILSCOR framework.

Life Cycle Support planning should include assessment of collaborative sustainment planning for "like-systems".

The MILSCOR framework is likely to identify many opportunities to streamline support and eliminate redundancy in DoD's supply chain. To successfully implement the framework, DoD must evaluate all platforms to identify potential opportunities for collaborative sustainment models for those "like-systems". "Like-systems" may be defined as those that contain the same types of parts, those produced by the same manufacturer, or those that perform similar functions. Once these "like-systems" are identified MILSCOR may be used to help streamline and consolidate these previously independent supply chains. This cannot occur however, until DoD conducts a through assessment of the "as-is" state for similar systems across the enterprise. This assessment should be completed without respect for "who owns what" but rather for where the greatest opportunities to eliminate redundancy in effort may lie.

DoD should work to standardize and consolidate support functions to increase data sharing

Current rules for data sharing across the defense enterprise provide exceptions that are left to individual interpretation. Many across DoD interpret these rules to their benefit—thereby not sharing information as required. Furthermore, a general aversion to risk tends to contribute to a belief that the costs of data sharing across DoD do more harm than good. For the MILSCOR framework to be successfully implemented data must be readily available across the defense enterprise. Further, this data must be able to be accessed by all military Services and agencies involved in the supply chain as well as those contractors who support a given system. To overcome the current data sharing barrier, DoD should work to help standardize support functions across the services through consolidation of program management and contracting functions. Such consolidation would permit increased data sharing by default because it would eliminate the current structural barriers that prohibit information getting from one stove-pipe to another.

<u>*Systems*</u>

While organizational structure provides a roadmap for dividing an organization to perform work, systems consist of the various policies and processes that provide instructions on how the work within the organization should be conducted. A SCOR-based framework such as MILSCOR is a process mapping and improvement tool. It allows users to evaluate their current operational processes to identify areas that may require improvement. In this sense, MILSCOR could be defined as an "entry point" for shaping the path that is required to achieve DoD supply chain transformation.

Systems (Policies and Processes) in the Literature

Systems theory can be used as a novel approach for dissecting the internal workings of a complex organization. Within the context of organizational change theory, systems are standardized policies and mechanisms that facilitate work, primarily manifested in the organization's reward systems, management information systems (MIS), and in such control systems as performance appraisal, goal and budget development, and human resource allocation.[385] More generally, a system can be defined as a group of elements which are in exchange with one another and are bounded. An element can be considered nearly anything that performs a function and a boundary is

---

[385] Burke and Litwin, (1992).

anything that separates the elements of the system from their environment.[386] General Systems Theory (GST) was originally introduced by Ludwig von Bertalanffy and was directly influenced by prior work in the field of Tectology by Bogdanov.[387] Operations research during World War II provided an impetus to the field of systems theory as a direct result of expanding logistics and supply chain requirements to meet warfighting needs.[388] The topic of systems theory can be incredibly overwhelming as it can pertain to a range of topics including biology, economics, sociology and engineering. Despite this, a few key contributions to the subject of systems theory as related organizational change research are applicable to the discussion in this research. One key distinction that must be made when examining systems theory as applied to organizations is the difference between "organization theory" and "the theory organizations." Rapoport and Horvath note that organization theory addresses both general and abstract organizational principles and is often examined with in the context of systems theory. Alternatively, the theory of organizations is more aptly described as a social science, which addresses the social structure of organizations—the behavior of individuals and groups as part of a larger social psychology including both power relations and principles of control.[389]

---

[386] Gregory, R. (UD). General systems theory: A framework for analysis and social change. Retrieved from http://wsarch.ucr.edu/archive/papers/gregory/gensysTh.html.
[387] Dudley, Peter. (1996). Bogdanov's tektology (1st Engl transl). Centre for Systems Studies, University of Hull.
[388] Gregory, (UD).
[389] Rapoport, A. and Horvath, W. (1968). Thoughts on organizational theory, in Walter Buckley, ed. *Modern systems research for the behavioral scientist*. Aldine Publishing Company.

Boulding expanded the field by arranging systems in a hierarchical framework with nine levels that were organized based upon their complexity. Most important for the current discussion is level 8 of Boulding's hierarchy. Level 8 addresses socio-cultural systems, which include roles for those involved, communications between them, and the transmission of values.[390] Scott further articulated the relationship between Systems Theory and organizational theory in his work which noted that both theories examine their subjects as "an integrated whole."[391]

Katz and Kahn expanded the field, particularly with respect to Level 8 of Boulding's hierarchy, and focused their research on organizations and social psychology. Specifically, they examined organizational structures, relationships, and interdependence between elements from a systems theory perspective. Of particular interest to Katz and Kahn was the notion of "open systems," where the goal was to improve horizontal and vertical fit of the subsystems with each other, and within the greater organization. Katz and Kahn's work in this area is related to Burke and Litwin's framework for organizational change. Specifically, Katz and Kahn articulated their belief that organizations in open systems transform energy from their environment (the input), transform that energy into some product which is characteristic of the

[390] Jackson, MC. (UD). Fifty years of systems thinking for management. Retrieved from http://www.incose.org/newsevents/news/docs/Fifty_years_of_systems_thinking_for_management.pdf.

[391] Scott, William G. (1961). Organizational theory: An overview and an appraisal. *Journal of the Academy of Management* 4 (1), 7-26.

system (the throughput), and finally export that product into the environment (the output).[392]

Related, is the field of applied systems theory, which is more deeply rooted in systems analysis and systems, engineering fields. Checkland refers to this as "hard systems thinking". As applied to an organization, this theory is predicated upon "the assumption that the problem task is to select an efficient means of achieving a known and defined end."[393] This application of systems theory is most aptly associated with the Federal government where leadership develops a pre-defined goal; analytic models are typically used to capture the most important variables; and, interactions in the system of concern are used to determine the most efficient way of reaching the goal. Using systems in this manner direct a rigid development of machine-like processes. The current Planning-Programming-Budgeting System or PPBS, initiated under President Johnson can be used as a good example of an "output-based" planning system based in applied systems theory.[394] For DoD, the PPBS provides operational commanders a system to acquire the best mix of forces, equipment, and support attainable within fiscal constraints. The system establishes the framework and process for decision-making on future programs, and permits periodic review of prior decisions to be examined and analyzed from a current environment (threat, political, economic, technological, and resources)

---

[392] Katz, D. and Kahn, R. (1978). The social psychology of organizations. Wiley.
[393] Checkland PB. (1978). The origins and nature of "hard" systems thinking. *Journal of Applied Systems Analysis,* 5, 99-110.
[394] Jackson, MC., (UD).

perspective.[395] Among its benefits, Schick notes that the multi-year forecasting aspect of the PPBS allows "the annual routine of preparing a budget into a conscious appraisal and formulation of future goals and policies."[396] Among the major drawbacks, PPBS doesn't permit visibility into the daily implementation budgets to see how funding is spent to achieve objectives—and perhaps most importantly, how effective each dollar spent is in achieving stated objectives. This drawback makes it highly challenging to control implementation of the budget in daily operations—particularly with respect to efforts designed to improve performance and reduce costs.[397]

Systems (Policies and Processes) Barriers at DoD

In the case of the DoD, systems can be defined as the processes performed either by individuals or information technology systems to affect an outcome. DoD's rigid, hierarchical approach to command-and-control dictates the use of Checkland's "Hard Systems" thinking. This thinking supports the generation of specific policies and processes as inputs, which are intended to achieve high-level objectives, without consideration for low-level details. Furthermore leadership and management are so-focused on high-level objectives that they have become incredibly resistant to anything that might deviate from achievement of their pre-determined plans—particularly in those

---

[395] Department of Defense. (2003). Directive 7045.47: The planning, programming, and budgeting system (PPBS). Retrieved from http://www.dtic.mil/whs/directives/corres/pdf/704514p.pdf.

[396] Schick, A. (2007). The road to PPB: The stages of budget reform. In Jay Shafritz & Albert Hyde (Eds.), *Classics of Public Administration*. Thomson Wadsworth.

[397] Herrmann, R. et. Al. (2010). Planning, programming, budgeting systems: A review and analysis of Department of Defense implementation. Retrieved from http://userwww.sfsu.edu/~katucker/documents/ppbs.pdf.

areas, which may leave market forces to dictate outcomes. This reality contributes to two specific barriers to implementation of a framework such as MILSCOR at DoD. First, DoD systems are typically not designed with reliability, maintainability and supportability as firm requirements. Secondly, there has been limited progress for implementation of Performance-Based Logistics (PBL) across the defense-enterprise.

Reliability, Maintainability and Supportability are Not Always Firm Requirements

Reliability, Maintainability, and Supportability for a weapons system is not always identified as a firm system requirement early on in the acquisition life cycle. As a result, system sustainment is typically treated as something separate that must be addressed later in the acquisition life cycle. This is especially true for many of DoD's legacy platforms that are currently in the operations and maintenance phase of their life cycle. While the Defense Acquisition Guidebook and DoD's 5000 series note that system design factors should include *consideration* of…

> **Reliability**: the ability of a system to perform as designed in an operational environment over time without failure.
>
> **Maintainability:** the ability of a system to be repaired and restored to service when maintenance is conducted by personnel using specified skill levels and prescribed procedures and resources (e.g., personnel, support equipment, technical data). It includes unscheduled, scheduled maintenance as well as corrosion protection/mitigation and calibration tasks.
>
> **Support features:** including operational suitability features cutting across reliability and maintainability and the supply chain to facilitate detection, isolation, and timely repair/replacement of system anomalies. It also includes features for servicing and other activities necessary for operation and support including resources that contribute to the overall support.[398]

...these design characteristics can be traded off by the program manager. In many cases, system design and development often remains focused on system performance in the field and capabilities for the warfighter—e.g. can the missile hit its target when the fighter jet is flying Mach 3? This reality makes reliability, maintainability and supportability secondary considerations—

[398] Department of Defense. (2010). Applying system engineering to life cycle sustainment. Retrieved from https://acc.dau.mil/CommunityBrowser.aspx?id=328734.

particularly when cost and schedule become primary factors of concern in pursuit of achieving the larger program objectives. The major challenge for program managers, particularly when there is downward budgetary pressure, is to make the appropriate cost/benefit tradeoffs within their system design to accommodate any rigid performance specifications. The "trade space" can be defined as the set of parameters, attributes, and characteristics required for satisfying program and system performance standards. If reliability, maintainability and supportability are not considered performance standards, they can be overlooked at the expense of other performance characteristics.[399] These sustainment characteristics become ever more important as DoD systems become more complex in the twenty-first century with a focus on software intensive systems. For example, software reliability is something that must be built-in up-front during the design process as it can only be designed into a system from the start, it cannot be tested in, nor can it be included as a retrofit after the fact.[400] As noted by one observer "Acquisition processes pay too little attention to supportability and consistently trade down-stream

---

[400] Air Force Software Technology Support Center. (2003). Guidelines for successful acquisition and management of software-intensive systems: weapons systems, command and control systems, management information systems – condensed version 4.0. Retrieved from http://www.stsc.hill.af.mil/resources/tech_docs/gsam3/chap9.pdf.

Brantley, Mark W. et. al. (2002). Expanding the trade space: An analysis of requirements tradeoffs affecting system design. Retrieved from http://www.dau.mil/pubscats/PubsCats/AR%20Journal/arq2002/Brantley.pdf.

sustainability for required capability or program survival. Some program managers assert that *logistics is their only discretionary account*."[401]

Another concern in this area is that those responsible for initial systems development are not necessarily responsible for eventual systems support and maintenance because of the extended length of the systems development cycle. Technically, the program manager is supposed to be the single point of accountability for accomplishment of program objectives across the total life cycle, including sustainment.[402] However, as systems are quite often developed and produced over a period of decades, turnover in program personnel make it nearly impossible to hold the same person accountable for decisions made by other program managers in decades prior. Likewise, it is also possible that many of the initial developers and engineers who worked on a program during early phases of the life cycle are no longer associated with the program once it reaches sustainment. The same can be said for senior military representatives in program offices, who are often detailed to these positions for a temporary period of time until they are reassigned. Taken together, these facts makes it incredibly difficult to maintain accountability in early design and development decisions related to reliability, maintainability

[401] Osborne, Mike. (2010). Increasing logistical speed and agility. Retrieved from http://www.military-logistics-forum.com/mlf-archives/229-mlf-2010-volume-4-issue-2-march/2596-increasing-logistical-speed-and-agility.html.

[402] Department of Defense. (2003). Designing and assessing supportability in DoD weapons systems. Retrieved from http://www.dau.mil/pubscats/PubsCats/FINAL%20GUIDE%20with%20Memo%20-%20October%2024.pdf.

and supportability that may have negative impacts decades later.[403]

Implementation of a performance-based framework such as MILSCOR would be difficult if identified improvements to increase supply chain efficiency could not be implemented because legacy weapons systems did not have the requisite reliability, maintainability and/or supportability characteristics designed-in. For example, a particular improvement identified by a MILSCOR process mapping exercise might not be implemented because an existing inefficiency in maintenance processes may be directly tied to a poor system design. In this case, while the MILSCOR framework might have been successful in identifying the problem, implementing an improvement becomes incredibly difficult it not impossible.

Limited Progress for Performance-Based Logistics Implementation

Many of DoD's support processes have long been centered on completing transactions (or input focused). An alternative approach to these traditional processes can be found in Performance-Based Logistics (PBL), which has been noted as being beneficial for improved performance, efficiency, and, responsiveness at lower costs. Implementation of PBL requires a focus on outcome-based metrics by support personnel.

PBL has been stated as "the preferred Department of Defense (DoD) product support strategy to improve weapons system readiness by procuring

---

[403] Defense Business Board. (2011). Review of DoD's program managers. Retrieved from http://dbb.defense.gov/pdf/FY11-03_Program_Manager_Final_Report.pdf.

performance, which capitalizes on integrated logistics chains and public/private partnerships." Both DoD's Quadrennial Defense Review (QDR) and the Defense Planning Guidance (DPG) directed the application of PBL to new and legacy weapons systems. Furthermore, DoD Directive 5000.1 also mandates PBL implementation.[404]

Despite agreement on the value of PBL (particularly when coupled with public-private partnerships), to improve performance and reduce costs, the approach has still not been widely adopted across DoD. A 2009 Product Support Assessment conducted by then Under Secretary of Defense for Acquisition, Technology, and Logistics, Dr. Ashton Carter, reviewed 34 major weapons system programs and found that nearly *two thirds* of them used transactional support strategies without any consideration of outcome or performance-based metrics. Example programs contained in this list include: F-15, F-16, C-5, KC-135, and UH-60, among several others.[405]

Difficulty gathering accurate cost data has been repeatedly given as one reason that it has been incredibly hard to implement PBL approaches across the Defense enterprise. As cost data is a key factor required for any SCOR based framework, the inability to easily gather this information creates a

---

[404] Defense Acquisition University. (2005). Performance based logistics: A program manager's product support guide. Retrieved from https://acc.dau.mil/GetAttachment.aspx?id=32536&pname=file&lang=en-US&aid=6154.

[405] Department of Defense. (2009). DoD weapon system acquisition reform product support assessment. Retrieved from https://acc.dau.mil/adl/en-US/328610/file/47489/DoD%20Weapon%20System%20Acquisition%20Reform%20PSA_19%20NOV_Final.pdf.

major roadblock to MILSCOR implementation. Several GAO reports have noted the difficultly in collecting and reporting DoD cost data due to incompatible information systems which make measuring costs accurately nearly impossible.[406] This fact is also directly related to DoD's stove-piped organizational structure, which by default limits transparency in activities across organizational boundaries, and thus impedes accurate activities-based costing estimation—a major barrier to implementation of the MILSCOR cost metrics. If the organization is not structured to promote conduct in support of its vision/mission/strategy, it will not be likely to achieve the desired level of performance. Furthermore, if the proper incentives are not provided to help motivate the desired conduct (even if current organizational structure is altered), the performance of the organization is also likely to fall short of expectations.

In the immediate future, a shift toward PBL and implementation of an enterprise-wide framework such as MILSCOR will become only more important for DoD to improve supply chain performance and reduce costs. Known as the "death spiral", continued schedule delays for new programs and major budget reductions over the next several years will force the Department to reallocate funding from development and production to sustainment and

[406] IBID.

upgrades to extend the life of existing platforms further delaying completion of new systems.[407]

The effects of the “death spiral” are only exacerbated as DoD faces escalating sustainment pressures from:

- Increased operational tempo;
- Increased mean time between maintenance (MTBM) cycles due to increased operational requirements;
- Increased life extension of existing weapon systems due to delays in new system acquisition;
- Unforeseen support problems associated with aging weapons systems;
- Material shortages because of diminishing manufacturing resources and technological obsolescence.[408]

[407] Cahlink, G. (1998). Gansler: DoD in a ‘death spiral,’ program terminations likely. Retrieved from http://findarticles.com/p/articles/mi_6712/is_11_200/ai_n28715210/.
[408] Agripino, M. et. Al. (2002). A lean sustainment enterprise model for military systems. Retrieved from http://faculty.babson.edu/mathaisel/Pubs/AQR_LSEM.pdf.

Recommendations for Improvement

Reliability, maintainability and supportability should be firm capability requirements

The current acquisition system allows PMs to trade-off capabilities that are "nice to have" for firm program requirements. Often, these trade-offs result in greater performance (e.g. firepower, range, speed, etc.) at the expense of other capabilities such as reliability, maintainability and supportability. In order to successfully implement the MILSCOR model and reap the benefits from its use, programs must be willing to change how they acquire systems to ensure adequate resources are allocated for improving the performance and lowering the costs of the supply chain. If DoD continues to acquire systems that are not designed to optimize support strategies, tools such as MILSCOR will only yield limited benefits. In short, reliability, maintainability, and supportability for all weapons systems must become firm program requirements that cannot be traded off in all new system developments. One way that DoD can seek to acquire these additional system capabilities is to require industry to provide warranties on their products. These warranties could guarantee a minimum level of reliability, maintainability and/or supportability. If these features are pursued during the design/production phases of the acquisition in a competitive environment, they may even be acquired for little or no additional cost as was the case in the Great Engine War.[409]

Performance-Based Logistics (PBL) should become DoD's default support approach

Implementation of the MILSCOR model will only be possible if DoD undergoes an enterprise-wide shift toward performance-based logistics support. MILSCOR is predicated upon measuring supply chain outcomes as they support warfighter readiness. If DoD's support strategies are focused on compliance as opposed to outcomes implementation of a tool such as MILSCOR will be unsuccessful. While it is noted that PBL is a preferred strategy within the Department, it is not mandatory. DoD policy should be updated to reflect a firm PBL requirement for all weapon systems support with exceptions only being justified on a cost/responsiveness/risk basis. It is important to note that the PBL approach does not necessarily that support be provided by the private sector, rather, this approach is focused on competition to drive improved supply chain performance and lower costs. In order to achieve this change, modification to the 50/50 depot rule will have to be made and DoD must achieve its current plan to become fully auditable by 2017.

[409] Camm, Frank. (1993). The development of the F100-PW-220 and F110-GE-100 engines: A case study of risk assessment and risk management. Retrieved from http://www.rand.org/pubs/notes/2007/N3618.pdf.

DoD should define enterprise-wide goals and objectives for Public-Private Partnerships for improved performance at reduced costs

Implementation of the MILSCOR model will require improved coordination across government and industry to communicate and collaborate for enhanced supply chain performance at reduced costs. Given the proven success of public private partnerships, DoD must work to develop a plan for strategically leveraging PPPs to help drive implementation of the MILSCOR framework and optimize the DoD supply chain. These partnerships will help to open lines of communication and help align priorities of industry and government because they will be working together to achieve a common set of goals—in this case optimization of the MILSCOR elements across DoD's supply chain.

Task Requirements and Individual Skills

Tasks and Ind. Skills

For successful implementation of MILSCOR, the workforce must have the skills and competencies required to apply the framework and implement any improvements that come out of the exercise.

Task Requirements and Individual Skills and Abilities in the Literature

Task requirements and individual skills and abilities are the required behavior for task effectiveness, including specific skills and knowledge required of people to accomplish the work for which they have been assigned and for which they feel directly responsible.[410] Three main theories in the literature exist which directly relate to the discussion on task requirements and individual skills and abilities. First, and most generally, is the idea of person-environment fit. This theory was originally introduced by Lewin[411] and expanded upon by Chatman.[412] This theory explains behavior (e.g. performance) as a function of a person and their environment. A second theory, which is more specific than the first theory, is called the Person-Organization theory and is rooted in the Attraction-Selection-Attrition (ASA) framework developed by Schneider. The basis of this theory is that people and organizations work like puzzle pieces; the challenge being to pair up people

[410] Burke and Litwin, (1992).
[411] Lewin, K. (1951). *Field theory in social science.* Harper & Row.
[412] Chatman, J.A. (1989). Improving interactional organizational research: A model of person-organization fit. *Academy of Management Journal,* 14 (3), 333-349.

and an organization that is a good fit—thus the attraction-selection moniker. If there is a wrong fit, the attrition part of the model should exhibit itself through the performance evaluation process where "wrong pieces" would be automatically weeded out through an organization's personnel evaluation system.[413] Four specific applications of this theory exist. They include: 1. Person-organization fit between individual and organizational values.[414] 2. Person-Organization fit with leadership or peers.[415] 3. Person-Organization fit between individual preferences/needs and organizational systems and structures.[416] 4. Person-Organization fit between the applicant's personality and the organization's climate.[417] The third theory, which is the most specific of the three, is the person-job fit. The basis for this concept originated out of Taylor's work in the early 20th century on scientific management.[418] Specifically, Taylor noted the need to match up the job tasks with skills and knowledge required to perform the job. This general theory can be further broken down into the needs-supplies view (e.g. the fit between the requirements of the job and a person's abilities) or the demands and abilities

---

[413] Scheinder, B. Goldstein, H.W., and Smith D.B. (1995). The ASA framework: An update. *Personnel Psychology* 48, 747-773.

[414] Boxx, W. R., Odom, R.Y., and Dunn, M.G. (1991). Organizational values and value congruency and their impact on satisfaction, commitment, and cohesion. *Public Personnel Management*, 20, 195-205.
Chatman, J.A., (1989).

[415] Vancouver, J.B., Millsap, R.E., & Peters, P.A., (1994). Multilevel analysis of organizational goal congruence. *Journal of Applied Psychology,* 79, 666-679.

[416] Bretz, R.D., Ash, R.A., & Dreher, G.F. (1989). Do people make the place? An examination of the attraction-selection–attrition hypotheses. *Personnel Psychology*, 42, 561-581.

[417] Bowen, D.E., Ledford, G.E., & Nathan, B.R., (1991). Hiring for the organization, not the job. *Academy of Management Executive*, 5 (4), 35-51.

[418] Taylor, Frederick Winslow. (1911). *The principles of scientific management.* Harper & Brothers.

view (e.g. the fit between the desires of the person and the attributes of the job).[419]

Task Requirements and Individual Skills and Abilities Barriers at DoD

Workforce skills at DoD are incredibly important as the Department seeks to transform itself in response to the twenty-first century security environment. This transition requires a workforce with a diverse set of skills and competencies, particularly with respect to advanced engineering, information technology, business, and management. Despite a recognized need for these capacities, a 2011 survey of over 200,000 Federal employees found that only 45 percent of those surveyed believed that their work unit was able to recruit people with the right skills for their job.[420] This reality highlights two barriers that will inhibit DoD's ability to effectively implement the improvements that may come out of a model such as MILSCOR. These two barriers are: 1. A lack of understanding of the current skills DoD has in the workforce; and 2. A lack of focus on the right skills.

Lack of Understanding of Current Skills in the DoD Workforce

Some might think that application of the Attraction-Selection-Attrition (ASA) framework noted previously is sufficient to weed out those individuals who may not be the appropriate fit for their organization and/or specific job function. However, the previously noted 2011 survey of Federal employees

---

[419] Edwards, J.R., (1991). Person-job fit: A conceptual integration, literature review, and methodological critique. In C.L. Cooper & I.T. Robertson (Eds.), *International Review of Industrial and Organizational Psychology*. Wiley.

[420] Office of Personnel Management. (2011). Federal Viewpoint Survey. Retrieved from http://www.fedview.opm.gov/2011/.

found that less than 31 percent of those surveyed believed that steps were taken to deal with a poor performer who cannot or will not improve.[421] With this type of data it becomes evident; that the "attrition" portion of the ASA framework may not sufficiently address the problem allowing for an organic achievement of the job-fit match. Instead, DoD must undertake active management of its workforce including assessments and evaluations of current job skills and competencies across the Department.

In GAO's February 2011 high risk report, it noted that despite years of continually identifying DoD's acquisition workforce as needing major improvements the Department had still not yet: (1) completed assessments of the skills and competencies of its acquisition workforce[422]; (2) included in its plan an assessment of what the appropriate mix of its total acquisition workforce should be; and (3) included information on the funding needed to achieve DOD's human capital initiatives for the acquisition workforce.[423] Pertaining to DoD's supply chain workforce specifically, within the acquisition workforce career fields, the life cycle logistics career field constitutes some 11 percent of the overall acquisition workforce but only represents some 2 percent of the larger military and civilian logistics communities in the Department. It's also important to recognize that the

---

[421] IBID.

[422] Note: "Acquisition Workforce" has multiple definitions, but generally includes all those members of the workforce who support DoD logistics and supply-chain activities as a sub-group in addition to several other categories of personnel.

[423] Farrell, B. and Hutton, J. (2011). DoD civilian personnel: competency gap analyses and other actions needed to enhance DoD's strategic workforce plans. Retrieved from http://armedservices.house.gov/index.cfm/files/serve?File_id=59a75007-2245-436c-8c6a-3b934a9a546b.

contractors are completely removed from this metric.[424] In short, while the Defense Acquisition University has a core competency that addresses training and certification for life-cycle logisticians, this group represents a mere fraction of all of those individuals who compose the larger logistics and supply chain workforce.

Directly related to the issue of not understanding the current skill sets and their levels which are in DoD's workforce, is the issue of trying to improve in the skills in those areas DoD has identified as focal points. However, DoD does not actually differentiate skills vs. competencies in their assessments but instead considers skills to be a component of each of the workforce competencies. The challenge with this approach is that it may make it more difficult to pinpoint which specific skills might require additional development when undertaking a workforce transformation.[425] When examining DoD's 2008 Logistics Human Capital Strategy, there is recognition of the importance of analyzing the logistics workforce including completing a current state analysis, emerging work requirements analysis, and a competency gap analysis.[426] While the important factor here is that DoD recognized the need to evaluate skills and competencies, no specific details regarding how the evaluation would take place were provided. This lack of information supports GAO's assertion that as of 2011 it was still unable to

---

[424] Department of Defense. (2005). Civilian human capital strategic plan 2006-2010. Retrieved from https://acc.dau.mil/adl/en-US/364217/file/50204/7%20-%20DAW%20HCSP%20Chap2%20Analytics%20v87%20E.pdf.

[425] Farrell, B. and Hutton, J., (2011).

[426] Department of Defense. (2008). DoD logistics human capital strategy. Retrieved from http://www.acq.osd.mil/log/sci/hcs/DoD_Logistics_HCS.pdf.

track skills and competencies as well as the efficacy of workforce improvement efforts across the larger acquisition workforce.[427]

Another problem with tracking skills and competencies across the workforce is understanding the skills/competences of contractors. This problem occurs because quite often most assessments of DoD's acquisition or logistics workforce fail to account for the presence of contractors—who in many cases largely outnumber government personnel. This is also often the case in expeditionary environments such as Afghanistan where contactors have consistently out-numbered troops for several years.[428] This inability to accurately understand the skills of both the public and private sector members of the workforce goes directly to difficulty implementing the appropriate mix of personnel in a public-private partnership (e.g. how the distribution of work should be structured). In short, without understanding who holds the best skills/experience to perform certain job functions, it becomes incredibly difficult to effectively allocate workload distribution to achieve the highest performance at the lowest cost.

Workforce Lacks the "Right" Skills – Particularly in Acquiring Goods vs. Services

Part and parcel with the need to understand what skills the workforce possesses is the requirement to ensure the workforce has the "right" skills to perform the job functions that will be required to implement the process

---

[427] Farrell, B. and Hutton, J., (2011).

[428] Cole, August. (2011). Afghanistan contractors outnumber troops. Retrieved from http://online.wsj.com/article/SB125089638739950599.html.

improvements that would come out of using MILSCOR. There has been fairly wide agreement that across the Federal government that the workforce lacks the necessary skills to shift from a rigid input or transaction-based model of work to an output or performance-based approach. One 2007 study by the Acquisition Advisory Panel found that there was an incredible mismatch between demands placed on the workforce and skills available to meet those demands. Of particular note, the study found that there were significant shortcomings with respect to important skills required for performance-based acquisition ("PBA"), commercial item contracting, and interagency and government-wide contracts.[429]

As DoD is the largest consumer of goods and services within the Federal Government, it is only reasonable to acknowledge that the need for these skills at DoD are incredibly high—particularly within the context of implementing a performance-focused framework such as MILSCOR. One aspect, which is directly addressed in the MILSCOR model, is the breakdown between acquisition and management of goods in the supply chain vs. services—a major distinction that requires different knowledge and skills for each. Services can range from maintenance support; to serving food in the chow hall in Afghanistan; to providing software development, testing & evaluation. The Defense Science Board study on DoD services found that in

[429] Acquisition Advisory Panel. (2007). Report of the Acquisition Advisory Panel to the Office of Federal Procurement Policy and the United States Congress. Retrieved from https://www.acquisition.gov/comp/aap/documents/Chapter5.pdf.

FY2009 some 57 percent of DoD's budget was spent on services.[430]Shay Assad, Director of Defense Pricing noted publicly the importance of having DoD improve its acquisition and management of services as in FY2010 DoD spent about $200 billion on services and only $160 billion on supplies and weapons.[431] As a result, leadership across the Department is taking notice that the real money — and potentially, the real waste exists in acquisition and management of services.

A major roadblock to implementing a straightforward workforce-training curriculum for services is DoD's lack of standardization for the provisioning of services. In short, there is a lack of standard definitions on what particular services consists of; what skills, knowledge, experience, and level of performance may be required; and, what currently exists across DoD's portfolio of contractor provided support services.

Without this information, undertaking a MILSCOR implementation as related to the services within DoD's supply chain becomes nearly impossible. For example, how could DoD compare the cost of various types of services it acquires across the enterprise without standard job definitions? This issue was highlighted as being critical in Under Secretary of Defense for Acquisition, Technology and Logistics' (USD AT&L) Better Buying Power Memo of 14

[430] Defense Science Board, (2011).

[431] Ewing, P. (2011). What costs even more than DoD's weapons? Its 'services'. Retrieved from http://www.dodbuzz.com/2011/07/29/what-costs-even-more-than-dods-weapons-its-services/.

Sept. 2010.[432] In this memo, Dr. Carter indicated the need to improve DoD's tradecraft in service acquisition. This serves as a first step to develop a standard lexicon for contractor provided services across the Department. Once this is established, it could be further developed into a well-defined set of criteria and pricing data which might be integrated into an enterprise-wide tool for process improvement such as MILSCOR.

Recommendations for Improvement

Require Skills and Competency Assessments as Part of Hiring and Grade/Step Promotion Process.

DoD is having major difficulty undertaking skills and competency assessments of its workforce. As related to implementation of the MILSCOR framework, such assessments become ever-more important as the original SCOR 10.0 model introduced for the first time workforce skills required for successful supply chain process improvement. The SCOR 10.0 approach can be directly applied to the MILSCOR framework and requires the following:

- Baseline skills necessary for the overall process area (e.g., Sourcing or Planning) and for the individual process.
- Critical skills that differentiate leaders in a particular process area from those who only perform at a baseline level.
- Performance measures through SCOR metrics that relate to continuous assessment of job performance in each process area.
- Credentialing of supply chain skills, including training or certification programs, related to the specific process areas.[433]

[432] Under Secretary of Defense for Acquisition, Technology and Logistics. (2010).
[433] Supply Chain Council, (2010).

To identify baseline and critical skill compositions across the workforce, all personnel should be subject to skills assessments as a condition of hiring and grade/step promotion. Initial assessments should not prohibit promotion, but serve to establish a baseline moving forward. It also appears that the workforce may in fact support such a move. Nearly 2/3rds of those DoD professionals who were surveyed during this research supported the use of skill/competency assessments as a condition for hiring/promotion.

On the leadership side, DoD should ensure that all of those hired and/or promoted to senior level positions possess the necessary skills required to manage large-scale transformational change that will be required out of the implementation of the MILSCOR framework. These skills include a range of competencies in leading the organization, leading the self, and leading others as shown in the figure below.

Skills Required for Leading the Organization	Skills Required for Leading the Self	Skills Required for Leading others
Managing change	Demonstrating ethics and integrity	Communicating effectively
Solving problems and making decisions	Displaying drive and purpose	Developing others
Managing politics and influencing others	Exhibiting leadership stature	Valuing diversity and difference
Taking risks and innovating	Increasing the capacity to learn	Building and maintaining relationships
Setting the vision, mission, and strategy	Managing one's self	Managing effective teams and work groups
Managing the work	Increasing self-awareness	
Enhancing business skills and knowledge	Developing adaptability	
Understanding and navigating the defense enterprise		

Table 27. Leadership Competencies.[434]

Expand DAU Curricula to Include Focus on Service Science Management, and Engineering.

Successful implementation of the MILSCOR model across the defense enterprise will require a new focus on enhancement of workforce skills and competencies in service acquisition. Current DAU training and education primarily focuses upon the acquisition of goods instead of services, despite the fact that DoD now spends 57% on services.[435] Because service acquisitions are highly complex and make up a significant portion of DoD's supply chain, DoD must establish a new focus on developing the human capital capabilities required to support these transactions. Specific areas of focus should be on professional services and technology services.

---

[434] Society for Human Resource Management. (2008). Leadership competencies. Retrieved from http://www.shrm.org/Research/Articles/Articles/Pages/LeadershipCompetencies.aspx.

[435] Defense Science Board, (2011).

Motivation

Perhaps the most important factor to influence change in any organization is the ability to motivate the workforce through incentives (or penalties) to compel improved performance. This element is key for MILSCOR implementation because it will drive personnel to try and change each of the previously noted elements (culture, policies, processes, etc.) that are required to successfully implement the framework. In short, incentives are important to help motivate personnel to change *and* to align their behavior in support the transformation effort.

Motivation in the Literature

Motivation is considered aroused behavior tendencies to move toward goals, take needed action, and persist until satisfaction is attained. This is the net resultant motivation: that is, the resultant net energy generated by the sum of achievement, power, affection, discovery, and other important human motives.[436] Extensive work on motivation and work exists in the current literature including multiple classic works on the subject. As motivation and incentives in the workplace are a major factor which must be addressed to transition DoD's supply chain to a performance-based framework rooted in MILSCOR, additional attention to the subject of motivation and values will be given in this section.

---

[436] Burke and Litwin, (1992).

The literature can be divided up into multiple theories on motivation and work which have emerged since the turn of the 20th century. The traditional theory, introduced by the work of Taylor was initiated during the scientific management movement of the early 1900's. The traditional theory of work and motivation assumes that money or financial compensation is the primary motivating factor for work—the more one was paid, the more one would produce.[437]

Mayo's work expanded upon the foundation initiated by Taylor on the subject and led to the Human Relation theory of work motivation. Mayo believed that workers were motivated by more than simple financial incentives, but rather they were motivated by having their social needs met while at work through personal interactions with one another.[438] Maslow expanded upon this theory by creating a hybrid approach rooted in the "Hierarchy theory". Maslow believed that money was only able to partially satisfy some of needs that motivated a worker. The most important contention of Maslow's hierarchy theory is that once a need is satisfied it is no longer a motivator. Maslow's hierarchy consists of the five levels of needs shown in Figure 3 below.[439]

[437] Taylor, F., (1911).
[438] Mayo, Elton. (2007). *The social problems of an industrial civilization.* Routledge.
Mayo, Elton. (2003). *The human problems of an industrial civilization*. Routledge.
[439] Maslow, A.H. (1943). A Theory of Human Motivation. *Psychological Review* 50 (4), 370-96.

Figure 13. Maslow's Hierarchy of Needs.

Physiological needs are the strongest and considered the foundation of motivation. These needs include the basic bodily needs that must be satisfied to sustain life such as food, sleep, water, exercise, clothing, and shelter. Safety needs are concerned with the protection against imminent or threatened danger. The third level of the hierarchy is the social needs, which include love, affection, and belonging. The four levels pertain to esteem needs involving the drive to value oneself and to inspire the esteem of others. The final level in the hierarchy is self-actualization or self-fulfillment.

Frederick Herzberg developed a theory of work motivation known as the motivation-maintenance, dual factor, or the motivation-hygiene theory. This theory was based on a series of interviews with over 200 subjects. The results of the research indicated that there were several different factors that were associated with good and bad feelings toward work incidents. When subjects felt positive about a work experience they were questioned on the factors, which were most frequently mentioned. Responses typically included so-called motivational factors such as achievement, recognition, responsibility, advancement, and the characteristics of the job. However, when the subjects felt negatively about a work incident, they were more likely to mention hygiene factors associated with the work environment such as status; relations with supervisors, peers, and subordinates; technical aspects of supervision; company policy and administration; job security; working conditions; salary; or aspects of personal life. Herzberg concluded that these factors could not motivate an individual, but could easily prevent motivation and were thus equally as important as those motivating factors in work.[440]

McGregor's work outlined two opposing theories motivation and work known as Theory X and Theory Y. Theory X is the traditional approach to work, which assumes that people generally dislike work, and thus they must be both threatened and rewarded. Alternatively, Theory Y assumes that people have a psychological need to work and are motivated by success and achievement.[441] Reinforcement theory was developed by B.F. Skinner, which contributed greatly to the study of work and motivation. The premise of the theory is that reinforced behavior will be repeated and behavior that is not reinforced is less likely to be repeated. For example, if an employee is provided increased pay when their work performance is high, the employee is likely to continue to strive for high performance.[442]

---

[440] Herzberg, Frederick, Mausner, Bernard, and Barbara Bloch Snyderman. (2009). The motivation to work. Transaction Publishers.
Herzberg, F. (1964). The motivation-hygiene concept and problems of manpower. *Personnel Administration*, 3–7.
[441] McGregor, Douglas. (1985).
[442] Skinner, B.F. (1953). *Science and human behavior.* Macmillan.

Equity theory is based on the belief that employees will take whatever actions are necessary, based upon the individual's perception of their individual inputs vs. outcomes, to produce feelings of equity with those around their work unit. In short, equity theory is concerned with the relationship between the perceived value produced by an individual, how that value is viewed (e.g. punished or rewarded) and if that is consistent across other members of the work unit.[443]

Motivation Barriers at DoD

Many attributes of the theories noted above can be traced to barriers to motivation for performance improvement and accountability across DoD. For example, while DoD's organizational structure may be stove-piped and limit sharing of information, the proper incentives could motivate personnel to reach across traditional boundaries to achieve improved performance and results. Without addressing the motivation factor which drives personnel, any effort to shift to a performance-based culture at DoD through a MILSCOR implementation may yield severely limited results. Specific barriers include limited incentives to improve personnel performance, and limited incentives to improve program office performance.

Limited Incentives to Improve Performance and Align Behavior Across the Workforce

The notion that limited incentives exist at DoD for improved performance and alignment is supported by much of the theory noted above. Financial

[443] Adams, J.S. (1965). Inequity in social exchange. *Adv. Exp. Soc. Psychol.,* 62, 335-343.

compensation, in some form is considered as one key motivator for work as noted by Taylor, Hertzberg, Maslow, McGregor, Skinner and Adams. However, as noted in the literature above, this type of motivator is not the only one that matters. In short, other motivators such as intrinsic factors (e.g. purpose) or emotional factors (e.g. sense of identity) may also incentivize changes in behavior.

As it currently stands at DoD, the current acquisition workforce has little direct incentive to improve the performance and reduce costs of the supply chain as supported by current government personnel office policy. While indirectly personnel may feel responsibility from the notion that they are working on behalf of the warfighter and taxpayer (both intrinsic and emotional factors), there is essentially no direct (one to one) connection between workplace performance improvements or cost reductions and government employee financial compensation, benefits, etc.

This assertion is directly supported by the recent trends in the Federal Employee Viewpoint Survey. This survey examined over 200,000 Federal civilian personnel and asked them a range of questions regarding leadership, work unit climate and other pertinent topics. Specifically pertaining to the subject of motivation, personnel were asked about performance (both positive and negative) and how it was addressed within the work unit. When personnel were asked if differences in performance were recognized in a meaningful way only 36 percent responded positively. This level of response indicates that intrinsic and emotional motivational factors to influence workforce performance are probably not being maximized to the fullest extent possible. Roughly the same affirmative answer was given in response to the question regarding if respondent's believed promotions in their work unit were based upon merit. Perhaps even more alarming is the 24 percent positive response to the question in regards pay raises dependency upon job performance. Further, the positive response rate to this question has actually decreased compared with the 2008 and 2010 variants of the same survey. The survey also noted that just over 40 percent of respondents believed that creativity and innovation were rewarded by their respective organizations—both factors that go to intrinsic and emotional incentives. Finally, as related to the subject of motivation of personnel, the survey noted a 45 percent positive response to a question regarding the role of leadership and generation of motivation and commitment among the ranks of the workforce, another missed opportunity to drive a sense of purpose across the workforce to motivate changes in behavior.[444]

[444] Office of Personnel Management, (2011).

Question	FHCS 2008	FEVS 2010	FEVS 2011
In my organization, leaders generate high levels of motivation and commitment in the workforce.	40.20%	44.50%	45.00%
In my work unit, differences in performance are recognized in a meaningful way.	32.80%	36.20%	35.90%
Pay raises depend on how well employees perform their jobs.	27.00%	26.30%	24.00%
Promotions in my work unit are based on merit.	36.90%	35.40%	35.60%
Creativity and innovation are rewarded.	41.10%	41.10%	40.90%

Table 28. Selected Results from the Federal Employee Viewpoint Survey 2010.[445]

The National Security Personnel System (NSPS) was designed to help change this lack of incentives across DoD writ-large and improve responses to concerns raised by workers as demonstrated in answers to the survey questions above. In short, this program was designed to tie the compensation of some 205,000 defense employees to their performance. However, plans to cancel the NSPS program completely by 2012 were included in a recent Defense Authorization bill. The program was deeply criticized from both sides of the political aisle and by union leadership. Specifically, there were many complaints that the system was unfair, nontransparent and potentially discriminatory.[446]

---

[445] IBID.

[446] Losey S. and Castelli, E. (2009). Congress ends NSPS: DoD bill also includes new benefits for Feds. Retrieved from http://www.federaltimes.com/article/20091026/DEPARTMENTS01/910260304/-1/RSS.

For example, a *Federal Times* analyses of the NSPS program in 2008 and 2009 found that both white employees, and those employees of Defense agencies which were not part of the uniformed services, constantly received higher performance ratings, raises and bonuses than others participating in the NSPS program.[447] Likewise, a Defense Business Board (DBB) study said NSPS was systemically flawed and must be rebuilt from the ground up.[448] One specific criticism of the program by the DBB study was directly related to the failure to connect the performance incentives provided by NSPS to actual organizational performance improvement due to a lack of historical data collection and measurable organizational improvement goals and standards.[449]

An additional problem in motivating individuals at DoD is the staunch differences that exist in pay and benefits across the public and private sectors for completion of similar support functions. Using the previously noted Equity Theory as a model to examine DoD personnel, there are frequent differences in pay and benefits across the public and private sector workforce, even for those individuals who may be working side-by-side completing similar job functions. This inequity contributes to the distrust of contractors and resentment between different groups as the private sector workforce is often

---

[447] Maze, R. (2009). Lawmakers move to end NSPS. Retrieved from http://www.federaltimes.com/article/20090622/DEPARTMENTS01/906220308/.

[448] Defense Business Board. (2009). Review of the National Security Personnel System. Retrieved from http://dbb.defense.gov/pdf/Review_of_National_Security_Personnel_System_Final_Report.pdf.

Losey S. and Castelli, E., (2009).

[449] IBID.

held to greater performance standards and a larger threat of loosing their job than their public sector counterparts.[450]

Limited Incentives for Program Offices to Save

Looking at the lack of incentives within DoD at a higher level of analysis it becomes clear that the same lack of incentives, which exist for individuals, can roll up beyond the individual level to the program office itself. If individuals are not appropriately incentivized to achieve improvements in performance and cost, and, these individuals collectively compose a larger DoD program office, then it is quite likely that the program office as a whole is also not incentivized. Examining this barrier within the context of applying the MILSCOR framework across DoD, it becomes apparent that without alignment of incentives for improvement across all Department/agencies and their respective program offices across the enterprise, implementing any identified supply chain improvements from the applying the framework may be incredibly difficult.

One widely recognized example of program office incentive problem can be found when looking at program growth over time. For example, as noted by Gansler, the shorter the time for development, the smaller the cost growth

---

[450] Sahadi, J. (2011). Which pays better: government or private sector? Retrieved from http://money.cnn.com/2012/01/31/news/economy/federal_worker_pay/index.htm?iid=GM.
Congressional Budget Office. (2011). Comparing the compensation of Federal and private-sector employees. Retrieved from http://www.cbo.gov/doc.cfm?index=12696.

factor will be. Alternatively, the longer the development cycle time, the greater the cost growth factor will be. Using the Global Hawk UAS program as one example, as development time grew from 55 months to 78 months; the associated unit costs grew from $78.6 million to over $168 million.[451] In these cases, an extended program schedule increases the size of the program and thus creates a sense of job security and stability for the program office involved. (also known as "Longer Begets Bigger").[452] Recent guidance from DoD's USD AT&L on Will Cost/Should Cost management[453] for programs notes the intent to incentivize program managers to help contain costs to keep programs from spiraling out of control, but this guidance fails to provide specific details regarding its execution.[454] For example, one recent review of the program posited several important concerns over precisely how the program may be administered.

1. What type of incentives will be provided to the successful DOD program managers who drive significant cost reductions in the planned cost vs. negotiated cost, the budgeted cost vs. the actual cost, and/ or the life cycle costs?
2. Will salary increases, bonuses, early promotions, or higher performance ratings be offered only to program managers who reach their respective targeted reductions?

[451] Gansler, J.S., (2011).
[452] Software Engineering Institute. (ND) Longer begets bigger. Retrieved from http://www.sei.cmu.edu/library/assets/longerbetter.pdf.
[453] Undersecretary of Defense for Acquisition, Technology and Logistics, (2010).
[454] Garrett, G. And Beatty, F. (2011). DoD moves to implement will-cost and should cost management. Retrieved from http://www.navigant.com/~/media/Site/Insights/Government/Will_Cost_Should_CostManagement_Government.ashx.

3. What about providing incentives to the tens of thousands of other DOD acquisition support personnel, such as contracting officers, contract administrators, government property managers, contracting officers technical representatives, cost/price analysts, project engineers, auditors, logistics managers, financial managers, and others?
4. Is it possible that if only the project managers are rewarded that the other DOD critical acquisition personnel may not be highly motivated to drive cost reductions?
5. Further, is it possible that rewarding only project managers may prove to be divisive to teamwork and effective implementation?[455]

If all of those personnel who are associated with the job functions that are required to make the program office function as a work unit are not equally incentivized and thereby motivated to improve performance and reduce costs, significant, meaningful change in current practices may remain illusive.

Even if this hurdle were overcome to align all program office stakeholders through incentives to try and achieve the same goals, the law (as currently written), still disincentivizes programs to spend less money than was appropriated during the budget process. In short, the Congressional budget process is not designed to reward savings; instead it is a highly rigid, bureaucratic process that is designed to ensure control and oversight of each line item. This process fails to encourage and reward cost savings as leftover funds must be reprogrammed by Congress and may not be reallocated by the program office independently.

[455] IBID.

By definition, this process greatly distinguishes the Federal government from the private sector. By design, intentional or not, the government essentially provides a de facto reward for spending which meets the guidelines set in the appropriations process, with no incentive for coming in below the specified target level. Alternatively, in the private sector, the prospect of achieving increased profitability promotes a push down the curve from initial plans/projections because increased profitability results (or at least should result) in increased rewards for managers, employees and shareholders. While there have been efforts to try and bring these principles to the public sector, such as through the now defunct A-76[456] process which put public sector personnel in competition for their jobs against private companies, staunch political and cultural resistance ended the program as Congress passed legislation in the FY09 Appropriations Act to halt the beginning of any new A-76 competitions. The government-wide moratorium has continued to the present.[457]

Likewise, even in the event that the Congressional budget process permitted programs to reinstate A-76 competitions, the program office that is responsible for developing and producing the system is not responsible for maintaining it many years, sometimes even decades later. As a result, the

---

[456] Gansler, J.S. and Lucyshyn, W., (2004).

[457] Grasso, V. B. (2011). Circular A-76 and the moratorium on DoD competitions: background and issues for Congress. Retrieved from http://www.ieeeusa.org/policy/eyeonwashington/2012/documents/OMBCirculara76.pdf.

program would not even redeem the benefits of any potential savings directly at the time that it is making the decisions to potentially change how the system might be sustained to improve performance and/or reduce costs.

Recommendations for Improvement

DoD Must Align Organizational Vision, Mission, and Strategy with Rewards

To successfully implement MILSCOR DoD must its reward system with the supporting organizational vision, mission and strategy. For example, if a particular office achieves a major improvement in performance at lower costs as a result of using the MILSCOR framework to identify a process improvement, all personnel should be rewarded accordingly and the office should be able to “share” in the savings to reinvest into the program. Individual employee recognition in the forms of financial compensation or public recognition can also be major incentives for alignment of the workforce with the organizational vision, mission, and strategy. Rewards can also be non-financial in nature. For example, it can be valuable for employees to understand the importance of their contributions across the enterprise—to see how and where they fit into achievement of DoD’s overall objectives. Further, employees can feel rewarded if they receive general encouragement and support for innovative, creative thinking.

For contractors the same types of awards should apply. Financial incentives can come in the form of share-line payments, where a portion of the savings identified by the contractor is shared between the contractor. A non-financial incentive for contractors would be to provide additional past performance credit on future proposals for participation in those programs DoD has identified as achieving significant performance improvements at lower costs.

Provide personnel with extrinsic motivators and intrinsic motivators that align with appropriate job functions.

Without addressing the motivation factor that drives personnel, any effort to shift to a performance-based culture at DoD through a MILSCOR implementation may yield severely limited results. To drive change across the lower and middle tiers of DoD organizations, incentives need to be focused on engagement in solving problems vs. compliance for completing processes as discussed previously in “motivating the elephant.” For implementation of the MILSCOR framework to be successful, major changes will need to take place across the organization—many of which will require innovative solutions to improving supply chain performance and efficiency while reducing costs.

Per Pink, the best way to use money as a motivator is to take the issue of money off the table at the beginning so people can concentrate on their work.[458] This approach ties directly into the differences between public sector and private sector motivating factors as there are differences in pay and benefits across the public and private sectors for personnel completing similar tasks. When examining DoD personnel, there are frequent differences in pay and benefits across the public/private sector workforce, even for those

[458] Chai, Barbara. (2009). How to stay motivated and get that bonus. Retrieved from http://online.wsj.com/article/SB10001424052748704152804574628230428869074.html.

individuals who may be working side-by-side completing similar job functions. A recent CBO review found that most government workers with low levels of education are routinely paid greater benefits and salaries than their private sector counterparts, while those with advanced degrees (which are incredibly important for having a highly skilled workforce), are paid on average 23% less than their private sector counterparts. This inequity contributes to the distrust and resentment between the workforces as the private sector workforce is also often held to greater performance standards and has a larger threat of job loss over their public sector counterparts.[459] If the public and private sectors can bridge the gap between differences in pay and benefits for similar job functions, job performance, and job security, then the motivation and incentive discussion can shift from extrinsic factors such as money and benefits to intrinsic factors that will stimulate greater workplace creativity, innovation, teamwork, and problem solving required for implementation of the MILSCOR framework.

Specifically, there are three intrinsic incentives that motivate people more than money and should be considered to implement the MILSCOR framework successfully across the DoD enterprise:

- **Self-direction:** Giving entry-level and mid-level personnel the ability to choose how they do their jobs. The benefit of this approach is that if personnel have more freedom, they tend to feel greater ownership over

---

[459] Sahadi, J. (2011).
Congressional Budget Office. (2011).

their work ultimately giving them a sense of pride when performing it.

- **Improvement:** Most people want to continue to learn and grow. This is one reason many companies offer training programs for employees. Opportunities to cross-train staffers can pay off by giving personnel a motivational boost and helping them better understand the job roles of others across the organization.
- **A sense of purpose:** People want to feel that they are doing something bigger than their jobs—that they are a part of something important. To help employees see this purpose they should be able to understand their connection to satisfied customers. In the military environment, every employee should know exactly how his or her work helps the warfighter on the battlefield.[460]

Self-direction, for example, has proven to be incredibly valuable toward driving innovation and improvement in business across some of the worlds most successful companies. At Google, self-direction is given to employees as an incentive through a program called "20 Percent Time." 20 Percent Time is where Google employees are permitted to have complete independence for 20 percent of their day or week to work on whatever they want. As noted by Pink, Google engineers are given complete autonomy on their time, task, team and technique during 20 Percent Time. The results of this independence have been nothing short of remarkable as *half* of the new products developed each

---

[460] Pink, Dan. (2009). The Surprising Science of Motivation Retrieved from. http://www.ted.com/talks/dan_pink_on_motivation.html.

year by Google come from work done during 20 Percent Time. Perhaps the most notable 20 Percent Time development was the creation of Gmail that was actually built as an independent project outside the normal Google workflow.[461]

[461] Mediratta, Bharat. (2007). The Google way: give engineers room. Retrieved from http://www.nytimes.com/2007/10/21/jobs/21pre.html.

Management Practices

Management practices are directly informed by organizational structure, incentives and motivation. The following section will address specific barriers created by traditional management practices at DoD.

Management Practices in the Literature

Management practices are what managers do in the normal course of events to use the human and material resources at their disposal to carry out the organization's strategy. For the purposes of this research, management practices will have a specific meaning, which is applicable to how DoD managers choose to manage their programs given their people and resources.[462]

The literature contains a vast array of information on management practices. Henri Fayol's initial work developing a series of principles of administration (e.g. unity of command, centralization, discipline, etc.) created a bedrock of knowledge in the field of administration and management and reinforced the notion of a command-and-control or hierarchical organizational structure for management.[463] Taylor's work on scientific management highlighted the importance of dividing labor from management provided foundational knowledge in the field, noting the importance of the division of labor between

---

[462] Burke and Litwin, (1992).
[463] Wren, D. et. al. (2002). The foundations of Henri Fayol's administrative theory. Retrieved from http://www.bus.lsu.edu/bedeian/articles/Fayol.pdf.

workers and management with management holding responsibility for "how" the work is to be executed.[464]

Work by Follett during this early period has also had a direct influence on current management theory. Her work was centered on a more collaborative approach to management than the previous theories, which were more rigid and hierarchical in nature. Specifically, Follett's work suggested that a democratic approach to management is most effective and that all individuals in an organization derive their actions from a combination of reason and feeling—implying that there is not a definitive difference between what drives a manager and what drives a worker. Follett also noted that cooperation and "cooperative competition" would ultimately generate the best results for an organization—what might be considered a pre-cursor to the ideas of networked governance and Public-Private Partnerships.[465]

Further work by Drucker, Mintzbert and Kotter became highly influential in the field as we know it today. Peter Drucker was a leader in the field of applied management in his work with General Motors following World War II.[466] In this groundbreaking research, Drucker examined the management of General Motors from within, providing real insight into how politics, power struggles, and information flows directly impacted day-to-day management activities inside the company—a feat never before undertaken at this time.

[464] Taylor, Frederick Winslow, (1911).
[465] Graham, P. (1995). *Mary Parker Follett: Prophet of management.* Beard Books.
[466] Drucker, Peter F. (2001). *The essential Drucker.* Harper Collins Publishers.

Mintzbert further articulated the role of the manager as being responsible for how the organization sets out to achieve its stated goals with a focus on the role of the "manager" in directing the organization. Mintzberg developed various types of management "roles" including interpersonal roles such as figurehead, leader, and liaison; informational roles including monitor or nerve center, disseminator, and spokesman, as well as four decision-making roles such as entrepreneur, disturbance handler, resource allocator, and negotiator.[467] More recent work by Mintzberg has noted the need for leadership to become more involved in management activities as he noted we are over-led and under-managed.[468]

Kotter's work on managers was based on his study of 15 successful general managers. Kotter found that the key to successful management was networking to accomplish the manager's "agenda". This approach dispelled many previous myths surrounding the notion that any individual who happened to be a good "manager" could simply show up in an organization and be successful. Instead, Kotter found that good managers are in fact "specialists" not "generalists" who have spent an extensive amount of time gaining specific knowledge in a particular industry. Kotter also found that

---

[467] Mintzberg, Henry. (1975). The manager's job: folklore and fact. Retrieved from http://rafael.glendale.edu/ppal/Busad%20101/mintzbergmar1990.pdf.
[468] Mintzberg, Henry. (2009). The best leadership is good management. Retrieved from http://www.businessweek.com/magazine/content/09_33/b4143068890733.htm.

good managers have built a large, informal network of relationships because they rely on others to successfully complete almost everything they do.[469]

Finally, Deming's work in the field of management has been a cornerstone of the quality management revolution and has directly influenced the way many public and private sector entities function today. Furthermore, this work directly influences the underpinnings of the MILSCOR model. Initially rooted in the manufacturing sector, Deming noted that the key to quality management required several specific practices (14 specifically). Some of these practices include: continually seeking to improve products/services; introducing on-the-job training for all including management; building for high quality and low price; encouraging education and self improvement; utilizing management by objectives; removing barriers between organizations; etc.[470]

While the short survey of literature above is by no means comprehensive, it does give some background on foundational management theory applicable to the topic at hand. The table below provides a brief overview on various theories in the field of management as adapted from Koontz.[471]

---

[469] Kotter, J. (1982). *The general managers.* Free Press.
[470] Deming, W. Edwards. (2000). *Out of the crisis*. MIT Press.
[471] Koontz, Harold. (1980). The management theory jungle revisited. *Academy of Management Review*. 5 (3), 175-187.

Management Theory	**Description**
Empirical or Case Approach	Analyzes management practices predicated upon experiences through case studies.
Interpersonal Behavior Approach	Analyzes the interrelationships between people including motivation and psychology.
Group Behavior Approach	Elevates the interpersonal behavior approach to group behavior patterns.
Cooperative Social System Approach	Cooperative interaction of ideas, forces, desires and thinking of groups.
Sociotechnical Systems Approach	Attitudes and group behavior are influenced by technology used to perform work.
Decision Theory Approach	Managers must make decisions; therefore we should study how these decisions are made.
Systems Approach	Management planning requires consideration of many environmental factors (inputs) for the organization to achieve its stated goals (outputs).
Mathematical or "Management Science" Approach	Management can be defined in terms of mathematical processes, concepts, symbols and models.
Contingency or Situational Approach	Management practices are really responses which are dependent upon each specific situation.
Managerial Roles Approach	Management actions should be observed directly to understand what roles managers perform and how.
Operational Theory Approach	Management is a combination of several different fields (systems, math, sociology, psychology, etc.).

Table 29. Selected Theories of Management.[472]

[472] Adapted from Koontz, 1980.

Management Practices and the "Switch" Framework

Bottom up change in an organization requires engagement and motivation of low/mid level personnel. This engagement and motivation can be successfully achieved by having managers harness the change methodology as outlined in Dan and Chip Heath's book entitled "Switch".[473] The "switch" change approach requires three phases: 1. Directing the Rider; 2. Motivating the Elephant; and, 3. Shaping the Path. This section will address these three actions and give special attention to motivation and incentives required for successful change from the bottom up.

Directing the Rider

Directing the rider is defined as setting a clear vision for the future by management. If lower and mid-level personnel are unsure of the direction they should be headed, it often leads to confusion and lack of progress towards achieving the stated vision. In short, how can an employee be motivated to change if they aren't certain on which direction they should be headed? To identify the corresponding actions that are required to achieve the vision, the manager should: 1. Find the bright spots, and 2. Script the critical moves.[474]

1. Find the bright spots. Finding the bright spots in an organizational change effort requires managers to identify those individuals who are already successfully executing the actions required to achieve the desired vision and

---

[473] Heath, Dan and Chip., (2010).
[474] IBID.

determine how these actions might be replicated to motivate a greater change effort. Finding the bright spots requires managers to be very familiar with the specific performance levels of the individual members of their team. In this case, a key skill that managers need to possess is an intimate awareness of their team's overall performance and understanding of the roles that individuals play in that performance. Once the recipe for success is uncovered by identifying those top performers in the group, the next task for the manager is to replicate this behavior by scripting the critical moves.

2. Script the critical moves. A roadmap for change must be articulated to delineate the critical actions required to transform organizational behavior. One key distinction that must be made is the difference between those activities deemed as "critical" to an organizational change effort vs. those that may be considered relatively inconsequential. Managers must be able to recognize which moves are important for change and which are not. An example of a critical move is one that forces widespread behavior change during a critical moment; something that drives personnel to make a different decision than they had in the past—perhaps such as when to take a risk vs. when to follow the status quo. A critical move is one that is aligned with achieving the organizational vision for change. The manager must be able to trace the moves in his work unit and understand how they fit into achievement of the overall vision. Critical moves are ones that can be changed through adjusting a motivational factor or incentive; the manager's challenge is to identify the motivational factors and incentives that are most effective.

Motivating the elephant

For any change effort to be successful, personnel at all levels must be motivated. Managers must understand how can change be initiated from the bottom (low and mid-level personnel) up. To successfully motivate the elephant (e.g. the large part of the workforce who is primarily responsible for a majority of the day-to-day tasks), managers must recognize that their workforce must *feel* the need for change.

1. Find the feeling. Kohn's work on incentives, which has been echoed in later work by Pink and the Heath brothers, supports the notion that financial incentives alone are insufficient to drive effective organizational change.[475] Kohn argues that monetary incentives alone may in fact be used to circumvent other problems in the workplace. For example, Kohn suggests that sometimes firms who offer incentives to boost sales or cut costs may be working to compensate for unresolved management and/or leadership problems. Dr. Bernd Irlenbusch from the London School of Economics recently completed a meta-analysis of some 51 different studies on the impact of pay-for-performance and concluded "that financial incentives … can result in a

---

[475] Kohn, Alfie. (1993). Why incentive plans cannot work in Ultimate Rewards. ed. by S. Kerr. Harvard Business School Press.
Pink, Dan. (2009). Drive-the surprising truth about what motivates us. Riverhead Publishers.
Heath, Dan and Chip, (2010).

negative impact on overall performance."[476] Monetary incentives may actually encourage compliance as opposed to innovation (e.g. risk taking). As a result, monetary incentives alone result in reduced creativity within the workplace—a key ingredient when implementing a change effort.

The difference described here is between those incentives that are extrinsic (e.g. money) vs. those which are intrinsic (e.g. feelings). Extrinsic incentives are "contingent" motivators that only drive if-than behavior and are only effective for highly structured, narrowly focused rule or process based tasks. These types of tasks can be traced to traditional twentieth-century work activities that are production or process focused and derived from industrial-based theories of management. Examples of these types of tasks could be working on an assembly line in a factory making car parts or in a mailroom stuffing envelopes. Sales jobs often also fall into this category; the more appliances I sell, the larger commission I get. A problem with these types of incentives is that they can disrupt or terminate good relationships between co-workers across an organization because they are transformed into competitors instead of cooperators—working against each other vs. working together toward achievement of the common vision.[477] This behavior can thus be harmful to those job functions that require innovation, risk taking, and

---

[476] London School of Economics. (2009). When Performance-Related Pay Backfires. Retrieved from http://www2.lse.ac.uk/newsAndMedia/news/archives/2009/06/performancepay.aspx.

[477] Kohn, Alfie. (1993).
Ballentine, et. al. (ND). The role of monetary and non-monetary incentives in the workplace as influenced by career stage. Retrieved from http://edis.ifas.ufl.edu/pdffiles/HR/HR01600.pdf.

cooperation for problem solving.

Intrinsic motivators, on the other hand, are those motivating factors that influence an individuals behavior to do something because the activity matters, because they like doing the activity, because the activity is interesting, or because the activity is part of something important to them. For example, thousands of people each year volunteer for America's Armed Services. In many cases these brave individuals volunteer not because of the promise of hundreds of thousands of dollars in salary, but because of a feeling of national pride, duty, and honor—all intrinsic motivators. These types of motivators also happen to be well aligned with twenty-first century work that is tied to using complex technology to solve difficult problems. This type of work requires flexibility, innovation, creativity, etc.

Recent research demonstrates the value these intrinsic motivators have over extrinsic ones on incentivizing behavior. For example, a study funded by the U.S. Federal Reserve Bank on incentives and motivation found that when individuals performed tasks that only required mechanical skills for completion, extrinsic incentives such as monetary bonuses worked as expected—the higher the pay, the better the performance. However, the study found that once the task called for cognitive skill—even rudimentary in nature—a larger monetary reward actually led to poorer performance by the participants. In fact, the research found that in eight of the nine tasks examined across three different experiments requiring the use of cognitive skill vs. mechanical skill—higher incentives led to worse performance."[478] The distinction that can be deduced from this work is not that pay for performance doesn't work, but rather it is best suited for very specific, process-focused types of work while other incentives (intrinsic ones) are better suited for another type of work that demands more flexibility, creativity, innovation, and problem solving. Once a manager clearly identifies which incentives are best suited for his/her workforce, the must begin to think about how they can structure the environment to support the change effort by "shaping the path."

Shaping the path

Shaping the path is about managers removing obstacles to those elements in organizational processes that need to be changed for transformation to occur. In short, shaping the path is eliminating the barriers in day-to-day workflows that make change difficult to smooth the way ahead and ensure a fast track to success.[479] These barriers should be identifiable by management who works with low/mid-level personnel on a daily basis and understands the work unit routine. To successfully shape the path, managers should work to make two specific changes: 1. Tweaking the environment; and, 2. Rallying the heard.

---

[478] Ariely, D. et. al. (2005). Large Stakes and Big Mistakes. Retrieved from http://www.bos.frb.org/economic/wp/wp2005/wp0511.pdf.

[479] Heath, Dan and Chip, (2010).

1. Tweaking the environment. Managers must make it easy for personnel to embrace the changes that are required to achieve the desired vision. If MILSCOR implementation requires a major change effort across all levels of an organization, managers must be able to recognize the impact of key environmental factors on the MILSCOR implementation effort and be empowered to change those, which are barriers for success. For example, IT service provider Rackspace had a major problem with its customer service; it paid little attention to customer satisfaction as a means of evaluating its performance. Despite the fact that Rackspace was a "service" business, it actually viewed customer service as an additional cost which needed to be minimized as much as possible. When one angry customer was able to make contact with the company founder, the founder decided to tweak the environment to change the company's customer service performance for good. The founder's solution was simple: get rid of the automated customer service phone call queue so staff had to engage customers more quickly. If a customer called with a problem from now on, a staff member had to answer the phone otherwise it would keep ringing.[480]

2. Rally the herd. Once the environment is tweaked, management must work to rally the herd so everyone's efforts are aligned in the same direction. This step will be incredibly important for MILSCOR implementation, as there are numerous work units across DoD supporting the military Services and

---

[480] Barba, Jorge. (2010). How to change peoples behavior by tweaking the environment. Retrieved from http://www.game-changer.net/2010/10/27/how-to-change-peoples-behavior-by-tweaking-the-environment/#.UBLd1qlsq6G.

agencies. Rallying the herd can be accomplished most aptly by creating peer pressure that will drive the desired behavior change. Managers can accomplish this feat by creating mentors or a buddy system within a work unit to help personnel hold each other accountable for the change effort. Managers can also create support groups or dedicate time during business hours for personnel who are having difficulty can easily get assistance, ask questions, or undertake additional training. An important factor here is that these types of interventions must not seem punitive in nature; rather, they should be a part of a new expected trend of behavior.

Management Practice Barriers at DoD

The size and scope of management practices at DoD makes pinpointing a few that could applicable to the implementation of MILSCOR incredibly difficult. Perhaps the most important management practice, which is a barrier to MILSCOR implementation at DoD, is the Program Manager's (PMs) general aversion to "risk." In this context, we refer to aversion to risk as anything that might negatively impact prospects for achieving program goals and/or objectives. The section below will address this risk aversion for Program Managers in greater detail.

Management is Highly Risk Averse

DoD program managers are faced with the responsibility to coordinate a vast network of people and resources for the purposes of achieving program success. In many cases they are responsible for overseeing millions (if not billions) of dollars; anywhere from a few dozen to hundreds (or thousands) of people as well as a plethora of contractors from a variety of businesses. Consequently, the scope of a PMs responsibility is immense. Consistent with this, PMs have traditionally erred on the side of caution when it comes to management of risk. Over 70 percent of DoD professionals surveyed for this portion of the research agreed that in their experience, aversion to risk had negatively impacted opportunities for positive change.[481]

Risk management at DoD, like most other management practices, is something that follows the DoD's traditional hierarchical, command-and-control, bureaucratic theme which has been reiterated throughout the course of this research. As a result, DoD's view of "risk management" (and hence the PMs view) portrays risk as something that can be effectively managed through a series of repeatable and auditable processes such as those provided in DoD's Risk Management Guidebook.[482]

According to a recent Defense Business Board study on the subject, Program Managers have become incredibly risk averse because the bureaucratic process has eliminated their flexibility to make decisions. Instead, this system has been replaced with an extensive oversight processes which promotes "checkers, checking, checkers" throughout the program management

[481] See survey results in Appendix A.
[482] Department of Defense. (2006). DoD risk management guidebook. Retrieved from https://acc.dau.mil/CommunityBrowser.aspx?id=17757.

process.[483] This process has created a risk aversion has a direct impact on the willingness of PMs to accept new technology or potentially innovative ideas—thus reinforcing the “old” way of how things have always been done. For those major ACAT I programs which may be under incredible scrutiny from Congress and senior defense officials regarding program progress, this aversion to risk may lead to reinforcing old ideas because they are deemed “safe” or more risk prudent. To make matters worse, the acquisition system is set up to encourage PMs to spend money or reduce performance to reduce uncertainty (e.g. risk). However, rarely are PMs willing and able undertake the opposite—where a deliberate decision might be taken to increase uncertainty (e.g. risk) in order to save money or improve performance.[484]

For the purposes of this study, the issue of risk management also applies directly to DoD’s supply chain. Concerns over supply chain integrity have recently emerged due to several instances of counterfeit parts getting into DoD systems.[485] Perhaps even more worrisome is the emergent threat in DoD’s cyber supply chain. The cyber supply chain can be defined as:

> *The mass of IT systems--hardware, software, public, and classified networks--that together enable the uninterrupted operations of government agencies, public companies, and their major suppliers. It includes the entire set of key actors and their organizational and process--level interactions that plan, build, manage, maintain, and defend this infrastructure.*[486]

---

[483] Defense Business Board. (2011).

[484] Frick, D. (2010). Embracing uncertainty in DoD acquisition. Retrieved from http://www.dau.mil/pubscats/PubsCats/AR%20Journal/arj55/Frick_55.pdf.

[485] Corrin, Amber. (2011). Should contractors get blamed for counterfeit parts? Retrieved from http://washingtontechnology.com/articles/2011/11/08/sasc-hearing-counterfeit-parts-dod-supply-chain.aspx.

[486] Georgetown University Institute for Law, Science and Global Security & Cyber Security Seminars. (2010). Securing the cyber supply chain. Retrieved from

Of particular concern within the realm of cyber-security is the potential introduction of security risks during deployment, system operation, and design & development of key software and hardware that supports DoD operations. For example, as noted by Deputy Secretary of Defense William Lynn in 2008, the U.S. Department of Defense suffered a significant compromise of its classified military computer networks. In this particular case, a single flash drive, containing malicious code, was inserted into a U.S. military laptop overseas. The result was a breach of classified and unclassified systems where the malicious code spread autonomously throughout DoD's vast network of information systems. The incident was the most significant breach of U.S. military computers ever.[487] This single event sent shockwaves across the establishment and led to the generation DoD's first cyber security strategy to help develop an approach to protect the Department's 15,000 networks and seven million computing devices across around the globe.[488]

When examining this event within the context of a program manager's aversion to risk, the implications become readily apparent. In the near-term, an event such as the cyber-security breach noted above has the potential to only reinforce DoD's resistance to information sharing, citing potential information assurance concerns (e.g. risk management). Within the context of

---

http://lsgs.georgetown.edu/programs/CyberProject/SupplyChain/Securing%20the%20Cyber%20Supply%20Chain.pdf.

[487] Lynn, W. (2010). Defending a new domain. Retrieved from: http://www.foreignaffairs.com/articles/66552/william-j-lynn-iii/defending-a-new-domain.

[488] Department of Defense. (2011). Department of Defense strategy for operating in cyberspace. Retrieved from http://www.defense.gov/news/d20110714cyber.pdf.

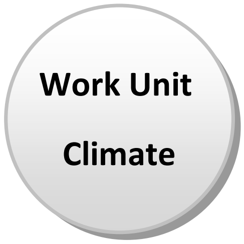
MILSCOR implementation, sharing of data across the enterprise becomes a cornerstone of successful supply chain integration permitting improved efficiency, performance, and reduced costs. Improved information exchange and transparency in data across the enterprise will be required for a successful MILSCOR implementation. Thus if DoD program managers are becoming increasingly risk-averse with respect to information sharing due to cyber threats—any effort to share data for the purposes of implementing a framework such as MILSCOR across the Defense enterprise will likely be resisted.

Recommendations for Improvement

Rebalance Management Autonomy and Flexibility against Control/Oversight

DoD's acquisition environment has become highly risk averse—particularly with respect to cyber security and information sharing. This aversion to risk has undermined the ability to openly share vital data across the Defense enterprise. Without open lines of communication between military, civilian and contractor elements that support the Department, real-time data sharing which is required for implementation of the MILSCOR framework will be impossible. To overcome this barrier, DoD must rebalance management autonomy and flexibility against high-level control/oversight. In short, additional flexibility in decision-making, particularly with respect to data sharing, should be considered when the benefits have the potential to significantly outweigh the risk. Personnel should be encouraged to innovate to solve potential cyber threats to help improve data sharing instead of being fearful regarding compliance of strict data control procedures.

Work Unit Climate



Work unit climate or the "feel" of a work unit can vary significantly at DoD. Climate is directly influenced by both organizational structure and systems. Successful implementation of a performance framework such as MILSCOR will ultimately require that features of work unit climate at DoD such as a resistance to sharing information and work unit sub-optimization be thoughtfully addressed. In short, an enterprise-wide performance framework will require that all work units are open to sharing information and working together to achieve the same end-goals.

Work Unit Climate in the Literature

Climate is the collective current impressions, expectations and feeling that members of local work units have that, in turn, affect their relations with their boss, one another, and with other units.[489] The "feel" of an organization is strongly influenced by both its culture and climate. The literature provides competing theories regarding how the "feel" of the organization or work unit climate is developed. Three main approaches to organizational climate exist in the literature: 1. The Multiple Measurement-Organizational Attribute Approach (MMOAA); 2. The Perceptual Measurements-Organizational Attribute Approach (PMOAA); and 3. The Perceptual Measurement-Individual Attribute Approach (PMIAA).

---

[489] Burke and Litwin, (1992).

The MMOAA was introduced by Forehand and Gilmer who defined organizational climate as a "*set of characteristics that describe an organization and that (a) distinguish the organization from other organizations, (b) are relatively enduring over time, and (c) influence the behavior of people in the organization."* This approach included a series of dimensions of organizational climate such as size, structure, etc. which could be examined through field studies.[490]

The Perceptual Measurements-Organizational Attribute Approach (PMOAA) defines an organization's climate by the individual perceptions of the organization.[491] In this context, James and Sells noted that climate can defined as "individual's cognitive representations of proximal environments."[492] Per Cambell et. al. climate is defined as:

> "*a set of attributes specific to a particular organization that may be induced from the way the organization deals with its members and its environment. For the individual member within an organization, climate takes the form of a set of attitudes and expectancies which describe the organization in terms of both static characteristics (such as degree of autonomy) and behavior-outcome and outcome-outcome contingencies*."

Further, Cambell et. al. identified a series of dimensions of organizational climate which influenced this perception including: individual autonomy, the

---

490 Forehand, G. A., & Gilmer, B. V. H. (1964). Environmental variation in studies of organizational behavior. *Psychological Bulletin,* 62, 361-382.

491 James, L. R. and Jones, A. P. (1974). organizational climate: A review of theory and research. *Psychological Bulletin* 81 (12), 1096-1112.

James, L. R. and Sells, S. B. (1981). Psychological climate: Theoretical perspectives and empirical research. In: Magnusson, D. (Ed.) *Toward a Psychology of Situations. An International Perspective*. Erlbaum,

492 IBID.

degree of structure imposed upon the position, reward orientation, and consideration, warmth and support.[493]

Finally, the Perceptual Measurement-Individual Attribute Approach (PMIAA), takes the individual perceptions from the PMOAA and focuses those which are shared across the work unit to define the climate. Reichers and Schneider define climate according to this approach as *"the shared perception of the way things are round here…shared perceptions of organizational policies, practices, and procedures."*[494] Schneider and Hall noted that such perceptions in this approach are really reflected as an interaction between a combination of both personal and organizational elements. In this case, Schneider and Hall found that the individual "acts as an information processor, using inputs from (a) the objective events in and characteristics of the organization and *(b)* characteristics (e.g., values, needs) of the perceiver."[495]

Numerous questionnaires have been developed to measure climate and to what degree various elements within the organization influence such as: the Agency Climate Questionnaire,[496] and the Business Organization Climate

---

[493] IBID

[494] Reichers, A. E. and Schneider, B. (1990). *Climate and culture: An evolution of constructs.* In: *Schneider, B. (Ed.) Organizational climate and culture.* Jossey-Bass.

[495] Schneider, B., & Hall, D. T. (1972). Toward specifying the concept of work climate: a Study of Roman Catholic Diocesan priests. *Journal of Applied Psychology*, 56, 447-455.

James, L. R. and Jones, A. P. (1974). Organizational climate: a review of theory and research. *Psychological Bulletin*, 81 (12), 1096-1112.

[496] Schneider, B., and Bartlett, C.J. (2006) Individual differences and organizational climate: II measurement of organizational climate by the multi-trait multi-rater matrix. *Personnel Psychology,* 23, 403-512.

Index,[497] Perhaps most notably, Litwin and Stringer developed an early organizational climate questionnaire which asked questions to participants on nine scales to gauge perceptions of the individuals in the organization. The scales included: Structure, Responsibility, Reward, Risk, Warmth, Support, Standards, Conflict and Identity.[498]

Work Unit Climate Barriers at DoD

Work unit climate differs from culture in that it can be most simply described as "the way we do things around here." Culture is a set of deeply rooted beliefs and values that underlie the climate of individual work units across the enterprise. As noted previously, some of the cultural beliefs that are widely held at DoD are barriers to the widespread adoption of a performance improvement tool like MILSCOR. Thus these cultural barriers also directly contribute to a series of climate barriers at DoD as well.

Internal Control of Information

As discussed previously in the section on Culture, there exists severe resistance toward cooperation and coordination across DoD's structural stove-pipes. This resistance is deeply rooted in the parochialism, resistance to change, and distrust of others that exists across many Services and agencies at DoD. As a result of this resistance, a sentiment within individual work units

---

[497] Payne, R.L. and Pheysey, D.C. (1971). Stern's organizational climate index: A reconceptualization and application to business organizations. *Organizational Behavior and Human Performance,* 6, 77-98.

[498] Litwin, G. and Stringer, R. (1968). *Motivation and organizational climate.* Harvard Business School Publications.

has emerged that dictates many functions must be done within the work unit itself and should not require outside intervention for completion. This behavior has directly influenced duplicative stove-pipes for completing of virtually identical functions as indicated in an earlier reference to DoD's some 2,300 independent business systems. A recent Defense Business Board study confirmed this assertion when it undertook a thorough review of DoD agencies and noted that many organizations within DoD have difficulty giving up control and trusting internal areas of responsibility with others across the greater enterprise.[499]

Part of this behavior is reinforced because of an unwillingness to share information outside of one's work unit. As a result, tasks that could be completed by others, either more efficiently or perhaps with greater performance, must be kept in-house because the requisite data isn't shared across the enterprise. Consequently, enterprise-wide efforts to engage in transformative behavior become stymied because senior leadership lacks a clear picture of what the enterprise really looks like; to what degree change may be occurring; and, if improvement efforts may be yielding any results.

Former Chief of Staff of the Air Force, General John Jumper, noted the existence of what he called "titanium stove-pipes," where ownership became more important than enterprise integration."[500] He reiterated that this was not a technology problem, but rather a people problem as people within individual

---

[499] Defense Business Board, (2011).
[500] Federal News Radio. (2011). Jumper: breaking "titanium stovepipes" key to DoD success. Retrieved from http://www.federalnewsradio.com/?nid=86&sid=2307836.

work units are simply not willing to share what they have or what they know across the greater enterprise.

Lack of an Enterprise-View (Optimization of the Parts vs. Whole)

The stove-piped organizational structure coupled with unique policies and processes and a culture supportive of parochial self-interest, resistance to change, and distrust drives work-units to sub-optimize outcomes. In short, the climate of individual work units is very much focused on achieving a specific, work-unit level task, in some cases these tasks are performed without consideration for how they may help achieve larger component Service or DoD-enterprise goals and objectives. With respect to DoD's supply chain specifically, the disintegrated nature of DoD's supply chain management structure and business processes make it incredibly difficult for a particular link in the chain to understand how it fits into the overall success (or failure) of the enterprise. This is especially true because of the absence of a single point at DoD with total responsibility for supply chain management.

This difficult directly contributes to the problem of optimizing the parts at the expense of the whole—while an individual link in the chain may become incredibly efficient for costs/performance but this improvement may have a negative impact on those organizations down-stream who rely on their outputs as inputs. For example, given the stove-piped organizational structure, resistance to information sharing, and wide-spread parochialism, when a new approach such as Performance-Based Logistics (PBL) is introduced, the aforementioned underlying conditions have directly contributed to a sub-optimization of DoD's supply chain. This sub-optimization is not because PBL is not successful at achieving its stated objectives of improved performance at lower costs, but rather because DoD's organizational climate doesn't support maximizing the promise of wide-spread PBL implementation across work unit barriers—a factor that directly impacts the success of implementing an enterprise framework like MILSCOR.

One example exists in DoD's use of an auxiliary power unit (APU) by multiple component Services on multiple weapon systems. While these units are supported by PBL, the PBL efforts for these units do not extend across the greater DoD-enterprise. Instead, each military Service has decided on an independent PBL support strategy, with its own set of metrics, and separate contracts with the very same OEM. This approach optimizes the individual parts, but by default creates overlap in contracting, administration, management, and loses the benefits of economies of scale. If a joint PBL approach were taken for the APU, the cost savings could be significant. A MILSCOR implementation at the enterprise-level would likely highlight many of these kinds of opportunities, but DoD organizations must be supportive of collaborating across work units and must be willing to optimize the "whole," not just individual links in the chain to capture joint economy and reduce unnecessary redundancy.[501]

[501] Woodlief, Paul. (2009). Delivering PBL. Retrieved from http://www.military-logistics-forum.com/military-logistics-forum/216-mlf-2009-volume-3-issue-10/2277-delivering-pbl.html.

Recommendations for Improvement

DoD Must Break Down Climate Barriers across Work Units

Current work unit climate at DoD is supportive of the organizational stove-pipes noted previously. The influence of organizational structure on conduct and ultimately performance cannot be overstated. For implementation of the MILSCOR model to be effective, members of individual work units must fully recognize the impact of their efforts across the enterprise to ensure they are not optimizing the “parts” at the expense of the “whole”. One way to accomplish this is to increase the use of cross-service or gov’t to industry rotations of personnel. Such rotations would allow members of individual work units to understand the perspectives of those who may exist at different parts of the chain (e.g. either their customers or their suppliers). As these individuals are rotated back to their home unit, they bring with them the knowledge of how their activities impact the other members of the supply-chain. Another mechanism for breaking down organizational climate barriers across work units is to shift the focus from a Service or Agency centric to mission/role centric. For example, instead of supporting the Navy, the mission or role could be altered to support the undersea mission. Such an approach encourages the development of a network-centric structure across the defense enterprise and readily supports implementation of the MILSCOR framework which demands enterprise-wide collaboration.

Chapter 6: Case TF-34/CF-34 Aircraft Engine

General Electric TF34 Turbofan

The TF34 engine was originally developed for the US Navy's S-3A Viking aircraft and the Air Force's A-10 Thunderbolt. The engine provides the highest thrust-to-weight ratio and the lowest specific fuel consumption in its class. Over time, the engine has proven to be reliable and maintainable at low operating costs.[502]

General Electric CF34 Turbofan

The CF34 is a commercial derivative of TF34. The CF34 is a commercial engine for regional jets. The engine has excellent performance, durability, and, a high level of reliability. The engine's dispatch reliability rate remains at 99.95 percent with more than 80 million flight-hours and 65 million cycles completed since 1992. GE has invested over $1 billion over the last decade to upgrade the reliability and performance of this engine.[503]

TF34 Base Consolidation: Alameda and Jacksonville.

Support for the TF34 engine is provided organically by the government through a network of military Depots. Support for this engine has undergone a series of transitions to various depot locations around the country. Following

[502] Hill Air Force Base. (2007). TF34 turbofan engine. Retrieved from http://www.hill.af.mil/library/factsheets/factsheet.asp?id=5742.

[503] General Electric. (2012). CF34 turbofan. Retrieved from http://www.geaviation.com/engines/commercial/cf34/.

the Base Closure and Realignment Commission's July 1993 recommendations, three of the Navy' six aviation depots were closed including the Alameda Naval Aviation Depot which performed maintenance on the TF34. As a result, the TF34 workload was transferred to the Jacksonville Naval Aviation Depot.[504] During this process severe delays occurred including several productivity and quality problems. Further, the monetary costs of the work transfer ended up being higher than anticipated. Despite this, the additional costs were unable to be fully quantified by either the Air Force or Navy. Some of the additional costs could be attributed to unanticipated equipment retooling at Jacksonville that was unexpected prior to the transfer.

Following the transition, it was found that the replacement frequencies during the overhaul process for TF34 parts were out of date and had to be completely revised. As part of this process, the Air Force insisted on full certification of all overhaul tasks that were unique to the Air Force *and* common to both the Air Force and Navy, despite the fact that this effort was duplicative in nature. Problems achieving the 100 percent certification requirements emerged when it was discovered that the Air Force lacked the necessary engineering support personnel to complete the task because of problems recruiting engineers.[505] When examining this experience through the lens of the MILSCOR framework it becomes evident that the transition process was not initiated

---

[504] General Accounting Office. (1998). Depot maintenance: lessons learned from transferring Alameda Naval Aviation Depot Engine Workloads. Retrieved from http://www.globalsecurity.org/military/systems/aircraft/systems/tf34.htm.
[505] IBID.

with a complete understanding of the drivers for supply chain reliability, responsiveness, agility, cost, and, asset management. Had a supply chain framework like MILSCOR been in place to provide a complete picture of the transition, many of these bad experiences could have been avoided. For example, had the all of the cost drivers associated with the transition been identified upfront-such as the need to retool equipment in Jacksonville—unexpected cost increases could have been planned for ahead of time. Likewise, regarding the lack of necessary engineering personnel, had an assessment of the human capital requirements needs versus available resources been conducted, appropriate measures could have been taken ahead of time to avoid the shortfall in staffing later on.

DoD has significantly improved its ability to support the TF34 to-date, however the Jacksonville Naval Aviation depot case provides an example of problems which may occur at the Depot level. As the TF34 engine continues to age, maintenance costs will continue to rise, ultimately placing greater pressure for the adoption of a performance-based logistics approach to sustainment. For example, in a 2009 case it was found that the failure of a portion of the turbine on the TF34 would require the replacement of 22 parts on over 800 engines at a cost of more than $900 million through FY2014.[506] Had these engines been supported by a warranty from the manufacturer, this

[506] Davis, Chris. (2009). A-10 aging aircraft issues. Retrieved from http://www.sae.org/events/dod/presentations/2009/b4chrisdavis.pdf.

unexpected repair cost may have been covered, thus saving the Government nearly $1 billion.

CF34 24x7, Around the Globe Repair Services and Warranty

The CF34 has a wide range of support options offered by General Electric and other engine repair and service providers around the world. GE's "On-Wing" and "On-Point" support coverage offers dispatched repair services 24 hours a day 7 days a week including a tool lease program for those performing repairs independently. Price plans for these programs are defined upfront depending upon the number of flight hours and level of service. GE also offers part warranties and guarantees for certain levels of aircraft reliability and performance. Service contracts exist either for fixed time intervals or based on condition of the parts. The services include all labor, material, repairs and testing.[507] Repairs can be made by GE at the plane's location as a technician will can be dispatched on-site to make the repairs.[508]

The nature of services offered by GE demonstrate the level of confidence they have not only in their engine design, but also in their ability to effectively predict expected maintenance requirements which will impact aircraft readiness. Further, GE's level of services demonstrates that it has used advanced supply chain modeling and forecasting capabilities to predict the frequency and associated costs for required service work. This permits

---

[507] General Electric. (2011). GE On Point Solutions (2011). Retrieved from http://cms.guides.com/cms_files/aircraftbluebook.com/MSP/GE%20OnPoint.pdf.
[508] IBID.

customers to know upfront, the cost of aircraft maintenance/repairs thereby minimizing the potential for unexpected costs.

Further, guaranteeing of 24/7 response to repair/service requests would not be possible without assurance of supply chain availability (for both goods and services) as well as flexibility and responsiveness. Undoubtedly, these characteristics are enabled in the private sector environment due to several differences in the transformational and transactional elements noted in the table below.

	TF34 (Alameda/Jacksonville)	CF34
Transformational Elements		
Leadership	Air Force/Navy	Various Airlines / Maintenance Company (GE)
Vision, Mission, Strategy	Readiness for the warfighter	Airlines: Readiness/Up-time tied to profit; Maintenance company: Readiness/Up-time tied to Profit
Culture	Process focused (no PBL)	Output focused tied to profitability
Transactional Elements		
Organizational Structure	Matrixed (a few specific depots can provide repairs)	Networked (global sources of supply for goods/services)
Systems (policies/processes)	Responsive after problem occurs.	Proactive, sense and respond, anticipatory.
Tasks and Individual Skills	Fixed number of repair personnel, subject to government employees available.	Global network of repair technicians available 24/7.
Motivation	Do your job	Profit
Management Practices	Seek to minimize risk	Motivated to balance risk vs. reward (profit).
Work Unit Climate	Depot specific	Networked structure enables work unit climate that is customer specific

Table 30. Comparison of Transformational and Transactional Elements between TF34 and CF34 Support Approaches.

Conclusion

The flexibility and responsiveness of the GE service and warranty program for the CF34 is precisely the capability needed by the military to ensure maximum operational readiness with a pre-determined, fixed set of costs. However, because the military is maintaining their TF34 variant organically, it is unable to take advantage of the benefits afforded by the GE program. If DoD could overcome some of the transformational and transactional barriers it faces to implementing a performance-based support strategy noted in the table above, it may be able to yield similar performance and cost outcomes as the private sector.

Chapter 7: Conclusion

In the post-9/11 era, the security environment has become much less predictable and has created a greater burden for America's military forces to endure. Even as the physical size of the military (in terms of both personnel and weapons systems) has declined post-Cold War, operations and maintenance spending has skyrocketed as the Department struggles to meets its vast array of mission requirements. Furthermore, the "death spiral"—a combination of inefficiencies in maintenance and support coupled with a poorly performing acquisition system—contributes to the reallocation of funds for new systems to sustainment coffers to extend the life-cycle of legacy systems. This practice is a long-time Defense Department force that must be broken. In light of these factors, for DoD to achieve mission success in the twenty-first century, it must seek to radically improve the performance of its supply chain at a significantly reduced cost. The MILSCOR framework provides an opportunity for DoD to accomplish this, however, significant barriers exist to its implementation. These barriers are composed of both transformational and transactional elements. To overcome these barriers, DoD must capitalize upon a combination of leadership and incentives among other factors to change the culture and climate across the defense enterprise. For the sake of the warfighter and the taxpayer, change must be made; the time is now.

Appendix A: Organizational Change Survey and Results

M. Arendt Dissertation Survey SurveyMonkey

1. What type of organization do you currently work for?

	Response Percent	Response Count
Public Sector - Civilian	12.5%	3
Public Sector - Military	**50.0%**	**12**
Private Sector - Contractor	37.5%	9
Academia	0.0%	0
	answered question	**24**
	skipped question	**0**

2. How many years have you been working in support of the Department of Defense (DoD)?

	Response Percent	Response Count
0-4	4.2%	1
5-9	**45.8%**	**11**
10-14	16.7%	4
15-19	8.3%	2
20 or more	25.0%	6
	answered question	**24**
	skipped question	**0**

3. What military branches/agencies have you been affiliated with? (if contractor, which have you supported most?) Select all that apply.

	Response Percent	Response Count
Army	33.3%	8
Air Force	20.8%	5
Navy	37.5%	9
Marine Corps	**54.2%**	**13**
Defense Logistics Agency	4.2%	1
Other	29.2%	7
	answered question	**24**
	skipped question	**0**

4. Have you ever been surveyed on DoD's modernization and/or transformation efforts?

	Response Percent	Response Count
Yes	20.8%	5
No	**79.2%**	**19**
	answered question	**24**
	skipped question	**0**

5. If yes to Question 4, by whom and when?

	Response Count
	4
answered question	**4**
skipped question	**20**

6. Leadership Have you experienced any of the following issues with senior leadership at DoD? Select all that apply.

	Response Percent	Response Count
High turnover/vacancy rate for key leadership positions	66.7%	14
Failure of senior leadership to convey the importance of why/how DoD must change how it operates	47.6%	10
Lack of empowerment by senior leadership to impact change	**81.0%**	**17**
	answered question	**21**
	skipped question	**3**

7. Vision, Mission, Strategy For the military branch/agency you support(ed), which of the following are measurable to evaluate success? Select all that apply.

	Response Percent	Response Count
Vision	41.7%	10
Mission	**83.3%**	**20**
Strategy	50.0%	12
Not sure	16.7%	4
	answered question	**24**
	skipped question	**0**

8. Culture Have you experienced competition with other Services, agencies?

	Response Percent	Response Count
Yes	75.0%	18
No	25.0%	6
answered question		24
skipped question		0

9. Culture Have you experienced cultural resistance to change?

	Response Percent	Response Count
Yes	83.3%	20
No	16.7%	4
answered question		24
skipped question		0

10. Culture If you answered Yes to either Question 8 or Question 9, what recommendations would you make to overcome competition and/or resistance to change?

	Response Count
	19
answered question	19
skipped question	5

11. Organizational Structure What one or two structural changes to DoD's organizational alignment do you believe would have the largest positive impact in the Department and why?

	Response Count
	16
answered question	16
skipped question	8

12. Systems (Policies and Processes) What one or two things would you do to improve reliability, maintainability, and supportability in DoD weapons systems?

	Response Count
	18
answered question	18
skipped question	6

13. Tasks/Skills Prior to being hired or receiving a promotion, do you believe all personnel (military, civilian, contractor) should pass a competency/skills assessment?

	Response Percent	Response Count
Yes	65.2%	15
No	34.8%	8
answered question		23
skipped question		1

14. Motivation/Incentives What workforce incentives do you believe would be most effective to motivate change at DoD?

		Response Count
		19
	answered question	19
	skipped question	5

15. Management Practices In your experience, has aversion to risk negatively impacted opportunities for positive change?

	Response Percent	Response Count
Yes	70.8%	17
No	29.2%	7
answered question		24
skipped question		0

16. Work Unit Climate What one or two improvements would you suggest to help DoD better share information across work unit boundaries?

		Response Count
		18
	answered question	18
	skipped question	6

17. Additional space for answer/description.		
		Response Count
		6
	answered question	6
	skipped question	18

Responses to questions are unaltered and completely anonymous.

Responses to Question 5: If yes to Question 4, by whom and when?

1. By the DoD, can't remember when.

2. US Marine Corps questionnaire in regards to repeal of Don't Ask Don't Tell

3. PEO IWS 7 (2007)

4. Several years ago. Not sure by who. probably whatever agency was in charge of transformation.

Responses to Question 10: If you answered Yes to either Question 8 or Question 9, what recommendations would you make to overcome competition and/or resistance to change?

1. increased/expanded cross-service rotations

2. WRT question 8, I believe competition is good. Competition drives for improvement in processes and sparks ingenuity. WRT question 9, I believe resistance is also a good quality. It just requires education on the change to instill it in the culture.

3. Boundaries and defined controls need to be established in order to keep from 'stepping on toes' and to avoid confusion on the actual location of Subject Matter Experts and controlling agencies. As for resistance to change, showing supported examples as to how the change will be beneficial or why it is necessary are key elements in overcoming such resistance.

4. let junior leaders have more say witht their marines.

5. Promote open creative thinking and idea soliciting from subordinates.

6. Reduce influence of the unions representing federal and civil service employees; reduce the feeling of a "job for life" for these employees

7. fire people

8. Coincidentally, a strong break from using surveys to analyze anything. I don't believe anyone trusts the 'anonymity' of questionaires. More importantly, I don't think anyone views surveys as a mechanism for growth/change. I was brought up on the slogan of the Marine Corps being a people business. Surveys undermine personal/professional discussion, distract Marines from more important tasks, and inflate the importance of numbers and percentages.

An unpopular view verbalized from a specific individual is more persuasive than a generalized stance supported from the anonymous population.

9. Strengthening ability to track key performance metrics and incorporate these into incentive and evaluation systems. Organizations need to know what are the key performance objectives and how they are performing against them. Also need to have a clearer picture of capability investment across DoD and within each service.

10. Move away from the GS system to a pay for performance compensation package

11. I don't believe the you can overcome the competition between services. Each service takes pride in what they do and there will be continuous competition between each branch of the service. As for cultural resistance... the Marine Corps prides itself on history and tradition, which is why there is such a resistance to change. This will always be hard to overcome.

12. To overcome resistance to change you need good leadership and communication at all levels why the change is needed. To change the competition between services and branches you need to change how funds are acquired in Washington.

13. It wasn't a resistance to the repeal of Don't Ask Don't Tell, no one cared when it was repealed, we cared how it was repealed, combined with the mentality of "are you kidding me?, your doing this right now?, we have much better things to be pre-occupied with."

14. The biggest item I can envision would be having leadership/sponsorship of strategic visioning and planning to establish roadmaps to execute toward the required transition while maintaining required daily operational duties.

15. Resistance to change usually comes from higher because they have been set doing things a certain way for longer. There should be a forum for junior leadership to be able to implement changes that will have effects at a bigger level than just their unit.

16. “Making a change in government is like trying to move a cemetery. You aren’t going to get any help from the residents.” (Former SECNAV Winter) It’s probably at least partially true that most insiders in government and industry don’t want major improvements. The acquisition insiders are not “most people”. Certainly the operational users and the taxpayers want major improvements. I think many current insiders would embrace improvements once shown the way. The bottom line is that we need “can do”, passionate and innovative folks as insiders. We have a few. We need more. Conversion of today’s insider to a new way is something to be pursued but, without the

infusion of fresh ideas and energy from outsiders, is doomed to failure. some fixes: 1. Include the operational warfighters in the system design process. They are the most knowledgeable regarding what new capabilities are required. Create open systems with processes that are designed to incorporate changes during the tours of individual operators. They will become strong program advocates who create a demand pull for performance improvements. 2. Establish a performance meritocracy in which candidate technologies are evaluated with common metrics and common data (open and closed). Utilize "peer review" groups to oversee the evaluation process. Establish a culture that understands decisions are to be made based on data driven analysis resulting in a level playing field for all. Select "peer review" members formed of experts from government, industry (including competitors), and academia. Remember the axiom…"no one organization knows all the answers". 3. Require roadmaps that provide real information on capabilities, resources, timeframes and options. Keep them current and make them available the entire community.

17. New leadership, increased external assessment, internal assessment, shortfalls addressed in resources, policy for continuous improvement in effectiveness, and efficiencies.

18. Bring in others senior leaders who are open minded over the old tried and true seasoned senior leaders. When their time is up, move them on and out, not bring them back

19. The competition was friendly and, given the nature of our business, I would argue that it is healthy and necessary and actually builds camaraderie and esprit de corps.

Responses to Question 11: What one or two structural changes to DoD's organizational alignment do you believe would have the largest positive impact in the Department and why?

1. Unite the services warfare labs under a DoD banner. There are still recognized service specific needs, but the alignment of the labs would have the potential to cross pollinate ideas that all services could benefit from (lesson learned in the first Gulf War about service to service combat communication shortcomings is a great example of what could have been avoided). This would also encourage equal investment by all services in technology procurement.

2. Streamlining and curtaling general level staffs across the board (agencies, services, etc)

3. Ensuring people with the right types of skills are n the right positions as well as ensuring on the job performance satisfaction.

4. not sure.

5. (1) Adjust the BRAC process to ensure that changes necessary to streamline infrastructure, including joint basing, can be carried out intelligently and without interference from legislators. This would allow savings to be realized to the federal taxpayer swiftly and allow legislators to focus on other issues for their constituents. (2) Increase the amount of training (PME, carrer-field training, etc.) done by contractors, reserve component, or gov't civilians to allow for active-duty uniformed men and women to focus on the "nuts and bolts" of providing for the daily mission of protecting our nation and its interests. (3) Continue the reduction of overseas permanent-party footprint, ensuring that as many dollars spent by our active-duty forces are spent in the US rather than in Germany, Korea, Italy, and Qatar.

6. alignment of $$ and programs

7. There are far too many senior officers holding redundant billets, and holding them for far too long. This means a push for joint operations has only ensured the opposite, whereby each service has a spokesman vice a shared office. It also means that the number of colonels and above have skyrocketed while we cut the population of junior officers and junior enlisted. Maintaining experienced personnel within the ranks is crucial. Forcing people to retire, and streamlining the goals of the DoD is equally important.

8. Strengthening the relationships between the Acquisition organizations of each service. Move to more common program management, contracting, and architecture principles.

9. Do a complete realignment that combines all branches of the government to one agency. This would eliminate redundant acquisitions

10. Change the structure of the non military DoD organizations to be more streamlined and less costly. Ensure the most cost effective process is put in place.

11. Get rid of alot of the smaller agencies within the DoD and the service branches that cause alot of red tape and bureaucracy that get in the way of the services actually doing their job.

12. The focus on "Jointness" as being pushed by DoD downward, it's reducing the number of subject matter experts big picture wise. Futhermore the feeling is that our non-military compatriots are not constrained to the same requirements. For us it's an order, however for them it's more of a suggestion if they wish to be promoted. Another structural change would be to can the

Hon. Mr Rumsfeld's idea of out-sourcing the support fields within the military to either bureaucrat's or civilian contractors.

13. Streamline the acquisition process

14. Allow the USMC to be it's own Department, instead of under the Navy. The Marines can make their decisions all they want, but at the end of the day still fall under the Navy.

15. DoD has three structural weaknesses?(1) people who make policy don?t spend enough time in the field, (2) the job is NOT done when the agency head signs the policy and (3) policy must be tied to allocation of resources?if not, the policy is, at best, advisory.

16. Goldwater-Nichols...1947 restructure....need major changes...breaking tradition...consolidation of resources...Funding is dwindling.

17. None recommended right now.

Responses to Question 12: What one or two things would you do to improve reliability, maintainability, and supportability in DoD weapons systems?

1. System engineering upfront and as previously mentioned - align ALL labs under a DoD banner.

2. -build reliability incentives into contracts (e.g. bonuses for achieving uptime/MTBF milestones) with attendant reductions in blanket O&M payments

3. Remove any and all political aspects and shaping from the decision processes.

4. Monitoring on the job performance more to ensure rapid response and supportability.

5. Imrpove the quality of the government workforce by making it easier to terminate employees for poor performance.

6. stop buys equipment from the lowest bidder.

7. Possibly more deployable contract maintanence/services prosvided by civilians.

8. Re-write FAR to streamline the RFQ - award process while holding contractors to specific standards for cost, quality, and delivery timelines

9. Reduce the influence of contracts and contractors in the acquisition process. Service members who actually have to use the systems are better suited to develop, maintain, and sustain them - since the accountabiilty for those systems is written into their job description, and they have to face their peers and the people that count on the success of those systems on a daily basis.

10. Require incorporation of Open Architecture contract language into programs. More rigorous enforcement of data rights -- and more reuse of items that the Government has rights for. For example, more strategic reuse of system components.

11. Put in the contract that DoD owns the intellectual capital or software codes used with the development of systems

12. Require manufactures to stand behind their products and produce a quality weapon. The warfighter is the most important aspect of the military and if he/she is ill equiped with unreliable weapons, then it is all for not.
13. Put more money into upgrading existing proven systems, and less (not all) into R&D projects that are looking way to far into the future.

14. Fund them. The civilian leadership forced the acquisition process into this corner that has resulted in bloated, uncapable, faulty systems, then goes and has dinner with the lobbyists that promote them, then the next day chides the services for not meeting milestones. Perhaps it is time to bring back in house development teams that can produce viable weapon systems.

15. Better definition of standards/interfaces, etc. to establish clear competition that eliminates proprietary lock in.

Responses to Question 14: What workforce incentives do you believe would be most effective to motivate change at DoD?

1. These recommendations apply to civilians and contractors only: Increased/improved telework policies Flex work hours/schedule The ability to fire dead weight without fear of reprisal or at a minimum, the ability to hold non-performers accountable (i. e. no raises!) Access to better equipment and easier procurement of needed work equipment (review the history and implementation ofNMCI and it's detremental impact on the warfare labs)

2. conveying proper authority / climate to induce suggestions for change

3. Stability in what retirement holds: medical care, pay, etc.

4. Monetary bonuses for demonstrating great on the job performance.

5. Providing proof that such changes have been beneficial and having strong, respectable leadership implementing it.

6. not sure.

7. Simply fostering creative thinking and allowing experimentation at certain levels.

8. Managed, wdie-spread implementation of Lean/Six Sigma intitiatives. Increased empowerment to make decisions and act upon those decisions at all levels

9. recognition, promotions

10. Workforce incentives have no place in the military. Individuals that meaure their success by the recognizition they receive are killing the military.

11. Allowing programs to "share in savings" obtained through reuse, better acquisition practices etc. Including appropriate criteria in personnel evaluation for key acquisition individuals.

12. pay for performance. Higher salaries at the top and lower in the middle. Put in bonuses for cost savings

13. losing your job would be an incentive

14. Enforce regulations and require accountability from those that hold key billets. If that person is not being accountable, he/she should be fired on the spot.

15. Again, most change will have to come from the political environment. Most DoD practices are derived from how Washington does buisness.

16. Speaking solely for the Officer Corps, being allowed use TA being the same across the board. The disparity between higher education opportunites across the services is a large motivator for me to leave the service.

17. Establish incentives/rewards/recognition for re-use and saving money. Too much emphasis on spending whatever budget you have and if you give back you won't see adequate resources in future.

18. DoD emphasizes program management with little or no emphasis on change. That is why we continue down the wrong path again and again. To incentivize change do these: 1. Identify “pioneering efforts” and recognize success appropriately…in both government and industry. Top managers must be involved hand-in-glove with the selection, protection, and rewarding of

these pathfinders. Folks with the requisite skills are a very precious asset…especially for a community that must change its culture. We cannot afford to lose the leaders with the energy, skills and courage required to lead transformation. If this happens as the result of lack of proper recognition, it's a big red flag to those sitting on the fence. If this happens, top management needs to be held accountable. 2. Require all sources competition for all senior government positions (GS-15 and above). I've met a number of extremely talented people in industry who would take a pay cut to lead a government program if it had the potential to make a real difference. This will send a clear signal to underperforming or otherwise recalcitrant civil servants that alignment with the spirit of the transformation matters in a personal way. 3. The career civil service is a comfortable place to be. It is too comfortable….especially at the senior levels. The accountability with teeth needs to be put in place. Institute mandatory 360 degree evaluations for the SES community. I would not limit this to only those in acquisition jobs. Many on the periphery have the power to obstruct progress. These evaluations must be connected with the strategic aims. One of these aims should be better coupling with the warfighter. The operational forces should have a place on the rating panel…as should successful pioneers. Be prepared to weed out those who are simply maintaining their empire or resting on their laurels. This will require planning and expertise not resident in the government.

19. Meritocracy, failure/risk encouraged, pay incentives based on speed, effectiveness, and efficiencies.

20. Performance incentives (financial).

Responses for Question 16: What one or two improvements would you suggest to help DoD better share information across work unit boundaries?

1. Not in my swim lane

2. -increased/expanded cross-service rotations

3. A common information management philosophy and network.

4. Routine training materials to understand what all the different teams and branches do within and outside of DoD so that it is well understood how employees can understand entire life cycle supportability and who to better contact for any information as there was a big lack in this.

5. not sure.

6. Orient DoD mentality more towards filling roles and completing missions rather than the focus on the service to which each member belongs.

7. N/A, there is too much unnecessary information sharing right now.

8. This is tricky, given the sensitive nature of so much information and the conflicting "openness" of the majority of current, trendy information sharing electronic media. It would almost be best if the DoD could create a "secure" twitter or facebook to parallel what is being used outside of the DoD space.

9. Exchange tours. There was a German in my advanced flight school class. I trained with various foreign nationals in earlier levels of flight school. But I've never had a US soldier or airman attached to my unit. Surely an Army administrative officer can do the job a Marine could for a couple months and learn/teach something valuable.

10. Development and enhancement of repository systems that can link budget and procurement information to component/system artifacts. Program acquisition teams should be able to identify potential components that can be reused. Also strengthening acquisition portfolio management support capabilities.

11. not sure, this is challenging.

12. Reenforce the fact that we're all working together for one unified purpose/goal.

13. Look at answer 11. It seems that the more programs are set up to accomplish information sharing, the more red tape we have to go through. Get rid of redundant agencies and streamline the process.

14. Stop trying to re-invent the wheel with a hodge-podge of internet applications. Transistion to a new networking protocol that does not rely upon civilian internet infrastructure. The military supposedly invented the internet (maybe Al Gore...) but we are woefully inept at utliizing it securely and effectively.

15. Establish mechanisms for real time collaboration and then establish rewards for effective collaboration.

16. Everyone has squirrel syndrome when gathering information. keep it to themselves because they think it will give them an advantage in gaining the contract, or the weapons system for their branch or company.

17. 1st....identify candidate functional areas in which cross cutting improvement is needed. 2nd...identify and combine the funding streams applicable for each of the selected areas. 3rd...For each area establish a centrally funded diverse “enterprise” executing consortium based on with

ground rules based on an open systems approach, transparency and an open business model.

18. Remove boundaries, greater situational awareness, incentives for sharing, increased feedback, and leadership encouragement.

19. Building a culture of trust in each other while dismantling many of the in place, ineffective and non-value added workforce. Unfortunately, this is challenging to detect, unless one is in the midst of such a workforce (as a former 1SG of mine currently is as a GS employee).

Bibliography

10 USC 2466. (2012). Limitations on the performance of depot-level maintenance of materiel. Retrieved from http://www.law.cornell.edu/uscode/usc_sec_10_00002466----000-.html.

10 USC 2469. (2012). Contracts to perform workloads previously performed by depot-level activities of the Department of Defense: requirement of competition. Retrieved from http://www.law.cornell.edu/uscode/usc_sec_10_00002469----000- .html.

Abrahams, Jeffrey. (1999). *The mission statement book: 301 corporate mission statements from America's top companies.* Ten Speed Press.

Abramson, Mark A., and Roland S. Harris. (2003). *The Procurement Revolution*. Rowman & Littlefield.

Acquisition Advisory Panel. (2007). Report of the Acquisition Advisory Panel to the Office of Federal Procurement Policy and the United States Congress. Retrieved from https://www.acquisition.gov/comp/aap/documents/Chapter5.pdf.

Adams, J.S. (1965). Inequity in social exchange. *Adv. Exp. Soc. Psychol.,* 62, 335-343.

Agripino, M. et. Al. (2002). A lean sustainment enterprise model for military systems. Retrieved from http://faculty.babson.edu/mathaisel/Pubs/AQR_LSEM.pdf.

Ainsley, J. Robert and James Riordan. (1999). DoD and the change paradigm. Retrieved from http://www.dau.mil/pubscats/PubsCats/AR%20Journal/arq99/ainsley.pdf.

Air Force Software Technology Support Center. (2003). Guidelines for successful acquisition and management of software-intensive systems: weapons systems, command and control systems, management information systems – condensed version 4.0. Retrieved from http://www.stsc.hill.af.mil/resources/tech_docs/gsam3/chap9.pdf.

Altiok, T., & Ranjan, R. (1995). Multi-stage, pull-type production/inventory systems. *IIE Transactions,* 27, 190-200.

Ariely, D. et. al. (2005). Large Stakes and Big Mistakes. Retrieved from http://www.bos.frb.org/economic/wp/wp2005/wp0511.pdf.

Arrif, H. et. al. (2008). Use of the analytical hierarchy process (APH) for selecting the best design concept. *Journal Teknologi.* 49(A): 1−18 Retrieved from http://www.penerbit.utm.my/onlinejournal/49/A/49siria1.pdf.

Ashforth, B.E., and F. Mael. (1989) Social identity theory and the organization. *Academy of Management Review,* 14 (1), 20-39.

Ashkenas, R. Et. Al. (1998). *The Boundaryless Organization: Breaking the Chains of Organizational Structure.* Prentice Hall.

Avolio, B.J., Zhu, W., Koh, W., & Bhatia, P. (2004). Transformational leadership and organizational commitment: Mediating role of psychological empowerment and moderating role of structural distance. *Journal of Organizational Behavior*, 25, 951-968.

Ballentine, et. al. (ND). The role of monetary and non-monetary incentives in the workplace as influenced by career stage. Retrieved from http://edis.ifas.ufl.edu/pdffiles/HR/HR01600.pdf.

Baramichai, M., Zimmers, E.W., & Marangos, C.A. (2007). Agile supply chain transformation matrix: An integrated tool for creating an agile enterprise. *Supply Chain Management: an International Journal,* 12, 334-348.

Barba, Jorge. (2010). How to change peoples behavior by tweaking the environment. Retrieved from http://www.game-changer.net/2010/10/27/how-to-change- peoples-behavior-by-tweaking-the-environment/#.UBLd1qlsq6G.

Bass, Bernard M. and Bruce J. Avolio. (1994). Improving organizational effectiveness through transformational leadership. Sage Publications.

Basu, R. (2001). New criteria of performance measurement. *Meas. Bus. Excel.*, 5, 7-12.

Beamon, B.M. (1998). Supply chain design and analysis: Models and methods. *International Journal of Production Economics* 55, 281-294.

________. (1999). Measuring supply chain performance. *International Journal of Operations and Production Management*, 19 (3), 275–292.

Betts, R. K. (1995). Military readiness. The Brookings Institution.

Bolden, R. et. Al. (2003). A review of leadership theory and competency frameworks. Retrieved from http://centres.exeter.ac.uk/cls/documents/mgmt_standards.pdf.

Bone, Elizabeth and Christopher Bolkcom. (2003). Unmanned aerial vehicles: background and issues for Congress. Retrieved from http://www.fas.org/irp/crs/RL31872.pdf.

Boudreau, Michael. (2006). Acoustic rapid COTS insertion: A case study in spiral development. Retrieved from http://www.acquisitionresearch.org/_files/FY2006/NPS-PM-06-041.pdf.

Bowen, D.E., Ledford, G.E., & Nathan, B.R., (1991). Hiring for the organization, not the job. *Academy of Management Executive*, 5 (4), 35-51.

Boxx, W. R., Odom, R.Y., and Dunn, M.G. (1991). Organizational values and value congruency and their impact on satisfaction, commitment, and cohesion. *Public Personnel Management*, 20, 195-205.

Boyson, S., Corsi, T., & Harrington, L. (2011). *X-SCM*. Routledge.

Brantley, Mark W. et. al. (2002). Expanding the trade space: An analysis of requirements tradeoffs affecting system design. Retrieved from http://www.dau.mil/pubscats/PubsCats/AR%20Journal/arq2002/Brantley.pdf.

Bretz, R.D., Ash, R.A., & Dreher, G.F. (1989). Do people make the place? An examination of the attraction-selection–attrition hypotheses. *Personnel Psychology*, 42, 561-581.

Brodsky, Robert. (2011). Survey shows growing distrust between industry and federal auditors. Retrieved from http://www.govexec.com/dailyfed/0111/011811rb1.htm.

Builder, C.H. (1989). *The masks of war: American military styles in strategy and analysis.* The John Hopkins University Press.

Burns, J.M. (1978). *Leadership*. Harper & Row.

Cahlink, G. (1998). Gansler: DoD in a ‘death spiral,’ program terminations likely. Retrieved from http://findarticles.com/p/articles/mi_6712/is_11_200/ai_n28715210/.

Cameron, K. S., & Quinn, R. E. (1999). *Diagnosing and changing organizational culture: based on the competing values framework.* Addison-Wesley.

Camm, Frank. (1993). The development of the F100-PW-220 and F110-GE-100 engines: A case study of risk assessment and risk management. Retrieved from http://www.rand.org/pubs/notes/2007/N3618.pdf.

Campbell, David, George Stonehouse, and Bill Houston. (2002). *Business Strategy*. Butterworth-Heinemann.

Carter, P. L., Monczka, R.M., Ragatz, G.L., & Jennings, P.L. (2009). *Supply chain integration: challenges and good practices*. Tempe, AZ: CAPS Research.

Chai, Barbara. (2009). How to stay motivated and get that bonus. Retrieved from http://online.wsj.com/article/SB10001424052748704152804574628230428869074.html.

Carlyle, Thomas. (1888). *On heroes, hero-worship and the heroic in history*. Fredrick A. Stokes & Brother.

Chan, Felix T.S., & Qi, H.J. (2003). An innovative performance measurement method for supply chain management. *Supply Chain Management: An International Journal,* 8(3), 209-223.

Chatman, J.A. (1989). Improving interactional organizational research: A model of person-organization fit. *Academy of Management Journal,* 14 (3), 333-349.

Checkland PB. (1978). The origins and nature of "hard" systems thinking. *Journal of Applied Systems Analysis,* 5, 99-110.

Christopher, M. & Peck, H. (2004). *Building the Resilient Supply Chain*. Cranfield School of Management.

Christy, D.P., & Grout, J.R. (1994). Safeguarding supply chain relationships. *International Journal of Production Economics,* 36, 233-42.

Cohen, M.A., & Lee, H.L. (1988). Strategic analysis of integrated production-distribution systems: models and methods. *Operations Research,* 36 (2), 216-228.

_________ (1989). Resource deployment analysis of global manufacturing and distribution networks. *Journal of Manufacturing and Operations Management,* 2, 81-104.

Cole, August. (2011). Afghanistan contractors outnumber troops. Retrieved from http://online.wsj.com/article/SB125089638739950599.html.

Cole, T. (2012). Cole statement on defense strategy announcement. Retrieved from http://cole.house.gov/news/press-releases/2012/01/cole-statement-on-defense-strategy-announcement.shtml.

Collins, Jim, and Jerry I. Porras. (1996). Building Your Company's Vision. *Harvard Business Review*, Sept./Oct, 65-77.

Congressional Budget Office. (1997). *Paying for military readiness and upkeep: Trends in operation and maintenance spending*. Congress of the United States.

Congressional Budget Office. (2011). Comparing the compensation of Federal and private-sector employees. Retrieved from http://www.cbo.gov/doc.cfm?index=12696.

Congressional Research Service. (2012). Circular A-76 and the moratorium on DoD competitions: Background and issues for Congress. Retrieved from http://www.fas.org/sgp/crs/misc/R40854.pdf.

Corrin, Amber. (2011). Should contractors get blamed for counterfeit parts? Retrieved from http://washingtontechnology.com/articles/2011/11/08/sasc-hearing-counterfeit-parts-dod-supply-chain.aspx.

CSCMP. (2010). CSCMP supply chain management definitions. *Council of Supply Chain Management Professional*s. Retrieved from http://cscmp.org/aboutcscmp/definitions.asp.

Daggett, S. & Belasco, A (2002). *CRS report for Congress: Defense budget for FY2003: Data summary*. Congressional Research Service.

Damanpour, F. and S. Gopalakrishnan. (1998). Theories of organizational structure and innovation adoption: the role of environmental change. *Journal of Engineering and Technology Management*, 15 (1), 1-24.

Daniel, L. (2010). Tempo takes toll on navy, marine equipment. Retrieved from http://www.navy.mil/search/display.asp?story_id=51559.

Daniell, Mark Haynes. (2004). *Strategy: a step-by-step approach to the development and presentation of world class business strategy.* Palgrave Macmillan.

Daniels, R. Steven and Carolyn L. Clark-Daniels. (2000). Transforming government: The renewal and revitalization of the Federal Emergency Management Agency. Retrieved from http://www.fema.gov/pdf/library/danielsreport.pdf.

Davis, Chris. (2009). A-10 aging aircraft issues. Retrieved from http://www.sae.org/events/dod/presentations/2009/b4chrisdavis.pdf.

Davis, D. (1995). State of a new art: manufacturers and trading partners learn as they go. *Manufacturing Systems,* 13(8), 2-10.

Davis, T. (1993). Effective supply chain management. *Sloan Management Review*, 35-46.

Day, George S., David J. Reibstein, Robert E. Gunther. (2004). *Wharton on dynamic competitive strategy.* John Wiley and Sons.

DeCelles, Katherine A., Tesluk, Paul, E. and Faye S. Taxman. (2012). A field investigation of multilevel cynicism toward change. *Organization Science, Articles in Advance:* 1-18.

Defense Business Board. (2010). Reducing overhead and improving business operations. Retrieved from http://dbb.defense.gov/MeetingFiles/presented.pdf.

Defense Business Board. A culture of savings. (2011). Retrieved from http://dbb.defense.gov/pdf/FY11-01-A-Culture-of-Savings-Final-Report_B256.pdf.

Defense Business Practice Implementation Board. (2003). Recommendations related to the continued implementation of performance-based logistics (PBL) in the Department of Defense. Retrieved from http://dbb.defense.gov/pdf/Supply-Chain-Report.pdf.

Defense Finance and Accounting Service. (n.d.). Defense finance and accounting service contractor and vendor payment information guidebook. Retrieved from http://www.dfas.mil/dms/dfas/contractorsvendors/pdf/ContractPayInformation-011110.pdf.

Defense Industry Daily. (2010). RFID Technology: Keeping Track of DoD's Stuff. Retrieved from http://www.defenseindustrydaily.com/RFID-Technology-Keeping-Track-of-DoDs-Stuff-05816/.

Defense Logistics Agency. (2010). Perfect order fulfillment. Retrieved from http://www.aviation.dla.mil/userweb/seprt/seprt17/doc/pof_book_draft5_dec10.doc.

Defense Logistics Agency. (2012). DLA land and maritime mission, vision and values.
Retrieved from http://www.dscc.dla.mil/About/vision_mission.asp.

Defense Logistics Agency. (2012). DLA aviation mission and vision. Retrieved from http://www.aviation.dla.mil/ExternalWeb/UserWeb/aviationengineering/missionandvisio n.asp.

Defense Logistics Agency. (UD). History of the Defense Logistics Agency. Retrieved from http://www.dla.mil/history/Pages/history.aspx.

Defense Science Board. (2004). Corrosion control. Retrieved from http://www.acq.osd.mil/dsb/reports/ADA428767.pdf.

Defense Science Board. (2011). Improvements to services contracting. Retrieved from http://www.acq.osd.mil/dsb/reports/ADA550491.pdf.

Defense Business Board. (2009). Review of the National Security Personnel System. Retrieved from http://dbb.defense.gov/pdf/Review_of_National_Security_Personnel_System_Final_Report.pdf.

Defense Business Board. (2011). Review of DoD’s program managers. Retrieved from http://dbb.defense.gov/pdf/FY11-03_Program_Manager_Final_Report.pdf.

Deming, W. Edwards. (2000). *Out of the crisis*. MIT Press.

Department of the Air Force. (ND). DD Form 1423, Contract data requirements list items. Retrieved from http://www.kirtland.af.mil/shared/media/document/AFD- 080401-055.pdf.

Department of the Air Force. (2011). LIMS-EV 101 Brief. Retrieved from http://www.acq.osd.mil/log/mpp/cbm+/Briefings/LIMS-EV_OSD_CBMPlus_AG_Brief.pdf.

Department of the Army. (UD). Common Logistics Operating Environment. Retrieved from http://www.army.mil/aps/08/information_papers/transform/Common_Logistics_Operating_Environment.html.

Department of Defense. (2003). Designing and assessing supportability in DoD weapons systems. Retrieved from http://www.dau.mil/pubscats/PubsCats/FINAL%20GUIDE%20with%20Memo%20-%20October%2024.pdf.

Department of Defense. (2003). Directive 7045.47: The planning, programming, and budgeting system (PPBS). Retrieved from http://www.dtic.mil/whs/directives/corres/pdf/704514p.pdf.

Department of Defense. (2005). Civilian human capital strategic plan 2006-2010. Retrieved from https://acc.dau.mil/adl/en-US/364217/file/50204/7%20-%20DAW%20HCSP%20Chap2%20Analytics%20v87%20E.pdf.

Department of Defense. (2006). DoD risk management guidebook. Retrieved from https://acc.dau.mil/CommunityBrowser.aspx?id=17757.

Department of Defense. (2007). Department of Defense Directive 8320.02: Data sharing in a net-centric Department of Defense. Retrieved from http://www.dtic.mil/whs/directives/corres/pdf/832002p.pdf.

Department of Defense. (2007). Department of Defense Instruction 4151.21: public- private partnerships for depot-level maintenance. Retrieved from http://www.dtic.mil/whs/directives/corres/pdf/415121p.pdf.

Department of Defense. (2007). DoD's standard practice military marking for shipment and storage. Retrieved from http://www.acq.osd.mil/log/rfid/mil-std-129pch4.pdf.

Department of Defense. (2007). Department of Defense standard practice identification marking of U.S. military property. Retrieved from http://www.easysoftcorp.com/usefulfiles/MIL-STD-130N.pdf.

Department of Defense. (2008). Department of Defense standard practice for military packaging. Retrieved from http://elsmar.com/pdf_files/Military%20Standards/MIL-STD-2073-1E.pdf.

Department of Defense. (2008). DoD logistics human capital strategy. Retrieved from http://www.acq.osd.mil/log/sci/hcs/DoD_Logistics_HCS.pdf.

Department of Defense. (2009). DoD weapon system acquisition reform product support assessment. Retrieved from https://acc.dau.mil/adl/en-US/328610/file/47489/DoD%20Weapon%20System%20Acquisition%20Reform%20PSA_19%20NOV_Final.pdf.

Department of Defense. (2009). Technology readiness assessment (TRA) deskbook. Retrieved from: http://www.dod.mil/ddre/doc/DoD_TRA_July_2009_Read_Version.pdf.

Department of Defense. (2010). Applying system engineering to life cycle sustainment. Retrieved from https://acc.dau.mil/CommunityBrowser.aspx?id=328734.

Department of Defense. (2011). Defense federal acquisition regulations: Subpart 216-4 incentive contracts. Retrieved from http://www.acq.osd.mil/dpap/dars/dfars/html/current/216_4.htm#BM216_4.

Department of Defense. (2011). Department of Defense strategy for operating in cyberspace. Retrieved from http://www.defense.gov/news/d20110714cyber.pdf.

Department of Defense. (2011) Directive 5000.01: The defense acquisition system. Retrieved from http://www.dtic.mil/whs/directives/corres/pdf/500001p.pdf.

Department of Defense, Office of the Deputy Chief Management Officer. (2011). Department of Defense enterprise transition plan. Retrieved from http://dcmo.defense.gov/etp/FY2011/content.html?tpl=tpl1&d=content_etp_sys_over.xml.

Department of Defense. (2012). Sustaining U.S. global leadership: Priorities for twenty-first century defense. Retrieved from http://www.defense.gov/news/Defense_Strategic_Guidance.pdf.

Department of Defense. (2012). Wide area work flow. Retrieved from https://wawf.eb.mil/ Defense Finance and Accounting Service. (2011). Electronic commerce and wide area workflow overview. Retrieved from http://www.dfas.mil/dms/dfas/ecommerce/pdf/WAWFOverviewCaptivatever5.pps.

Department of Defense Office of the Deputy Chief Management Officer. (2012). Mission and vision. Retrieved from http://dcmo.defense.gov/mission-vision.html.

Department of Defense. (2012). Joint capabilities integration and development system (JCIDS) manual. Retrieved from https://acc.dau.mil/CommunityBrowser.aspx?id=267116&lang=en-US.

Department of Defense Chief Information Officer. (UD). The DoD CIO mission and vision. Retrieved from http://cio-nii.defense.gov/docs/card.pdf.

Dipetto, C. (2008). DoD energy demand: Addressing unintended consequences. Retrieved from http://www.acq.osd.mil/se/briefs/20080912-ODUSD-AT-Energy- Demand-Brief-DiPetto.pdf.

Deal, Terrence E. and Allan A. Kennedy. (1982). *Corporate cultures: the rights and rituals of corporate life.* Addison-Wesley Publishing Company.

De Toni, A., & Tonchia, S. (2001). Performance measurement systems: models, characteristics and measures. *International Journal of Operations & Production Management* 21 (1).

Dong, J., Ding, H., Ren, C., & Wang W. (2006). *IBM SmartSCOR- A SCOR based supply chain transformation platform through simulation and optimization techniques*. China Research Laboratory.

Drucker, Peter F. (2001). *The essential Drucker.* Harper Collins Publishers.

Dudley, Peter. (1996). Bogdanov's tektology (1st Engl transl). Centre for Systems Studies, University of Hull.

Dwoskin, E. & Ratnam, G. (2011). U.S. military rushes to ship out eight years of Iraq war gear. Retrieved from http://www.bloomberg.com/news/2011-12-15/u-s- military-rushes-to-ship-out-eight-years-of-iraq-war-gear.html.

Eaglen, M. and Pollak, J. (2011). How to save money, reform processes, and increase efficiency in the Defense Department. Retrieved from http://www.heritage.org/research/reports/2011/01/how-to-save-money-reform-processes-and-increase-efficiency-in-the-defense-department.

Edwards, J.R., (1991). Person-job fit: A conceptual integration, literature review, and methodological critique. In C.L. Cooper & I.T. Robertson (Eds.), *International Review of Industrial and Organizational Psychology*. Wiley.

Eide, P. and Allen, C. (2012). The more things change acquisition reform remains the same. Retrieved from http://www.carlisle.army.mil/usawc/dclm/The%20More%20Things%20Change%20Acq%20Reform%20Remains%20the%20Same%20%28Eide,%20Allen,%20DARJ%2061%29.pdf.

Ellison, R. J., Goodenough, J.B., Weinstock, C.B. & Woody, C. (2010) *Evaluating and mitigating software supply chain security risks*. Software Engineering Institute, Carnegie Mellon.

Erwin, S. I. (2012). Army’s acquisition of battle network slowed down by red tape. Retrieved from http://www.nationaldefensemagazine.org/archive/2012/March/Pages/Army%E2%80%99sAcquisitionofBattleNetworkSlowedDownbyRedTape.aspx.

Estevez, A. (2010). *High-risk logistics planning: progress on improving Department of Defense supply chain management*. Washington, D.C.: Department of Defense.

Ewing, P. (2011). What costs even more than DoD's weapons? Its 'services'. Retrieved from http://www.dodbuzz.com/2011/07/29/what-costs-even-more-than-dods-weapons-its-services/.

Fabbe-Costes, N. & Marianne J. (2008). Supply chain integration and performance: a review of the evidence. *The International Journal of Logistics Management,* 19 (2), 130-154.

Farrell, B. and Hutton, J. (2011). DoD civilian personnel: competency gap analyses and other actions needed to enhance DoD's strategic workforce plans. Retrieved from http://armedservices.house.gov/index.cfm/files/serve?File_id=59a75007-2245-436c-8c6a-3b934a9a546b.

Federal Acquisition Regulations (FAR) Subpart 7.5, Retrieved from https://www.acquisition.gov/far/html/Subpart%207_5.html.

Federal Acquisition Regulations (2011). Subpart 16.5-Indefinite delivery contracts. Retrieved from https://www.acquisition.gov/FAR/current/html/Subpart%2016_5.html.

Federal News Radio. (2011). Jumper: breaking "titanium stovepipes" key to DoD success. Retrieved from http://www.federalnewsradio.com/?nid=86&sid=2307836.

FedEx. (2012). FedEx history. Retrieved from http://about.van.fedex.com/our_company/company_information/fedex_history .

Fiedler, F. (1964). A contingency model of leadership effectiveness. *Advances in Experimental Social Psychology,* 1, 149-190.

Francis, P. & Shaw, G. (2000) *Effect of Aircraft Age on Maintenance Costs*. Alexandria, VA: Center for Naval Analyses.

Freedberg, S.J. (2008) Aging aircraft. *National Journal.*

Frick, D. (2010). Embracing uncertainty in DoD acquisition. Retrieved from http://www.dau.mil/pubscats/PubsCats/AR%20Journal/arj55/Frick_55.pdf.

Fogarty, K. (2006). Lockheed Martin revs up supply chain ahead of F-35 fighter. Retrieved fromhttp://www.eweek.com/c/a/IT-Management/Lockheed-Martin-Revs-Up-Supply-Chain-Ahead-of-F35-Fighter/.

Forehand, G. A., & Gilmer, B. V. H. (1964). Environmental variation in studies of organizational behavior. *Psychological Bulletin,* 62, 361-382.

Galbraith, J.R. (1973). *Designing complex organizations*. Addison-Wesley.

Galbraith, J.R. (1977). *Organization design*. Addison-Wesley.

Gansler, J.S. (1999). Defense conversion. MIT Press: Cambridge, MA.

Gansler, Jacques S. "Defense Acquisition History Project Interview of Dr. Jacques S. Gansler," September 12, 2002. Retrieved from http://www.history.army.mil/acquisition/research/int_gansler.html.

Gansler, Jacques S., and Robert E. Luby. (2004). *Transforming government supply chain management*. Rowman & Littlefield.

Gansler, J. & W. Lucyshyn, (2004). Implementing alternative sourcing strategies: Four case studies. Retrieved from http://www.businessofgovernment.org/sites/default/files/Implementing%20Alternative%20Sourcing%20Strategies.pdf.

Gansler, Jacques S. and Lucyshyn, William. (2006). Evaluation of performance based logistics. Retrieved from from http:// acquisitionresearch.org/index.php?option=com_c ontent&task=view&id=100&Itemid=41.

Gansler, J.S. & W. Lucyshyn, (2008). *Commercial-off-the-shelf (COTS): Doing it right*. University of Maryland Center for Public Policy and Private Enterprise.

Gansler, J.S., Lucyshyn, W. & Spiers, A. (2008). *Using spiral development to reduce acquisition cycle times*. University of Maryland Center for Public Policy and Private Enterprise.

Gansler, Jacques S. and William Lucyshyn. (2009). Defense business transformation. Retrieved from http://www.ndu.edu/CTNSP/docUploaded/Defense%20Business%20Transformation%20Report.pdf.

Gansler, Jacques S., William Lucyshyn and Michael Arendt. (2009). Competition in defense acquisitions. Retrieved from http://acquisitionresearch.net/index.php?option=com_content&task=view&id=350&Itemid=41.

Gansler, J. Lucyshyn, W., & Arendt, M. (2010). Defense acquisition workforce modernization. Retrieved from http://www.acquisitionresearch.net/files/FY2010/UMD-AM-10-163.pdf.

Gansler, J. S. & Lucyshyn, W. (2011). An evaluation of IDIQ contracts for services. Retrieved from http://www.acquisitionresearch.net/_beta/files/FY2011/NPS-AM-11-C8P08Z02-107.pdf.

Gansler, J. S. (2011). *Democracy's arsenal*. MIT Press.

Garrett, G. And Beatty, F. (2011). DoD moves to implement will-cost and should cost management. Retrieved from http://www.navigant.com/~/media/Site/Insights/Government/Will_Cost_Should_CostManagement_Government.ashx.

Gates, R. M. (2010). *Remarks as delivered by secretary of defense Robert M. Gates*. Retrieved from http://www.defense.gov/speeches/speech.aspx?speechid=1467.

General Accounting Office. (1996). Logistics planning: opportunities for enhancing DoD's logistics strategic plan. Retrieved from http://www.fas.org/man/gao/ns97028.htm.

General Accounting Office. (1998). Depot maintenance: lessons learned from transferring Alameda Naval Aviation Depot Engine Workloads. Retrieved from http://www.globalsecurity.org/military/systems/aircraft/systems/tf34.htm.

General Accounting Office. (2001). Defense logistics: strategic planning weaknesses leave economy efficiency and effective of future support systems at risk. Retrieved from http://www.gao.gov/new.items/d02106.pdf.

General Electric. (2011). GE On Point Solutions (2011). Retrieved from http://cms.guides.com/cms_files/aircraftbluebook.com/MSP/GE%20OnPoint.pdf.

General Electric. (2012). CF34 turbofan. Retrieved from http://www.geaviation.com/engines/commercial/cf34/.

George Mason University. (2001). Biography of a leader: Jack Welch. Retrieved from http://mason.gmu.edu/~vdoherty/Portfolio/Products/jwelch.html.

Gerras, Steven J., Leonard Wong, Charles D. Allen. (2008). Organizational culture: applying a hybrid model to the U.S. Army. Retrieved from http://www.carlisle.army.mil/usawc/dclm/Organizational%20Culture%20Applying%20a%20Hybrid%20Model%20to%20the%20U%20S%20%20Army%20Nov%2008.docx.

Georgetown University Institute for Law, Science and Global Security & Cyber Security Seminars. (2010). Securing the cyber supply chain. Retrieved fromhttp://lsgs.georgetown.edu/programs/CyberProject/SupplyChain/Securing%20the%20Cyber%20Supply%20Chain.pdf.

Gimenez, G., & Ventura, E. (2005). Logistics-production, logistics-marketing and external integration – their impact on performance. *International Journal of Operations and Production Management,* 25 (1), 20-38.

Goldsmith, S. & Eggers, W.D. (2004) *Governing by Network*. Brookings Institution Press.

Gosselin, Maurice. (1998). The effect of strategy and organizational structure on the adoption and implementation of activity-based costing. *Accounting, Organizations and Society.* 22 (2), 105-122.

Goure, David. (2011). In-sourcing and why government costs so much. Retrieved from http://www.nationaldefensemagazine.org/archive/2011/March/Pages/FederalAgencyInsourcingWhyGovernmentCostsSoMuch.aspx.

Government Accountability Office. (2007). DoD personnel clearances: Delays and inadequate documentation found for industry personnel. Retrieved from http://www.gao.gov/new.items/d07842t.pdf.

Government Accountability Office. (2009). *Defense acquisitions: DOD must prioritize its weapon system acquisitions and balance them with available resources*. Government Accountability Office.

Government Accountability Office. (2009). Lack of key information may impede DoD's ability to improve supply chain management. Retrieved from http://www.gao.gov/products/GAO-09-150.

Government Accountability Office. (2009). Increased attention on fuel demand management at DoD's forward-deployed locations could reduce operational risks and costs. Retrieved from http://www.gao.gov/products/GAO-09-388T.

Government Accountability Office. (2010) *DoD's high risk areas: Observations on DoD's progress and challenges in strategic planning for supply chain management.* Retrieved from http://www.gao.gov/new.items/d10929t.pdf.

Government Accountability Office. (2010). Best practices: DoD can achieve better outcomes by standardizing the way manufacturing risks are managed. Retrieved from http://www.gao.gov/new.items/d10439.pdf.

Government Accountability Office. (2010). DoD's high risk areas: observations on DoD's progress and challenges in strategic planning for supply chain management. Retrieved from http://www.gao.gov/new.items/d10929t.pdf.

Government Accountability Office. (2010). Defense management: DoD has a rigorous process to select corrosion prevention projects, but would benefit from clearer guidance and validation of returns on investment. Retrieved from http://www.gao.gov/new.items/d1184.pdf.

Government Accountability Office. (2011). DoD needs to take additional actions to address challenges in supply chain management. Retrieved from http://www.gao.gov/new.items/d11569.pdf.

Government Accountability Office. (2011). DoD financial management: Ongoing challenges in implementing the financial improvement and audit readiness plan. Retrieved from http://www.govexec.com/pdfs/091611cc2.pdf.

Government Accountability Office. (2012). DoD supply chain management. Retrieved from http://www.gao.gov/highrisk/risks/dod-management/supply_chain_management.php.

Government Accountability Office. (2012). DoD approach to business transformation. Retrieved from http://www.gao.gov/highrisk/risks/dod-management/business_transformation.php.

Graham, P. (1995). *Mary Parker Follett: Prophet of management.* Beard Books.

Graham, John W. and Wendy C. Havlick. (2007). *Mission statements: A guide to the corporate and non-profit sectors*. Taylor and Francis.

Grasso, V. B. (2011). Circular A-76 and the moratorium on DoD competitions: background and issues for Congress. Retrieved from http://www.ieeeusa.org/policy/eyeonwashington/2012/documents/OMBCirculara76.pdf.

Gregory, R. (UD). General systems theory: A framework for analysis and social change. Retrieved from http://wsarch.ucr.edu/archive/papers/gregory/gensysTh.html.

Gunasekaran, A., Patel, C. & Tirtiroglu, E. (2001). Performance measures and metrics in a supply chain environment. *International Journal of Operations & Production Management*, 21(1),71-87.

Hammel, T., & Kopcak L. (1993). Tightening the supply chain. *Production and Inventory Management Journal,* 34(2), 63-70.

Handfield, R.B. (1995). *Re-engineering for Time-based Competition*. Quorum.

Handfield, R.B., & Pannesi, R.T. (1992). An empirical study of delivery speed and reliability. *International Journal of Operations and Production Management,* 12 (58).

Handy, C. (1978). *Gods of management: The changing work of organizations.* Oxford University Press.

Heath, Chip and Dan Heath. (2010). *Switch*. Crown Business.

Hennman, L. (UD). Foundations of strategy: mission, vision, and values. Retrieved from http://www.henmanperformancegroup.com/articles/Foundations-of-Strategy.pdf.

Herrmann, R. et. Al. (2010). Planning, programming, budgeting systems: A review and analysis of Department of Defense implementation. Retrieved from http://userwww.sfsu.edu/~katucker/documents/ppbs.pdf.

Hersey, P. and Blanchard, K.H. (1982). *Management of organizational behavior: utilizing human resources*, 4th ed. Prentice-Hall.

Herzberg, F. (1964). The motivation-hygiene concept and problems of manpower.*Personnel Administration*, 3–7.

Herzberg, Frederick, Mausner, Bernard, and Barbara Bloch Snyderman. (2009). The motivation to work. Transaction Publishers.

Hill Air Force Base. (2007). TF34 turbofan engine. Retrieved from http://www.hill.af.mil/library/factsheets/factsheet.asp?id=5742.

Hoffman, James C. and Tustin Kamps. (2005). At the crossroads. Retrieved from http://www.airpower.au.af.mil/airchronicles/apj/apj05/spr05/hoffman.html.

Holmberg, S.(2000). A system perspective on supply chain measurement. *International Journal of Physical Distribution & Logistics Management* 30 (10), 847-868.

Hoover, J.N. (2004) Air Force To Tackle Supply Chain Security. Retrieved from http://www.informationweek.com/news/government/security/showArticle.jhtml?articleID=226900005.

Hoskisson, Robert, Michael Hitt, and R. Duane Ireland. (2009). *Business strategy: theory.* South-Western.

Huan, S.H., Sheoran, S.K. & Wang, G. (2004). Review and analysis of the supply chain operation reference (SCOR) model. *Supply Chain Management: an International Journal* 9, 23-29.

Intel. (2002). The SCOR experience at Intel. Retrieved from http://logespro.cujae.edu.cu/upload/Caso7SCOR-INTEL.pdf.

Inspector General of the United States Department of Defense. (2011). Ballistic testing and product quality surveillance for the interceptor body armor – Vest components need improvement. Retrieved from http://www.dodig.mil/audit/reports/fy11/11-030.pdf.

Irgens, O,M. (1995). Situational leadership: a modification of Hersey and Blanchard. *Leadership & Organization Development Journal,* 16 (2), 36-39.

Ishii, K., Takahashi, K. & Muramatsu, R. (1988). Integrated production, inventory and distribution systems. *International Journal of Production Research,* 26 (3), 473-82.

Jackson J.H. and Morgan C.P. (1982). *Organization theory,* Prentice-Hall.

Jackson, MC. (UD). Fifty years of systems thinking for management. Retrieved from http://www.incose.org/newsevents/news/docs/Fifty_years_of_systems_thinking_for_management.pdf.

James, L. R. and Jones, A. P. (1974). Organizational climate: A review of theory and research. *Psychological Bulletin* 81 (12), 1096-1112.

James, L. R. and Sells, S. B. (1981). Psychological climate: Theoretical perspectives and empirical research. In: Magnusson, D. (Ed.) *Toward a Psychology of Situations. An International Perspective*. Erlbaum, Johnson, J. (1993). *Age impacts on operating and support costs: Navy aircraft age analysis methodology*. Naval Aviation Maintenance Office.

Johnson, M.E., & Davis, T. (1995). Gaining and edge with supply chain management. *APICS -- The Performance Advantage,* 5(12), 26-31.

Johnson, N.B. (2012). Empower DoD's CIO, panel urges Panetta. Retrieved from http://www.federaltimes.com/article/20120122/DEPARTMENTS01/201220303/.

Joint Chiefs of Staff. (2012). The dictionary of military and associated terms. JCS Publication 1-02. Retrieved from www.dtic.mil/doctrine/new_pubs/jp1_02.pdf.

Jones, Patricia, and Larry Kahaner. (1995). *Say It and Live It: The 50 Corporate Mission Statements That Hit the Mark*. Currency/Doubleday.

Joyce, W.F., & Slocum, J.W. (1984). Collective climate: agreement as a basis for defining aggregate climates in organizations. *Academy of Management Journal,* 27, 721-742.

Joyce, Paul. (2000). *Strategy in the public sector: a guide to effective change management.* John Wiley.

JITC. (UD). Integrated Data Environment & Global Transportation Network Convergence (IGC). Retrieved from http://jitc.fhu.disa.mil/igc/index.html and https://acc.dau.mil/CommunityBrowser.aspx?id=267660.

Kaplan, R. S. & Norton, D.P. (1996). *The balanced scorecard*. Boston, MA: Harvard Business School Press.

Kaplan, Robert S. and David P. Norton. (2000). Having trouble with your strategy? Then map It. *Harvard Business Review*, Sept/Oct.

Kaplan, R. S. & Anderson, S. R. (2005). Rethinking activity-based costing. Retrieved from http://hbswk.hbs.edu/item/4587.html.

Katz D. and Kahn R.L. (1978). *The social psychology of organizing,* Wiley.

Katz, D. and Kahn, R. (1978). *The social psychology of organizations*. Wiley.

King, T.K. (2009). Pit crew maintenance in the brigade support battalion. *Army Logistician.*

Koberg, C. S., Boss, W., Senjem, J. C., & Goodman, E. A. (1999). Antecedents and outcomes of empowerment: Empirical evidence from the health care industry, *Group and Organization Management*, 34 (1), 71-91.

Kohn, Alfie. (1993). Why incentive plans cannot work in Ultimate Rewards. ed. by S. Kerr. Harvard Business School Press.

Koontz, Harold. (1980). The management theory jungle revisited. *Academy of Management Review*. 5 (3), 175-187.

Kotter, J. (1982). *The general managers.* Free Press.

Kotter, John. (1999). *John P. Kotter On What Leaders Really Do*. Harvard Business Press.

Kotter, John. (2007). Why transformation efforts fail. Retrieved from http://hbr.org/2007/01/leading-change-why-transformation-efforts-fail/ar/.

Kourdi, Jeremy. (2003). *Business strategy: a guide to effective decision making.* Profile.

Kurt Salmon Associates, Inc. (1993). *Efficient consumer response: Enhancing consumer value in the grocery industry*. Washington, D.C.: Food Marketing Institute.

Lambert, B. (2011). Testimony of Brett B. Lambert on Nov. 1, 2011 before the United States House Committee on Armed Services, Defense Business Panel. Retrieved from http://armedservices.house.gov/index.cfm/files/serve?File_id=efff14a7-4cf8-4751-86b7-ed0330c71271.

Lawler III, E. et. al. (1974). Organizational climate: relationship to organizational structure, process and performance. *Organizational Behavior and Human Performance*, 11 (1), 139-155.

Lawrence, P.R., & Lorsch, J.W. (1969). *Organization and environment: managing differentiation and integration.* Harvard Business School.

Lebas, M.J. (1995). Performance measurement and performance management. *International Journal of Production Economics,* 41(1): 23-25.

Lee, H.L., & Billington, C. (1993). Material management in decentralized supply chains. *Operations Research,* 41(5), 835-47.

Levy, R.A. (1991). *ASPA and the effect of deferred depot maintenance on airframe rework cost.* Center for Naval Analyses.

Lewin, K. (1951). *Field theory in social science.* Harper & Row.

Litwin, G. and Stringer, R. (1968). *Motivation and organizational climate.* Harvard Business School Publications.

Locher, James R. (2002). *Victory on the Potomac: the Goldwater–Nichols Act unifies the pentagon.* Texas A & M University Press.

London School of Economics. (2009). When Performance-Related Pay Backfires. Retrieved from http://www2.lse.ac.uk/newsAndMedia/news/archives/2009/06/performancepay.aspx.

Losey S. and Castelli, E. (2009). Congress ends NSPS: DoD bill also includes new benefits for Feds. Retrieved from http://www.federaltimes.com/article/20091026/DEPARTMENTS01/910260304/-1/RSS.

Lummus, R. & Vokurka R. (1999). Defining supply chain management: a historical perspective and practical guidelines. *Industrial Management and Data Systems,* 99 (1), 11–17.

Lynn, W. (2010). Defending a new domain. Retrieved from: http://www.foreignaffairs.com/articles/66552/william-j-lynn-iii/defending-a-new-domain.

Mabey, C. et. Al. (2001). *Organizational structuring and restructuring* in Salaman, G. ed. *Understanding business organizations.* Routledge.

Maslow, A.H. (1943). A Theory of Human Motivation. *Psychological Review* 50 (4), 370-96.

Mayo, Elton. (2007). *The social problems of an industrial civilization.* Routledge.

Mayo, Elton. (2003). *The human problems of an industrial civilization*. Routledge.

Maze, R. (2009). Lawmakers move to end NSPS. Retrieved from http://www.federaltimes.com/article/20090622/DEPARTMENTS01/906220308/.

McGregor, Douglas. (1985). *The human side of enterprise*. McGraw-Hill/Irwin.

Mediratta, Bharat. (2007). The Google way: give engineers room. Retrieved from http://www.nytimes.com/2007/10/21/jobs/21pre.html.

Meyer, J.W. and Rowan, B. (1977). Institutionalized organizations: formal structure as myth and ceremony. *The American Journal of Sociology*, 83 (2), 340-363.

Mills, Steve, Fouse, Scott and Allen Green. (2011). Creating and sustaining effective Partnership between government and industry. Retrieved from http://www.acquisitionresearch.net/_beta/files/FY2011/NPS-AM-11-C8P11R03-047.pdf.

Mintzberg, Henry. (1975). The manager's job: folklore and fact. Retrieved from http://rafael.glendale.edu/ppal/Busad%20101/mintzbergmar1990.pdf.

Mintzberg, Henry. (2009). The best leadership is good management. Retrieved from http://www.businessweek.com/magazine/content/09_33/b4143068890733.htm.

Moore, Mark Harrison. (1995). *Creating public value: strategic management in Government.* Harvard University Press.

Moore, Mark, and Khagram, Sanjeev. (2004). On creating public value. Retrieved from http://www.hks.harvard.edu/m-rcbg/CSRI/publications/workingpaper_3_moore_khagram.pdf.

Moore, S. C. et. al. (1995). A framework for characterization of military unit training status. technical report. National Defense Research Institute, RAND Corp.

Moss, Charmaine. (2011). Empowerment and its roll in leadership. Retrieved from http://www.goodfellow.af.mil/news/story.asp?id=123255506.

Mullins, L. J. (1993). *Management and organizational behavior.* Pitman Publishing.

Nanus, B. (1992). *Visionary leadership*. Jossey-Bass.

NASA. (2009). Human Space Flight. Retrieved from http://spaceflight.nasa.gov/history/.

National Defense University. (UD). Strategic leadership and decision making: organizational culture. Retrieved from http://www.au.af.mil/au/awc/awcgate/ndu/strat-ldr-dm/pt4ch16.html.

Naylor, Wes. (2011). BAMS UAS & Global Hawk joint efficiencies. Retrieved from http://www.sae.org/events/dod/presentations/2011/BAMS_UAS_AND_Global_Hawk.pdf.

Neely, A., Gregory, M. & Platts, K. (1995). Performance measurement system design. *International Journal of Operations and Production Management*, 15: 80-116.

Newhart, D.D., Stott, K.L., & Vasko, F.J. (1993). Consolidating product sizes to minimize inventory levels for a multi-stage production and distribution systems. *Journal of the Operational Research Society,* 44 (7), 637-44.

New York Times. (2011). Predator drones and UAVs. Retrieved from http://topics.nytimes.com/top/reference/timestopics/subjects/u/unmanned_aerial_vehicles/index.html.

Nye, J. (2008). *The powers to lead*. Oxford University Press.

Obama, B. H. (2009). Remarks by the president at signing of the weapons systems acquisition reform act of 2009. Retrieved from http://www.whitehouse.gov/the_press_ office/Remarks-by-the-President-at-signing-of-the-Weapons-Systems-Acquisition-Reform-Act.

Office of Management and Budget. (1993). Government Performance Results Act of 1993. Retrieved from http://www.whitehouse.gov/omb/mgmt-gpra/gplaw2m.

Office of Management and Budget. (ND). FY 2011 President's Budget: Historical Tables Retrieved from http://www.whitehouse.gov/omb/budget/Historicals/.

Office of the Secretary of Defense, Director for Defense Procurement and Acquisition Policy. (2010). Taxonomy for the acquisition of services. Retrieved fromhttp://www.acq.osd.mil/dpap/policy/policyvault/USA006267-10-DPAP.pdf.

Office of Personnel Management. (2011). Federal Viewpoint Survey. Retrieved from http://www.fedview.opm.gov/2011/.

Office of the Secretary of Defense. (2011). PGI 216.4: Incentive contracts. Retrieved from http://www.acq.osd.mil/dpap/dars/pgi/pgi_htm/PGI216_4.htm.

Office of the Assistant Secretary of Defense for Acquisition. (2012). Civil military integration of the industrial base. Retrieved from http://www.acq.osd.mil/asda/initiatives/factsheets/civil_military_integration/index.shtml.

O'Hallaron, Richard, and David O'Hallaron. (2000). *The mission primer: four steps to an effective mission statement*. Mission Incorporated.

Oliver, R.K., & Webber, M.D. (1992). Supply chain management: logistics catches up with strategy, in *Logistics, The Strategic Issue*. Chapman & Hall.

Osborne, Mike. (2010). Increasing logistical speed and agility. Retrieved from http://www.military-logistics-forum.com/mlf-archives/229-mlf-2010-volume-4-issue-2-march/2596-increasing-logistical-speed-and-agility.html.

Ouchi, W.G. (1977). The relationship between organizational structure and organizational control. *Administrative Science Quarterly*, 22, 95-113.

Ouchi, W. (1980). Markets, bureaucracies and clans. *Administrative Science Quarterly* 25,129-141.

Pagell, M. (2004). Understanding the factors that enable and inhibit the integration of operations, purchasing and logistics. *Journal of Operations Management,* 22(5), 459-87.

Pappalardo, Joe. (2011). The future for UAVs in the Air Force. Retrieved from http://www.popularmechanics.com/technology/aviation/military/4347306.

Payne, R.L. and Pheysey, D.C. (1971). Stern's organizational climate index: A reconceptualization and application to business organizations. *Organizational Behavior and Human Performance,* 6, 77-98.

Payne, R. and Mansfield, R. (1973). Relationships of perceptions of organizational climate to organizational structure, context, and hierarchical position. *Administrative Science Quarterly*. 18, (4), 515-526.

Pearce II, John A. and Fred David. (1987). Corporate mission statements: the bottom line. *The Academy of Management Executive*, 1 (2), 109-115.

Performance Management Group, LLC. (2003). Boost the bottom line with supply chain best practices. Retrieved from http://www.pmgbenchmarking.com/resource/publication/signal/SC_SignalVol4No1.Pdf.

Phelps, T. (2006). *SCOR and benefits of using process reference models.* Taipei: Hewlett Packard.

Pierre-Alain, M., Schmitt, P., & Botta-Genoulaz, V. (2009). The SCOR model for the alignment of business processes and information systems - Enterprise Information Systems. *Enterprise Information Systems* 3 (4), 393-407.

Pink, Dan. (2009). Drive-the surprising truth about what motivates us. Riverhead Publishers.

Pink, Dan. (2009). The Surprising Science of Motivation Retrieved from. http://www.ted.com/talks/dan_pink_on_motivation.html.

Poluha, R. G. (2007). *Application of the SCOR model in supply chain management*. Cambria Press.

Porter, M.E. (1979). How competitive forces shape strategy. *Harvard Business Review*, March/April.

Porter, M.E. (1980). *Competitive strategy.* Free Press.

Porter, M.E. (2008). The five competitive forces that shape strategy. *Harvard Business Review*, Jan.

Public Broadcasting Service. (2011). Gates aims for a “culture of savings and restraint”. Retrieved from http://www.pbs.org/newshour/bb/military/jan-june11/defensecuts1_01-06.html.

Quinn, R. E. and M.R. McGrath. (1985). *The transformation of organizational cultures, in organizational culture.* Sage.

Rapoport, A. and Horvath, W. (1968). Thoughts on organizational theory, in Walter Buckley, ed. *Modern systems research for the behavioral scientist*. Aldine Publishing Company.

Raymond, L. et. Al. (1995). Matching information technology and organizational structure: An empirical study with implications for performance. *European Journal of Information Systems.* 4, 3-16.

Reilly, S. (2011). Experts : DoD could slash 150k jobs. Federal Times. Retrieved from http://www.federaltimes.com/article/20111204/BENEFITS01/112040307/.

Robert Duncan, R. (1979). What is the right organization structure? Decision tree analysis provides the answer. *Organizational Dynamics*, Winter.

Robbins, S.F., and Judge, T.A. (2007). *Organizational behaviour*. Pearson Education Inc.

Rolstandas, A. (1995). *Performance measurement: A business process benchmarking approach*. Chapman & Hall.

Roth, A.V., &.Miller, J.G. (1990). Manufacturing strategy, manufacturing strength, managerial success, and economic outcome.. *Manufacturing Strategies*, 97-108.

Sahadi, J. (2011). Which pays better: government or private sector? Retrieved from http://money.cnn.com/2012/01/31/news/economy/federal_worker_pay/index.htm?iid=GM.

Safizadeh, M.H., Ritzman,L.P., Sharma, D., & Wood, C. (1996). An empirical analysis of the product–process matrix. *Management Science* 42,1576-91.

Saaty, R.W. (1987). The analytic hierarchy process—What it is and how it is used. *Mathematical Modeling*, 9 (3-5), 161-176.

Saaty, T. L. (2008). Relative measurement and its generalization in decision making why pairwise comparisons are central in mathematics for the measurement of intangible factors the analytic hierarchy/network process. Retrieved from http://www.rac.es/ficheros/doc/00576.PDF.

Schick, A. (2007). The road to PPB: The stages of budget reform. In Jay Shafritz & Albert Hyde (Eds.), *Classics of Public Administration*. Thomson Wadsworth.

Schneider, B., and Snyder, R.A. (1975). Some relationships between job satisfaction and organizational climate. *Journal of Applied Psychology*, 60, 318-328.

Scheinder, B. Goldstein, H.W., and Smith D.B. (1995). The ASA framework: An update. *Personnel Psychology* 48, 747-773.

Schneider, B. et. al. (1996). Creating a climate and culture for sustainable organizational change. In Organizational Change: A Comprehensive Reader. Retrieved from http://media.wiley.com/product_ancillary/64/04702605/DOWNLOAD/chapter41.pdf.

Schneider, B., and Bartlett, C.J. (2006) Individual differences and organizational climate: II measurement of organizational climate by the multi-trait multi-rater matrix. *Personnel Psychology,* 23, 403-512.

Scholes, Kevan and Gerry Johnson. (2001). *Exploring public sector strategy.* Prentice Hall.

Scott, William G. (1961). Organizational theory: An overview and an appraisal. *Journal of the Academy of Management*, 4(1), 7-26.

Shaw, P. (2008). Achieving DoD's net centric vision of information sharing while overcoming cultural biases to control information. Retrieved from http://www.hsdl.org/?view&did=22019.

Skinner, B.F. (1953). *Science and human behavior.* Macmillan.

Sledge Jr., N. (2012). Pentagon resource wars: Why they can't be avoided. Retrieved from http://www.nationaldefensemagazine.org/archive/2012/February/Pages/Pentag on ResourceWarsWhyTheyCan%E2%80%99tBeAvoided.aspx.

Stankowski, John. (2011). Unmanned aircraft systems - maintenance support challenges. Retrieved from http://www.sae.org/events/dod/presentations/2011/Unmanned_Aircraft_Syste ms_Maintenance_Support_Challenges.pdf.

Sturgeon, T. J. (2002). Modular Production Networks: A New American Model of Industrial Organization. *Industrial and Corporate Change*. 11 (3), 451-496.

Software Engineering Institute. (ND) Longer begets bigger. Retrieved from http://www.sei.cmu.edu/library/assets/longerbetter.pdf.

Southwest Airlines. (2012). Fact sheet. Retrieved from http://www.southwest.com/html/about-southwest/history/fact-sheet.html#distinctions.

Srivastava, B. (2010). Critical management issues for implementing RFID in supply chain management. *International Journal of Manufacturing Technology and Management.* 21(3/4).

Stadtler, H. (2008). *Supply chain management and advanced planning: concepts, models, software, and case studies*. Springer Verlag.

Stewart, G. (1997). Supply-chain operations reference model (SCOR): the first cross-industry framework for integrated supply-chain management. *Logistics Information Management* 10(2), 62-67.

Stock, G.N., Greis, N.P. & Kasarda, J.D. (1998). Logistics, strategy and structure: a conceptual framework. *International Journal of Operations & Production Management,* 18 (1), 37-52.

Spekman, R.E., Kamauff Jr., J.W., & Mhyr, N. (1998). An empirical investigation into supply chain management: a perspective on partnership. *Supply Chain Management,* 3, 53-67.

Spring, B. (2010). Performance-based logistics: Making the military more efficient. *The Heritage Foundation*.

Society for Human Resource Management. (2008). Leadership competencies. Retrieved from http://www.shrm.org/Research/Articles/Articles/Pages/LeadershipCompetencies.aspx.

Supply Chain Council. (2010). What is SCOR? Retrieved from http://supply-chain.org/about/scor/what/is.

Taylor, Frederick Winslow. (1911). *The principles of scientific management.* Harper & Brothers.

The Global Logistics Research Team at Michigan State University. (1995). *World Class Logistics*. Council of Logistics Management.

Thompson J.D., (1966). *Organization in action.* McGraw-Hill.

Tirole, Jean. (1988). *The theory of industrial organization.* MIT Press.

Tirpak, J. (2010). Raptor final steps. Retrieved from http://www.airforce-magazine.com/DRArchive/Pages/2010/October%202010/October%2004%202010/Raptor%E2%80%99sFinalSteps.aspx.

Towill, D.R., Naim, M.M., & Wikner, J. (1992). Industrial dynamics simulation models in the design of supply chains. *International Journal of Physical Distribution & Logistics Management,* 22(5), 3-13.

Tuttle Jr., W. G. (2005). Defense logistics for the twenty-first century. Naval Institute Press.

Ulwick, Anthony W. and John Greenwood. (2000). *Business strategy formulation: theory, process and the intellectual revolution.* IAP.

Under Secretary of Defense for Acquisition, Technology and Logistics. (2010). Memorandum for acquisition professionals. Retrieved from http://www.acq.osd.mil/docs/USD_ATL_Guidance_Memo_September_14_2010_FINAL.PDF.

United States Joint Chiefs of Staff. (2008). *Joint Publication 4-0: Joint Logistics*. United States Department of Defense.

United States Marine Corps. (n.d.). Wide area work flow detailed instructions. Retrieved from www.lejeune.usmc.mil/contracting/**wawf**_detailed_instructions.doc.

United States Marine Corps (2010). 6 Hours: A marine expeditionary unit needs only six hours to plan and mobilize a mission.

USA Today. (2008). U.S. Marines will shift to Afghanistan. Retrieved from http://www.usatoday.com/news/washington/2008-12-08-marine-afghanistan_N.htm.

Vancouver, J.B., Millsap, R.E., & Peters, P.A., (1994). Multilevel analysis of organizational goal congruence. *Journal of Applied Psychology,* 79, 666-679.

Venkatraman, N., & Ramanujam, V. (1987). Measurement of business economic performance: an examination of method convergence. *Journal of Management,* 13, 109-122.

Vickery, S.K., Droge,C., Yeomans, J.M., & Markland, R.E. (1995). Time-based competition in the furniture industry: an empirical study. *Production and Inventory Management Journal* 36, 14-21.

Voudouris, V.T. (1996). Mathematical programming techniques to debottleneck the supply chain of fine chemical industries. *Computers and Chemical Engineering,* 20, S1269-74.

Walker, D. M. (2007) *Long-term budget outlook: Deficits matter—Saving our future requires tough choices today*. Washington, D.C.: United States Government Accountability Office.

Walker, Gordon. (2003). *Competitive strategy.* McGraw-Hill International.

Wall, Bob, Mark R. Sobol, and Robert S. Solum. (1999). *The mission-driven organization.* Prima Publishing.

Wang, Y.D. (2006). *Factory to foxhole: Improving the army's supply chain*. RAND Corporation.

Washington Post. (2006). Left of boom. Retrieved from http://www.washingtonpost.com/wp-srv/world/specials/leftofboom/index.html.

Washington Post. (2007). More attacks, mounting casualties. Retrieved from http://www.washingtonpost.com/wpdyn/content/graphic/2007/09/28/GR2007092802161.html.

Weber, Max. (1946). *Bureaucracy*. Oxford University Press.

Werther, W. (1999). Structure-driven strategy and virtual organization design. *Business Horizons*, 42 (2), 13-18.

Wharton School of the University of Pennsylvania. (2003). Managing supply chains: What the military can teach business (and vice versa)." *Knowledge@Wharton*.

Wilson, James Q. (1991). *Bureaucracy: what government agencies do and why they do it*. Basic Books.

Wilson, W. (1887). The study of administration. *Political Science Quarterly*, 2 (2), 197-222.

Woodlief, Paul. (2009). Delivering PBL. Retrieved from http://www.military-logistics-forum.com/military-logistics-forum/216-mlf-2009-volume-3-issue-10/2277-delivering-pbl.html.

Woods, F. A. (1913). The influence of monarchs: steps in a new science of history. Macmillan.

Worden, R.M. (2008). Developing Twenty-First-Century Airpower Strategists. *Strategic Studies Quarterly.* Spring, 18-32.

Worthy, J. (1950). Organizational structure and employee morale. *American Sociological Review*. 15 (2), 169-179.

Wren, D. et. al. (2002). The foundations of Henri Fayol's administrative theory. Retrieved from http://www.bus.lsu.edu/bedeian/articles/Fayol.pdf.

Xiao, Qinghan, et. al. (2007). RFID security issues in military supply chains. availability, reliability and security. Retrieved from http://ieeexplore.ieee.org/Xplore/login.jsp?url=http%3A%2F%2Fieeexplore.ieee.org%2Fiel5%2F4159773%2F4159774%2F04159853.pdf%3Farnumber%3D4159 853&a uthDecision=-203.