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THESIS

EVALUATION OF ORGANIZATIONAL SELF-ASSESSMENT TOOLS AND METHODOLOGIES TO MEASURE CONTINUOUS PROCESS IMPROVEMENT FOR THE NAVAL AVIATION ENTERPRISE

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September 2006

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13. ABSTRACT (maximum 200 words)

The Naval Aviation Enterprise (NAE) has created a program called AIR*Speed* to deliver the efficiency gains of continuous process improvement (CPI). NAE leadership seeks a self-assessment tool to measure how well AIR*Speed* has been implemented, including possible areas for improvement. This thesis studies the origins of continuous process improvement, the value of assessment, and current assessment methodologies. Key concepts are cited for the use of organizational assessment tools. The objectives are an enhanced body of knowledge for enterprise assessment, to provide a comparison of several approaches, and to recommend a tool for NAE AIR*Speed*. The tools to be considered are the Department of Defense CPI Transformation Guidebook (DoD CPITG), the Navy's Performance Excellence Guidebook (NPEG), the Lean Aerospace Initiative (LAI) Government Lean Enterprise Self-Assessment Tool (GLESAT), and the NAVAIR Alignment Assessment Tool (NAAT). Research revealed that three of the four tools (DoD CPITG, NPEG, and GLESAT) could efficiently measure AIR*Speed* maturity, and recommendations were made that a performance management framework be established by the NAE prior to implementation of any formal assessment process. The maturity level of NAE AIR*Speed* could be baselined using the LAI tool in those areas where lean principles have been implemented over a period of years.

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EVALUATION OF ORGANIZATIONAL SELF-ASSESSMENT TOOLS AND METHODOLOGIES TO MEASURE CONTINUOUS PROCESS IMPROVEMENT FOR THE NAVAL AVIATION ENTERPRISE

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ABSTRACT

Naval Aviation is being required to defend the nation in transformational ways, with constrained resources. To support these efforts, the Naval Aviation Enterprise (NAE) was created to improve the life-cycle management of naval aviation warfare systems. To meet the demands of this vision, the NAE has created a program called AIR*Speed* to deliver the efficiency gains of continuous process improvement (CPI). NAE leadership seeks a common self-assessment tool to measure how well AIR*Speed* has been implemented, including possible areas for improvement. This thesis studies the origins of continuous process improvement, the value of assessment, and current assessment methodologies. Key concepts are cited for the use of organizational assessment tools. The objectives are an enhanced body of knowledge for enterprise assessment, to provide a comparison of several approaches, and to recommend a tool for NAE AIR*Speed*. The tools to be considered are the Department of Defense CPI Transformation Guidebook (DoD CPITG), the Navy's Performance Excellence Guidebook (NPEG), the Lean Aerospace Initiative (LAI) Government Lean Enterprise Self-Assessment Tool (GLESAT), and the NAVAIR Alignment Assessment Tool (NAAT). Research revealed that three of the four tools (DoD CPITG, NPEG, and GLESAT) could efficiently measure AIR*Speed* maturity, and recommendations were made that a performance management framework be established by the NAE prior to implementation of any formal assessment process. Also, NAE can leverage the work being done by the LAI by using their lean enterprise toolset and participating in the yearly plenary conference. Further research by NAE graduate students in the MIT LAI enterprise transformation areas can also advance and leverage knowledge. The maturity level of NAE AIR*Speed* could be baselined using the LAI tool in those areas where lean principles have been implemented over a period of years.

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LIST OF ACRONYMS AND ABBREVIATIONS

Acronym	Definition
BOD	Board of Directors
BRT	Barrier Removal Team
CFT	Cross Functional Team
CMM	Capability Maturity Model
CMMI	Capability Maturity Model Integration
CNAF	Commander, Naval Air Forces
CPI	Continuous Process Improvement
DMAIC	Define, Measure, Assess, Improve, Control
DoD	Department of Defense
DoD CPITG	DoD Continuous Process Improvement Transformation Guidebook
DRRS	Defense Readiness Reporting System
FRP	Fleet Response Plan
GLESAT	Government Lean Enterprise Self-Assessment Tool
ISO	International Standards Organization
LAI	Lean Aerospace Initiative
LESAT	Lean Enterprise Self-Assessment Tool
MIT	Massachusetts Institute of Technology
NAAT	NAVAIR Alignment Assessment Tool
NAE	Naval Aviation Enterprise
NAVAIR	Naval Air Systems Command
NAVICP	Naval Inventory Control Point
NAVRIIP	Naval Aviation Readiness Integrated Improvement Program
NAVSUP	Naval Supply Systems Command
NPEG	Navy Performance Excellence Guide
OPNAV	Office of the Chief of Naval Operations
PD-21	Product Development for the 21st Century
SCAMPI	Standard CMMI Appraisal Method for Process Improvement
SEI	Software Engineering Institute
SORTS	Status of Resources and Training System
SP21	Sea Power 21
USD L&MR	Under Secretary of Defense, Logistics & Materiel Readiness

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EXECUTIVE SUMMARY

This joint thesis compares and contrasts four organizational self-assessment tools that are being considered to assess the successful implementation of the Naval Aviation Enterprise (NAE) AIR*Speed* continuous improvement approach. NAE is a warfighting partnership that improves the life-cycle management of naval aviation warfare systems where interdependent decisions affecting multiple commands are resolved on an Enterprise-wide basis. NAE leadership seeks a common self-assessment tool to measure how well AIR*Speed* has been implemented, including possible areas for improvement.

The NAE is concerned with improving processes that drive readiness and cost. In recent years, a continuous improvement effort called "AIR*Speed*" has been implemented within the NAE in three areas: (a) the production line in the aviation depots, (b) aircraft squadron and intermediate maintenance, and (c) transactional and non-production service environments. Four relevant organizational self-assessment tools and methodologies have emerged that can measure the productivity gains and maturity of AIR*Speed* continuous improvement efforts.

The thesis objectives are to enhance the body of knowledge on enterprise assessment, compare several approaches, and to recommend a tool to continually assess NAE's AIR*Speed* progress. The tools to be considered are the Department of Defense (DoD) Continuous Process Improvement Transformation Guidebook (DoD CPITG), the Navy's Performance Excellence Guidebook (NPEG), the Massachusetts Institute of Technology Lean Aerospace Initiative Government Lean Enterprise Self-Assessment Tool (GLESAT), and the Naval Air Systems Command Alignment Assessment Tool (NAAT).

The primary research question for this thesis was:

Which self-assessment tool(s) and methodology best captures the crucial aspect of measuring progress of continuous process improvement within the NAE?

The subsequent questions were:

1. How can the NAE leverage work being accomplished by the MIT Lean Aerospace Initiative (LAI)?
2. How can our "learning" be translated to provide value to the MIT LAI research in lean enterprise transformation?
3. Can a single tool be scaled for use across the NAE?

The thesis studies the origins of continuous process improvement, the value of assessment, and current enterprise assessment methodologies in industry. Key concepts are cited that require consideration when using tools for performing organizational assessments. Each of the four tools being researched are defined and discussed. Each tool has been analyzed against the key concepts and foundational assessment methodologies, and results and analysis of interviews with industry and government personnel are provided.

We conclude and recommend that three of the four tools under study could effectively be used to measure AIR*Speed* maturity. Follow-on research is recommended for measuring AIR*Speed* maturity in an area that has used lean for a number of years, using one of the tools; investigate whether the principles of the High Performance Organization can provide value to the AIR*Speed* effort; and apply AIR*Speed* tools to the budget process.

I. INTRODUCTION

A. BACKGROUND

> We shall not cease from exploration and the end of all our exploring will be to arrive where we started and know the place for the first time.
>
> -- T.S. Eliot

We are currently living in a time that is alternately confusing and exhilarating. We are a nation fighting a war on terror, and at the same time attempting to manage our position as the world's superpower. The world is more electronically connected than ever before, and speed seems an essential ingredient to success. We live in an age of change; however, we "are also living through a *change of age*. In the decade ahead, the collective choices and actions of people, businesses, organizations, and governments everywhere will likely define and shape global civilization for the next generation and beyond" (Kelly, 2006).

The U. S. Navy, including Naval Aviation, is being required to defend the nation in different ways. The overall mandate from defense executives is to transform individuals and organizations from doing "business as usual" to "business un-usual" and to create positive change for defense business processes. The Chief of Naval Operations has defined the mission as "a major sea change from thinking of ourselves as a conglomerate of independent commands focused on individual output to one of an enterprise focused on collective output" (Chief of Naval Operations (CNO), 2006).

In 2005, Admiral Vern Clark, then Chief of Naval Operations, defined a strategy for the Navy's future called "Sea Power 21" (SP21) to integrate weapons, networks, and platforms. SP21 has three core parts: Sea Shield, Sea Enterprise, and Sea Warrior. Sea Enterprise is the resource enabler for SP21, and provides the challenge and the business process change to recover resources (funding, people, and facilities) for recapitalization. The Navy plans to do this by "being bold and innovative in our business processes...by embracing change. We are trying to build a culture where people feel it is leadership's role to come to work every day looking for new and better ways to be more efficient and productive" (Kowba, 2003). Sea Enterprise is about balancing Naval priorities,

delivering the right force with the right readiness at the right cost, including challenging assumptions, encouraging innovation, maximizing productivity, managing by metrics, and driving execution to accomplish the mission.

1. Naval Aviation Enterprise (NAE)

The Naval Aviation Enterprise (NAE) was formed three years ago to implement SP21. The NAE is a warfighting partnership where interdependent issues affecting multiple commands are resolved on an enterprise-wide basis. The vision of the NAE is "to deliver the right force, with the right readiness, at the right cost, at the right time – today, and in the future." (http://www.cnaf.navy.mil/nae) This construct is portrayed as a revolution within the Navy, where individual organizations attempt to adopt a corporate model to better control costs, improve communications, identify redundancies, and drive waste out of support and operational processes. The NAE is meant to encourage inter-agency and inter-service integration, stimulate a culture of innovation and productivity, and facilitate change when change is needed to advance and improve as an organization.

NAE has created a single Fleet-driven metric to measure efficiency and effectiveness: "Aircraft and carriers ready for tasking at reduced cost." (http://www.cnaf.navy.mil/nae) This metric is the standard against which NAE measures the ability to deliver products tied to Fleet-driven demand, including buying the right amount of superior equipment, reducing cycle time (less maintenance time for aircraft and components), and implementing process efficiencies.

The processes that deliver Naval Aviation readiness and incur costs are interwoven among several commands, including Commander, Naval Air Forces (CNAF), Naval Air Systems Command (NAVAIR), Naval Sea Systems Command (NAVSEA), Naval Supply Systems Command (NAVSUP), and the Naval Inventory Control Point (NAVICP). Recently, the Navy Education and Training Command and Chief of Naval Air Training were aligned under Naval Air Forces so that all aircraft operations and training are functionally aligned under one command. Figure 1 depicts the NAE construct.

In this new triad structure, the ultimate customer is the Fleet, which refers to the warfighting force. The Fleet provides the "demand" or requirements to the triad. A single

leader directs and monitors requirements: CNAF, commonly known as the "Air Boss." Fleet requirements are gathered and funded through the Office of the Chief of Naval Operations (OPNAV), and then the various Systems Commands, such as NAVAIR, execute the requirements.

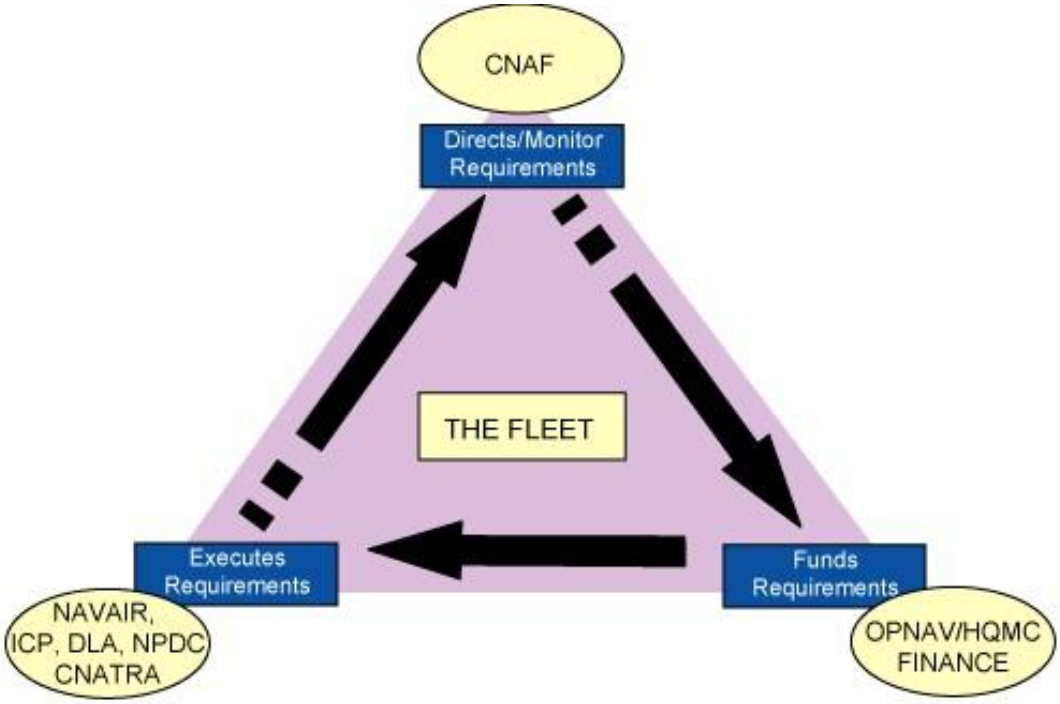

Figure 1. Naval Aviation Enterprise Construct (From: Moore, 2006)

2. NAVAIR Continuous Process Improvement

In 1999, NAVAIR embarked on a continuous process improvement (CPI) initiative called "AIR*Speed*." The intended goal of AIR*Speed* is to decrease cycle time and identify and eliminate non-value added work and inefficiencies. With the hopes of improving quality of service to the Fleet, another goal of AIR*Speed* is to identify and reduce variation in products and services. AIR*Speed* is meant to empower employees with the right tools to control and modify their daily processes to eliminate waste, reduce cycle time and improve quality of work. AIR*Speed* incorporates the concepts and tools of Lean, Six Sigma, and Theory of Constraints to achieve dramatic results in the enterprise (Moore, 2006).

AIR*Speed*, until recently, has been four separate efforts: Depot AIR*Speed*, which concentrates on improvements in the production process areas of the Naval Aviation

Depots; Enterprise AIR*Speed*, which focuses efforts in the Fleet-wide repair sites and processes; NAVAIR AIR*Speed*, focusing on the corporate and competency processes (transactional and service-oriented areas of the organization); and in 2005, NAVICP, which also focuses on corporate and competency processes. To foster enterprise behavior, the four individual AIR*Speed* projects are merging into a single AIR*Speed* initiative, managed by the NAE. The single NAE Fleet-driven metric of "aircraft and carriers ready for tasking at reduced cost…today and in the future" will apply to the single merged AIR*Speed* Program.

B. PURPOSE

The purpose of this joint thesis is to compare and contrast four organizational self-assessment tools to determine NAE's progress in implementing the AIR*Speed* continuous improvement approach. The NAE is concerned with improving processes that drive readiness and cost.

The Value of Assessment

Many organizations formulate strategy, however, deploying and implementing a strategy is a much more difficult task (Baldrige National Quality Program, 2005). Two key implementation questions that need to be answered are, "are we making progress," and "how do we know?" The NAE leadership should know that organizational leaders, managers and working level personnel understand the vision and mission for AIR*Speed* implementation and that processes and improvements are occurring throughout the organization. NAE leaders should also know the extent to which vertical and horizontal communications are effective, i.e., understood and acted-upon. Assessment tools can help provide senior executives a view of the continuity of their plans with the actions of their employees. One objective of this study is to assist leaders and managers to better understand implementation problems and challenges, and to provide recommendations for improvements.

Building on a body of knowledge from key concepts and organizations involved in enterprise assessment, four self-assessment tools from the Department of Defense (DoD), industry, and academia are examined. The tools include the DoD CPI Transformation Guidebook (DoD CPITG), the Navy's Performance Excellence

Guidebook (NPEG), the Massachusetts Institute of Technology (MIT) LAI's Government Lean Enterprise Self-Assessment Tool (GLESAT), and the NAVAIR Alignment Assessment Tool (NAAT), based on the survey tool from GENESYS. Their structures and applicability to the NAE are compared, and conclusions and recommendations are drawn regarding the maturity and future assessments of ongoing improvement efforts.

C. RESEARCH QUESTIONS

A key element of enterprise transformation is to understand the organization's current and desired future state (Murman, Allen, Bozdogan, Cutcher-Gershenfeld, McManus, Nightingale, et al, 2002). An initial effort is to understand the principles and methods for describing an "as is" enterprise, to ensure a baseline or starting point for analysis. Then, a desired future state is depicted to ascertain the extent of real and/or perceived gaps.

Our primary research question was:

Which self-assessment tool(s) and methodology best captures the crucial aspect of measuring progress of continuous process improvement within the NAE?

Subsidiary research questions that we address are:

- How can the NAE leverage work being accomplished by the MIT Lean Aerospace Initiative (LAI)?
- How can our "learning" be translated to provide value to the MIT LAI research in lean enterprise transformation?
- Can a single tool be scaled for use across the NAE?

D. BENEFITS OF STUDY

Assessment tools can provide leaders and managers methods for determining the relative fit or alignment between the direction they set and the actual accomplishment of goals and objectives by the workforce. Various tools can also be used to focus improvements and communication efforts, including funding and other implementation issues. This thesis provides the NAE with a recommended assessment tool approach, including strengths, weaknesses and areas for improvements. The NAE leadership will

have a depiction of a desired future state and a method to quantify the progress being made towards that future.

E. SCOPE AND LIMITATIONS

1. Scope

The scope of the thesis includes available assessment tools focused on internal assessment of government and industry organizations. Four organizational self-assessment tools are examined:

- DOD CPI Transformation Guidebook
- Navy Performance Excellence Guidebook
- MIT LAI GLESAT
- NAVAIR Alignment Assessment Tool

The tools are evaluated for their fit and relevance to the NAE, and the evaluation ensures that recommendations are scalable within the enterprise.

2. Limitations

The George Group's Lean Six Sigma maturity assessment was going to be assessed, however, the George Group is under contract to NAVAIR to assist with AIR*Speed* training and implementation, and aspects of their assessment tool are proprietary and therefore could not be disclosed.

F. METHODOLOGY

The thesis assesses organizational self-assessment tools through a literature foundation of industry and academic research in the subject area. Literary reviews are supplemented with (10) semi-structured interviews conducted with individuals in academia, industry, and government. The methodology details are summarized below, and are illustrated in Figure 2:

1. We performed literature reviews for assessment criteria from Malcolm Baldrige, International Standards Organization (ISO), Software Engineering Institute's (SEI) Capability Maturity Model Integration (CMMI), and MIT's LAI to establish a baseline of knowledge for enterprise assessment.

2. We interviewed points of contacts at major aerospace corporations, Naval activities, and industry users to establish context and requirements for organizational assessment. Interview questions were created and standardized for each interview. The knowledge gained from the interviews provided a solid foundation for an objective review of the assessment tools.

3. We reviewed each assessment tool candidate and associated guidance.

4. We researched case studies, as available, for tool applications in industry and government.

5. We created a matrix based on research and interviews for comparing and contrasting the tools.

6. We made recommendations to our NAE sponsor regarding a tool, or a combination of tools, that would best meet the needs of NAE for assessment of their continuous process improvement efforts.

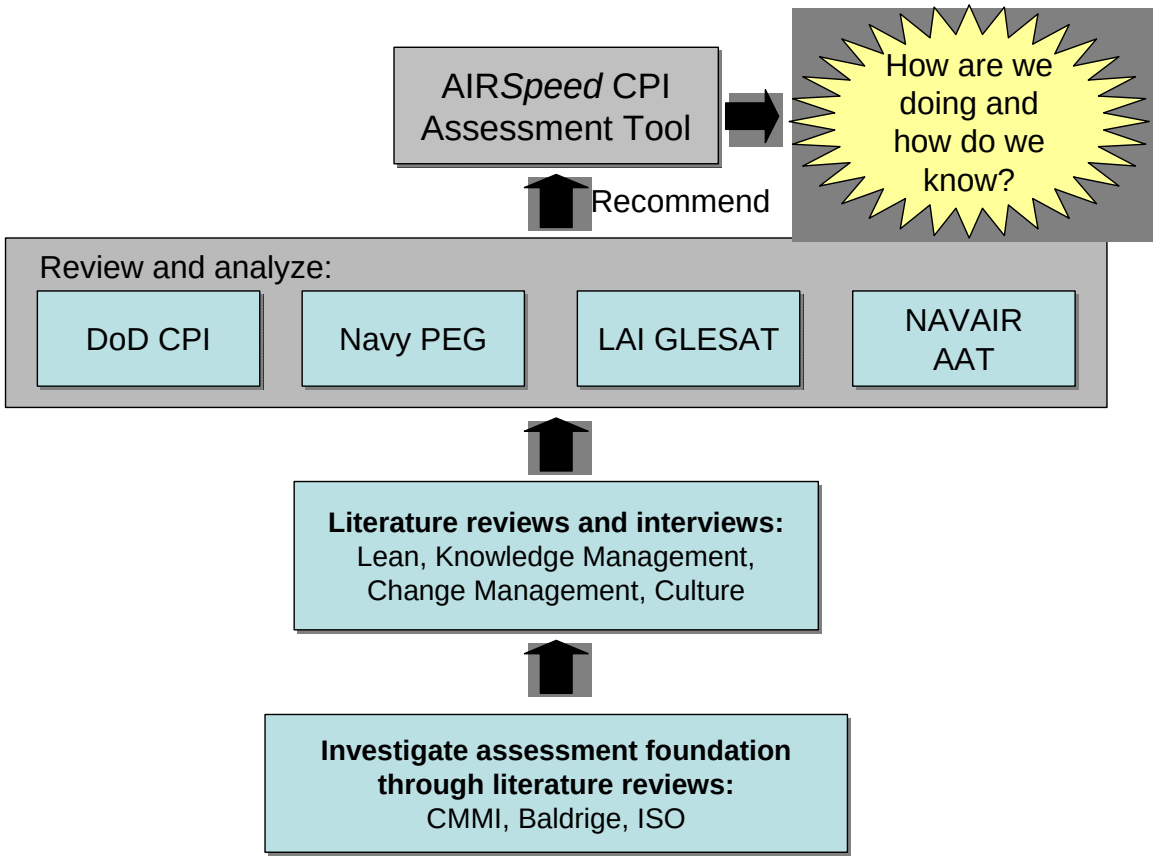

Figure 2. Thesis Methodology

G. ORGANIZATION OF STUDY

Following this introduction, Chapter II reviews enterprise assessment literature from DOD, academia, and industry to establish the basis for organizational self-assessment of CPI. Chapter III outlines the content of the specific assessment tools being studied for NAE. Chapter IV presents comparative analyses of the tools, provides results of interviews, and a summary of findings. Chapter V provides conclusions, recommendations, discussion, and proposed areas of further research.

II. KEY CONCEPTS AND ENTERPRISE ASSESSMENT METHODOLOGIES

> The road to wisdom? Well, it's plain and simple to express. Err and err and err again but less and less and less. – Piet Hein (Kelly, 2006)

A. INTRODUCTION

Why do companies and government agencies adopt a continuous improvement approach and use performance assessment tools? This chapter provides a brief overview of continuous improvement, including industry standards developed, and organizational assessment tools designed to measure the progress of continuous improvement efforts. The following four assessment methodologies are discussed: Malcolm Baldrige Quality Program, Massachusetts Institute of Technology (MIT) Lean Aerospace Initiative, the Software Engineering Institute's Capability Maturity Matrix Integration (CMMI), and the International Standards Organization (ISO) 9000 quality standard. Also discussed are key concepts and principles applicable for analyzing the dimensions of enterprise assessment.

B. ORIGINS OF CONTINUOUS IMPROVEMENT

Continuous improvement is a derivative of the overall quality movement that W. Edwards Deming taught to Japanese companies after WWII, and which was later adopted by many American companies in the 1980s (Walton, 1990). Concerns about quality had early origins in manufacturing, where medieval European guilds organized craftsmen into trade unions to improve and coordinate piecemeal product production. The factory system, which began in Great Britain in the mid-1750s, also organized craftsmen into specialized areas and emphasized product inspection, which grew into the Industrial Revolution in the early 1800s. By the late 19th century, the United States was moving away from the European model to a new "scientific management" approach developed by Frederick W. Taylor (Seddon, 2005). Taylor wanted to increase productivity without increasing the number of skilled craftsmen, instead increasing their efficiency. He concentrated on productivity gains, but unskilled labor was considered expendable and that emphasis started to have a negative effect on quality. Factory managers created inspection departments to remedy the decline in quality, but it was often more common to

ask how a defective product reached the customer, rather than asking why it was made that way.

The American Society for Quality website discusses the history of quality on its website (http://www.asq.org/learn-about-quality/history-of-quality/overview/20th-century.html). In the early 20th century, the element of "processes" started to be included in the description of quality practices. A process was defined as "a group of activities that takes an input, adds value to it and provides an output." Measurement of processes began in the 1920s using statistical quality control methods to determine if products could be produced more uniformly and with fewer defects. Quality became essential during World War II when the United States military needed bullets that were consistently usable in rifles while being manufactured in various factories across the United States. Initially, the military performed 100 percent inspection, but because of published standards based on statistical quality control, they were able to move to sampling techniques.

Following World War II, W. Edwards Deming and Joseph Juran, finding no American audience for their theories on total quality, went to Japan to assist in the recovery of a severely crippled manufacturing industry. Japanese industry embraced and acted upon total quality concepts and statistical process control, eventually achieving world-class success. Total quality began in the United States as a direct response to Japan's improved manufacturing processes and quality products, which were now directly competing with United States industry. Many in this country considered "Total Quality Management" (TQM) a business fad, and even though the term has faded from use, similar quality practices can be found in many Fortune 500 companies today.

C. THE COLD WAR AND WEAPON SYSTEMS

Aerospace manufacturers were able to continue their manufacturing rate after World War II with the advent of the Cold War. Waves of new military aircraft rolled off assembly lines. The defense budget dominated federal outlays. Continuing past the Vietnam War, funding levels remained relatively high, fueled by a pervasive Soviet threat. The Department of Defense (DoD) emphasized performance over cost with budget controls taking a back seat. Complexity in military systems and defense organizations

grew, technology expanded, and demand increased for more sophisticated weapon systems, such as stealth aircraft and smart munitions. Cost overruns were often handled by expanding schedules to postpone outlays. The time to develop major weapon systems increased by 80 percent during the latter half of the Cold War (Murman, et al, 2002), and cost increases resulted in additional oversight and reduced industry flexibility.

Further, with the end of the Cold War, the aerospace industry soon found itself with excess capacity and a reduced demand market. The industry needed to find ways to survive and grow. Military systems aged, and replacement costs were often prohibitively high. DoD missions changed with the fall of the Soviet Union and the Berlin Wall, and the aerospace industry found itself misaligned with changing national priorities, new market conditions, and the technological maturity of core products, all of which contributed to the need for substantial improvements. Industry and DOD seized on various tools and methods such as downsizing, outsourcing, privatizing, and mergers and acquisitions, including ubiquitous reorganizations. Modes of thinking ingrained during the five decade Cold War often acted as barriers to needed transformation.

D. INDUSTRY AND "THE TOYOTA WAY"

Toyota felt that one way to build Japan's economy was to "catch up to the Americans in three years" (Murman, et al, 2002). However, when Toyota's engineers visited the Ford Motor Company in the United States, they saw mass production with high volumes, large production lots and stored inventories. Their interpretation of effective production management was different than their Ford counterparts. They saw "flow" and the necessity to have flow match demand, which up to then was perceived differently in the United States. The Toyota engineers returned to Japan and developed a production system to match their capabilities and economic realities. They created their own dynamic processes with help from Juran and Deming: just-in-time delivery, process control, integrated process and product design, and the notion of quality not necessarily costing more. They developed methods in response to specific problems, and those problems were framed the way they thought about the design and management of work. Over time, they created company cultures based on sustained and applied learning. When Americans later went to visit Toyota to see the secret of their success, they saw solutions

applied to specific situations, safe and tidy organized workplaces, product designs that controlled the product being designed, and workers and managers solving problems together (Seddon, 2005).

Many companies across a number of industries in the United States began to adopt so-called "Lean principles," or the "Toyota way," to improve and evaluate performance including reliance on various assessment tools.

E. LEAN AND LEAN THINKING

Toyota took over 30 years to create their success, but they are now a worldwide leader in the automobile industry. Toyota did not coin the term "lean;" the term was coined as a result of research done by MIT (Murman, 2002). In 1993, MIT pioneered the concept of lean thinking and practice and formed the Lean Aerospace Initiative (LAI).

The word "lean" represented the ideas of economy of effort, minimizing waste, and working hand-in-hand with suppliers to manage flow. It means creating value by doing the right job, right. The Toyota culture was one of learning how to create value for customers by continual and steadfast focus on the above concepts, including learning from failures (e.g., Honda motorcycles in the U.S.).

The MIT LAI defines lean as "eliminating waste and creating value" (Murman, et al, 2002). Eliminating waste and creating value by themselves are not sufficient. LAI defines lean thinking as:

> Lean thinking is the dynamic, knowledge-driven, and customer-focused process through which all people in a defined enterprise continuously eliminate waste with the goal of creating value.

"Waste" has many examples, especially in manufacturing, but the concepts are also applicable to service organizations. Activities that absorb resources but create no value are examples of waste, i.e., mistakes requiring fixing or rework, production of unneeded items and inventory pile-up, unnecessary processing steps, unnecessary movement of employees and goods, groups of people in a downstream activity waiting for upstream people to make decisions or clear impediments, and of course, using energy and resources that do not contribute to customer needs and expectations (Womack & Jones, 2003).

Lean thinking provides a way to specify value, align value-creating activities in the most efficient sequence, conduct activities without interruption, and to adapt to internal and external environmental realities. Lean thinking evidently provides a way to do more with less: less human effort, less equipment, less time and space, while providing customers what they want. Lean should not be confused with "Business Process Engineering" (Hammer & Champy, 2003), which often translates into cutting and downsizing personnel to obtain efficiencies (as well as streamlining processes). Rather, Lean is meant to eliminate waste and to learn and internalize improvements, which can actually free human energy to create new work and accomplish existing work smarter and more efficiently.

F. WHAT IS THE LEAN ENTERPRISE?

LAI believes that a company can fully realize lean value only by adopting an enterprise perspective. Murman, et al (2002) say "a lean enterprise is an integrated entity that efficiently creates value to its multiple stakeholders by employing lean principles and practices." Interdependencies must be addressed across enterprise levels to increase lean value. In the lean enterprise, customer value is specified in a way that does not favor any singe entity's definition in the value stream. All of the entities in the value stream identify the actions required to bring a product from concept to use, from requirement to the battlespace, or from raw material into the hands of the customer. Any actions that do not create value are removed from the value stream. Actions that do create value will show continuous flow from constant customer demand. Results are then analyzed and evaluated and the process begins again.

Womack and Jones (2003) describe the mechanisms of the lean enterprise as: "a conference of all the firms along the stream, assisted by technical staff… to periodically conduct rapid analyses and then to take fast-strike improvement actions." These actions are in their first stages within the NAE with the formation of the NAE War Council, which has aligned the NAE entities to better identify resources to get the right things done at the right time.

A key concept of a lean enterprise is that all functions must become "transparent" for organizational learning to occur, i.e. each entity or function shares its information

rather than protect and hoard information. Trust and shared values are notions that must be carefully built, sustained and rewarded across functions. Womack and Jones indicate that for this to work, a mechanism for mutual verification must exist or be created to ensure that everyone abides by the same criteria, rules and principles. This is what organizational assessment and measurement is about.

The LAI describes the core principles of a lean enterprise as (Murman, et al, 2002):

- Waste minimization – eliminate non-value added activities and thereby deliver value to the customer
- Responsiveness to change – a need for agility in responding to changing threats to be able to produce the product when needed
- Right thing at right place, at right time, and in right quantity
- Effective relationships within the value stream – organizations function more efficiently when there is mutual trust and respect, information sharing, open and honest communication among all stakeholders
- Continuous improvement – the fundamental pursuit of perfection
- Quality from the beginning

A key element of enterprise transformation is to understand the organization's current and desired future state. The "as is" and the "to be" (future) state of the organization must be defined and analyzed (Murman, et al, 2002). There are a number of organizational tools that provide ways to assess performance and continuous improvement. Assessment tools discussed in following sections and chapters often provide indicators of "capability maturity assessment," including ways to survey an organization and evaluate responses.

G. KEY CONCEPTS FOR ASSESSMENT TOOLS

The following concepts are considered critical when discussing the attributes of an effective assessment tool for enterprise use. They are summarized below and more fully addressed within this section.

- Alignment, or the extent to which people and culture are congruent with desired performance.
- The critical importance of managing knowledge, change, and culture
- Create value for customers -- The ultimate customer defines value, and it means delivering what the customer needs or wants (with an expectation of quality).
- Eliminate waste, which is any activity that absorbs resources but creates no value.
- Have well-designed and mature processes -- Processes allow an organization to align its business for effectiveness, and to leverage resources and examine business trends. A focus on process provides the infrastructure necessary to maximize personnel and technology.
- Improve organizational learning, performance practices, capabilities and results -- Organizational learning includes not only continuous improvement of existing approaches, but acknowledging change and adjusting goals and approaches.
- Value employees and partners -- Having a diverse workforce and partners will ensure success when their knowledge, skills, creativity, and motivation are combined. Value can be enhanced by committing to employee satisfaction, development, and well-being; value is visible. Valuing partners and keeping both internal and external relationships strong can help identify complementary strengths and capabilities to address common issues.
- Create a “systems thinking” culture versus a command-and-control culture -- Having a systems perspective means looking at the organization as a whole and building on key requirements, including strategic objectives and action plans.
- Understanding the differences between manufacturing and production organizations and service organizations.

1. Alignment

Alignment is a crucial systems concept referring to alignment of organizational variables. In human resource terms, alignment means that everyone throughout the organization – from hiring through promotions -- is focused and working toward a constancy of purpose, i.e., recruiting aligned with the work technology, aligned with the promotion and reward system, aligned with outputs and outcomes. In sum, it is the extent to which important variables – people skills and culture in particular - are aligned or congruent with desired performance.

The concept of alignment extends beyond human resource alignment to include the extent to which an organization's overall design (structure, technology and processes) is aligned with its strategy, and how its strategy is aligned with its external environment, including stakeholder needs and expectations (i.e., customers are an essential subset of stakeholders). Alignment is a theoretical construct, a dynamic and ever-changing ideal state meant to increase the probability of obtaining superior performance and customer satisfaction.

There are vertical and horizontal nominal dimensions to alignment. The vertical dimension is concerned with organizational strategy and the people that implement the strategy through daily customer work. When vertical alignment exists, employee actions will show that the workforce understands the organizational goals and their role in achieving them. Vertical alignment energizes people, provides direction, and offers opportunity for involvement (Labovitz & Rosansky, 1997).

The horizontal dimension involves the business processes that create customer value. Processes cut across the horizontal functions within an organization, and people must work together across those functions to ensure alignment to customer needs. Horizontal alignment ensures that the processes support the customer, which should be the ultimate goal of an organization. Those processes not only create the products and services, but deliver them when and where customers want.

Both vertical and horizontal dimensions must be working synchronously, independently and with each other. When all of the main organizational variables are in relative alignment, a productive interrelationship – the emerging culture – is more likely

to yield desired results. Appropriate measures and management interventions can then be applied to keep things working towards congruence. Figure 3 illustrates the alignment concept.

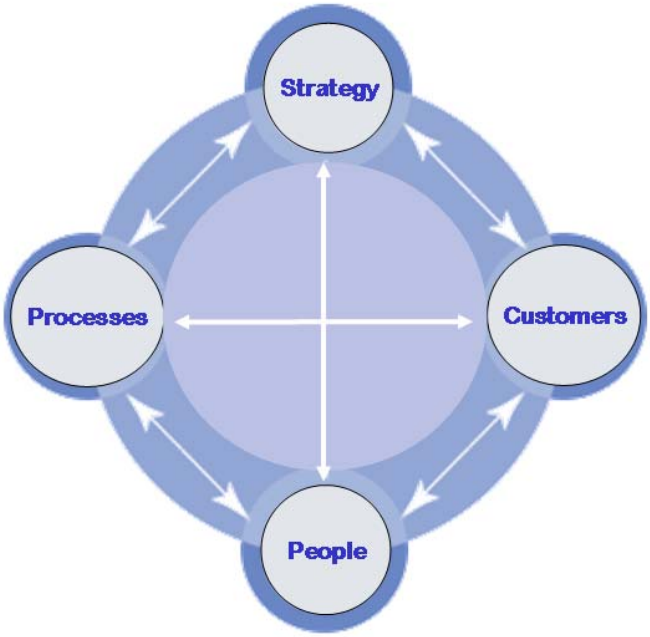

Figure 3. Alignment Concept (After Labovitz & Rosansky, 1997)

Labovitz & Rosansky (1997) indicate that an organization can achieve a state of "self-alignment" by using performance measures linked to awards and recognition. A self-aligning organization seeks to obtain and sustain relative alignment while anticipating and responding to environmental changes. An organization should continually monitor itself and the outside environment for indications of incongruence (e.g., making a product superseded by technology). While the invisible hand of culture (i.e., enduring employee behaviors) can guide, it can also inhibit, a transformative initiative.

What to measure becomes a challenging aspect of organizational alignment and assessment. Key measures can be developed and used, broad enough to capture crucial aspects, yet precise enough so that employees understand what exactly is being measured and what their contribution is. Some measures identify various relationships among

inputs, design, outputs and outcomes, and some focus directly on customer feedback. If measurement systems themselves are not aligned, they can pull aspects of the organization in different directions, i.e., everyone is working very hard but without constancy of purpose.

An example of crucial alignment concerns resource allocation. If an organizational design is fragmented or incongruent, then scarce resources are used in unneeded areas and goal accomplishment is threatened. Resources in this context include people, money, equipment, facilities and with increasing importance the resources of information and expertise (Ancona, D., Kochan, T., Scully, M., Van Maanen, J., & Westney, D., 2005).

Additional concerns around alignment include the following: To what extent does organizational design fit environmental forces and trends? Are espoused strategies capable of implementation? Are senior executive leaders correctly interpreting external environmental forces and trends, adjusting strategies, and identifying desired results? Is the organization getting needed inputs and efficiently transforming those inputs into customer satisfaction? Impediments to alignment are multiple, such as the degree to which employees understand and are able to accomplish stated and implied goals and tasks. Other impediments include inadequate and/or inaccurate information, insufficient resources to accomplish assigned tasks, and/or reward systems incongruent with desired behaviors (Ancona, et al, 2005).

2. Managing Knowledge, Change, and Culture in the Lean Environment

Recurring themes in the literature surrounding Lean are managing knowledge, change, and culture. If these broad concepts are not translated and converted into activities that can be assessed and improved, then Lean becomes another management fad to be discarded in the bins of history. The next section defines relevant terms and what they mean to an organization embarked on a lean journey, including the point of this thesis – assessing progress on the journey.

The term “knowledge management” is an abstract concept containing multiple definitions. Individuals, groups, and organizations not only process knowledge, but create it. Seddon (2005) states that “the value of knowledge is in its use, not its collection.”

Knowledge becomes more valuable the more it is used and combined with other knowledge.

Knowledge includes explicit and tacit types of knowledge. Explicit knowledge can be articulated in formal language through statements, mathematical expressions, manuals, etc. This type of knowledge is easily transmitted throughout an organization. On the other hand, Nonaka and Takeuchi (1995) describe tacit knowledge as "personal knowledge embedded in individual experience, and involves intangible factors such as personal belief, perspective, and the value system."

Why is understanding and recognizing the value of knowledge and its creation important? Because of the success of Japanese industry (a prime example being Toyota), it is widely known that what differentiates the Toyota model and contributes to its success is the way knowledge is received, processed and acted-upon. Intellectual capital is now considered by many businesses as being as important as financial capital (DeLong, 2004). Japanese companies continuously improve by having a culture and structure that systematically receives data (external and internal to the organization) and transforms it into usable knowledge that has value in the marketplace. Information becomes knowledge which is shared and acted-upon, including the capability to create and/or adapt new products (Nonaka & Takeuchi, 1995).

It is useful to ask about the possible attributes of an ideal "knowledge worker." (S)he has a strong sense of self, is well educated, wants to contribute, is mobile, a learner, is a team player, is comfortable with technology, and shares knowledge (Bennet & Bennet, 2004). Senior executive leaders are responsible for creating the climate and organizational design that is receptive and productive for employees to learn, i.e., a learning organization entails structure, rewards and consistent signals.

Also useful to consider are elements that can impede an organization from capturing and using knowledge (Seddon, 2005). In a traditional, bureaucratic, command-and-control structure, the "raison d'etre" (reason for being) is stability and predictability, not innovation and change. Managers and employees correctly perceive a plethora of impediments and constraints, which can filter out and dampen an organization's ability to receive and process knowledge into actions, i.e., violate a constraint and take a risk at

your peril. In many DoD organizations, unfortunately, knowledge may be perceived as commensurate with rank and hierarchy.

3. What's Important about Knowledge Management and Lean?

Why is it important to include knowledge management while assessing level of learning or Lean maturity level? Start with "waste." Eliminating waste is paramount in Lean progress. Womack and Jones (2003) have written about this crucial aspect, and Bauch (2004), in his MIT doctoral thesis, described 10 categories of waste. Another MIT doctoral student took Bauch's work and elaborated on the top three wastes in Bauch's list: over-processing, rework, and information decay (Livengood, 2006). Some specific wastes of rework and information decay are discussed as they relate to managing knowledge along a Lean journey.

In any organization, creating new information and processing existing information are core tasks. When employees leave or fail to document knowledge, knowledge can be lost or become deficient in quality. At the same time, information sharing is important in an organization so that knowledge can be created. If knowledge is not routinely shared, or has to be reinvented, there is a risk of solving the same problems over and over again. On the other hand, a frequent idea is to put an information technology system in place to "manage knowledge." However, if such a system is put in place to manage knowledge, will the employees utilize it? When using information systems, is more information than is needed being kept? Is it redundant, or are there multiple representations of the same ideas? As technology has grown, collectively, our ability to store vast quantities of information has outpaced our ability to retrieve, sort and act-upon that information. In this context, such accumulation only exemplifies waste.

a. *Information Decay*

If information processes are poorly executed or uncoordinated, information gets stored - information in inventory - and is then vulnerable to outside forces that can make it defective. Requirements and technical difficulties routinely occur. Livengood (2006) makes the case that information in inventory decays at a daily rate of 50 percent, and each working month, 12 percent of stored information decays.

Information in inventory creates cost, which is calculated by a "rework ratio" of the time spent on rework divided by the time spent on original work.

b. *Waiting*

The waste of "waiting" can also affect the information inventory. Examples of "waiting" waste are when people wait for answers, data, requirements, approvals or decisions; information created quickly can become obsolete by the time it is used, and rework may result and, obviously, waste occurs when people have to wait for other people or machines to be available. For example, this happens if one person needs a decision and the decision maker is not available or a new employee comes on board and computer equipment is not available for them to use.

c. *Rework*

When a task is not done correctly the first time, rework becomes necessary. Why was it done incorrectly the first time? Excuses abound, but it could be the result of fast, thoughtless, tasking; not having the right documented information; or knowledge is unavailable to do the task correctly.

4. Culture and Change

Culture is both an abstraction, and a reference to actual behaviors, and the forces derived from culture in social and organizational situations are powerful. Culture can be described in a hierarchical fashion or levels, consisting of artifacts, espoused beliefs and values, and underlying assumptions (Schein, 2004).

Artifacts are the visible or perceptive organizational structures and processes that can be seen, heard, or felt about the organization. Artifacts can include such things as buildings and facilities, employee and manager dress-codes, myths, stories, rituals and ceremonies. Although usually visible by definition, artifacts can be difficult or subtle to decipher. For example, one can observe a ritual or ceremony but not understand its meaning or origin. Espoused beliefs or values attempt to express the dominant culture's intended values and/or belief system, which may or may not be reflected in actual behaviors, e.g., Enron articulated all the high-sounding values. If beliefs and values are only "espoused theories," then they may well predict what employees *say* in a variety of

situations, but not reflect what employees will actually *do* when the values are challenged in difficult or stressful situations (Schein, 2004).

Basic underlying assumptions are created when a solution to a problem works repeatedly and is taken for granted. The degree of consensus about an assumption results from repeated success in implementing certain beliefs and values. For example, a basic underlying assumption rarely challenged at NAVAIR is that supporting the warfighter is a core doctrine.

Cultural subgroups want to perceive events as congruent with their assumptions, but what if there is a disconnect between assumptions and actual behaviors? This is where culture exerts its power and influence – and because it runs deep, it is slow to change. Most people tend to function well in a state of "cognitive stability;" therefore any challenge or questioning of a basic assumption will release anxiety and increase defensiveness (Schein, 2004).

Sustained top management direction and support is a prerequisite for any large-scale culture change (DeLong, 1994). To change culture, it is appropriate to question old beliefs, values, and assumptions and assess them in terms of their congruence with new organizational realities. Leaders can offer a new vision for employees to internalize, thereby stimulating more change. Over time, new assumptions become ingrained and a new culture emerges, i.e., a new common history is created. In sum, skillful leaders, managers and practitioners recognize the powerful role culture performs, and intervene in ways to shape and influence desired behaviors, i.e., culture is directly linked to performance.

5. Change Management

In Kotter's (1996) writings on change, he cites eight steps that are necessary to accomplish organizational change. The first step is to create a "sense of urgency" for change, i.e., a "burning platform" for change. The other steps describe creating a strong guiding coalition, setting a clear vision, communicating the vision extensively, removing barriers to the vision, and creating short-term wins along the way, while avoiding the tendency to declare victory too early and neglect to anchor changes in the corporate culture (Kotter, 1996).

Possible consequences of disregarding these steps abound: new strategies are simply not understood, much less implemented; reengineering (process improvement) takes too long and costs too much; downsizing does not get costs under control; and quality programs take on a life of their own but do not result in promised or hoped-for results.

The NAE is faced with hazards and opportunities driven by a fast-changing globalized world and a transforming DoD. Many large, complex, bureaucratic organizations are slow to adapt, especially in a command-and-control hierarchy designed for stability and predictability. Without real or perceived urgency, employees default towards status quo behaviors, i.e., transformation cannot occur through mandate and remote control.

Employee "empowerment" appears to be another ingredient relevant for accomplishing substantial change. Critical information about continual improvement and transformation can sit trapped in workers' minds waiting for approval to take appropriate actions. While often used loosely, "empowerment" in this context means communicating a sensible vision to employees, removing barriers to alignment, providing needed training, and ensuring supervisors support the vision (Kotter, 1996). Again, command-and-control, constraint-oriented organizations may not be able or receptive to genuine employee empowerment.

Seddon (2005) says change is a "problem of culture" and a problem in management thinking. He indicates that an organization must be managed as a system, and look from an outside-in perspective (the view of the customer), that the values of the organization must be based on learning, and change managed as an adaptive, integral exercise in organizational growth. Part of systems thinking includes designing organizational structure and processes around customer demand instead of around organizational convenience.

Womack and Jones (2003) discuss the need to overcome organizational inertia, a force associated with passive resistance to change. He says that the right person or persons with a "make something happen" mindset are necessary to act as "change agents," along with gathering the latest in knowledge about Lean success stories. Lean

thinking evidently must become second nature to everyone in the organization – culturally ingrained – for it to really work.

The change process can be very taxing to people at all levels of the organization. People tend to resist change for behavioral and/or systemic reasons, i.e., refusing to change, and not knowing how respectively. Change affects people's lives and introduces uncertainty. Understanding how change affects people in the organization is a key component of managing resistance (Shere, 2006). Thoroughly communicating the change to everyone affected, including senior leaders modeling the desired behaviors, capture Kotter's (1996) and others recommendations for successful change.

Creating a different culture is transformative. Unfortunately, the need for culture change is not likely to be driven by an expressed need to retain knowledge or prevent knowledge loss. Recognizing that culture change should be addressed is more complex, in that it emerges based on the relative fit among key organizational variables, i.e., strategy, structure and results. According to DeLong (1994), knowledge-sharing behaviors flourish only in an environment where there is a sense of mutual commitment between the organization and its employees.

6. Command and Control versus System Thinking

The previous discussion is meant to show that there is more to transformation than new programs, paying a contractor for good ideas, and training. The challenge for command-and-control cultures is to balance the need for control with new needs for speed, innovation, and decentralized decision-making. Although Deming (1982) described command and control as an organizational prison, a possible alternative is to balance a strong command and control culture with guidance gained by systems thinking or learning organizations (Senge, 1990).

H. ENTERPRISE ASSESSMENT METHODOLOGIES

1. Types of Assessment

Assessment is defined as "the evaluation, or estimation, of the nature, quality, or ability of someone or something." Evaluation is defined as "third party judgment on the worth of others' performance, project, or program" (Humphries, 1998). Evaluation is

then more about "success" or "failure" according to criteria external to the organization being assessed. Being judged, especially from others outside the trusted workgroup, can inhibit learning and promote "apparent compliance" rather than assessing for organizational learning and being able to see progress.

Evaluation appears frequently within companies, with pressure to provide proof or value to the business. In 1998, the Society for Organizational Learning (SoL) began an initiative to study assessment and how it either builds learning within the organization, or inhibits it. They found that where assessment is integrated into the ongoing procedures of an organization's activities, it becomes a tool for navigating self-correction or making continuous adjustments (Humphries, 1998). Three basic types of assessment are described below: external assessment, internal assessment, and self-assessment.

a. ***External Assessment***

This type of assessment is done in a formal, quantitative format. An example of an external enterprise assessment is the Malcolm Baldrige National Quality Award (Baldrige National Quality Program, 2006). Success criteria are provided to an agency applying for the award, and external, specially trained examiners evaluate the organization. Through a structured process of questions, answers and observations, examiners determine how the organization is performing against the criteria.

Another example of an external assessment is the Capability Maturity Model Integration (CMMI), where a specially trained examiner comes to the company and assesses it based on established criteria, usually resulting in certification levels, called capability or maturity levels (Chrissis, Konrad, & Shrum, 2003).

b. ***Internal Assessment***

An internal assessment can be the same tool as is used for an external assessment; however, in this case, an enterprise would manage the assessment internally for their own learning or recognition of value of the achievements in process improvement. The enterprise could have an assessment team that would facilitate the assessment of various groups or teams.

c. *Self-assessment*

An enterprise can choose to provide a tool for use across the enterprise, defining the value to its members, and those members within a team or group would use the tool to self-assess their progress. The enterprise can then obtain the results from all of those self-assessments, or just let the entities use it for their own measure of progress.

2. Types of Quality Programs

Different types of quality programs, certifications, and assessment methodologies exist in industry, government, and academia. Awards (such as Malcolm Baldrige Quality Award and the Shingo Prize for manufacturing), inspections, external certifications, and internal self-assessments exist to help companies ensure that their strategies, goals, and objectives are tied to results.

This study examines four assessment mechanisms in particular: MIT's LAI; Malcolm Baldrige Quality Program; SEI's CMMI; and the International Standards Organization (ISO) 9000 quality standard. The objective is to evaluate a foundation for which self-assessment tool or tools could be used by NAE. LAI and Baldrige are examples of enterprise tools, while CMMI and ISO 9000 are normally applied within an enterprise.

3. Lean Aerospace Initiative (LAI)

The Lean Aerospace Initiative (LAI) started in 1993, and is a consortium sponsored and managed by MIT. The purpose of the LAI consortium, which associates the collective needs of academia, industry, and government, is to provide a venue for collaboration with the objective of increasing the value of the United States aviation industry. As a consortium, or learning network, it stimulates new forms of interaction (transformation) by associating powerful monuments of previous organizational structures such as customers, suppliers, workers, management, and government (Murman, et al, 2002).

The consortium members come from airframe, engine, avionics, missile and space companies, military service program offices, Office of the Secretary of Defense, and MIT. The LAI is organized with member organizations as its base, and knowledge teams and networks supporting the work of executive committees and the executive board.

NAVAIR currently participates on the executive board. The member organizations provide the executive level with outcome facts, progress and issues, and research needs.

The LAI's work began in the 1990's by pioneering lean thinking and practice. They analyzed the elements of Lean and how an enterprise is transformed by applying lean practices. They knew that leadership was critical to the transformation, and defined a leadership model of setting direction, aligning people, and motivating and inspiring as key factors. LAI brought together a group of scholars, industry practitioners, and government officials to "operationalize" those elements into a "roadmap" framework that would translate change principles into guidelines for lean enterprise transformation. Their "transition to lean" roadmap was created to outline the steps necessary to initiate, sustain, and refine enterprise transformation (Murman, et al, 2002). Figure 4 illustrates the roadmap:

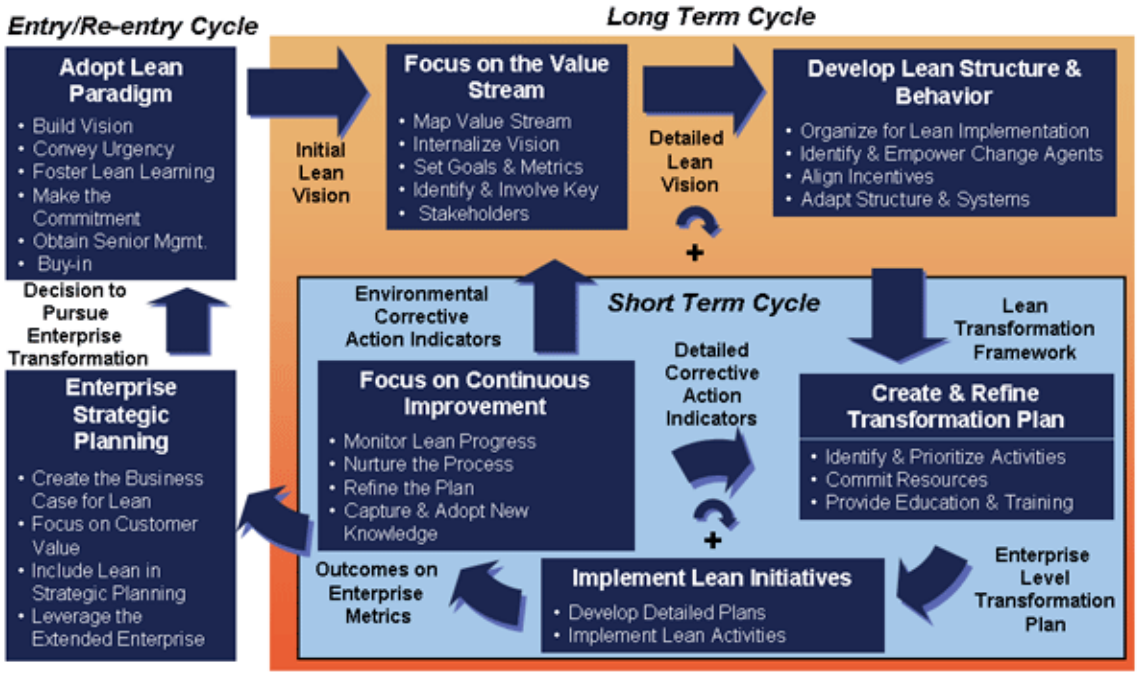

Figure 4. LAI Transition-to-Lean Roadmap (From Murman, et al, 2002)

LAI also understood that an enterprise must understand its current and desired future state. This led to the development of the Lean Enterprise Self Assessment Tool (LESAT). The LESAT has since been adapted for use by government organizations as the Government LESAT (GLESAT). The structure of the lean thinking espoused by LAI

also supports other systemic change initiatives, such as total quality management, Six Sigma, and process reengineering, as is seen in Figure 5.

	Total Quality Management	Reengineering	Traditional Six Sigma	Lean
Goal	Meet Customer Expectations	Breakthrough Solutions	Reduce Variation in Enterprise	Eliminate Waste to Create Value
Focus	Product Quality	Business Processes	All Sources of Product Variation	All Enterprise Processes & People
Change Process	Incremental	Radical	Process-specific; continuous	Evolutionary Systemic
Business Model	Improve Efficiency & Shareholder Value	Increase Enterprise Performance & Customer Value	Minimize Waste & Increase Customer Satisfaction	Deliver Value to All Stakeholders

Figure 5. LAI's Lean Thinking Linkages (From Murman, et al, 2002)

The LAI began its enterprise level work in 1999 and published its seminal book on the subject titled, "Lean Enterprise Value: Insights from MIT's Lean Aerospace Initiative" (Murman, et al, 2002). The principles driving the work and research of LAI to create lean value are:

- Doing the right job and doing it right.
- Deliver value only after identifying stakeholder value and constructing robust value propositions.
- Lean value is only fully realized after adopting an enterprise perspective.
- Address interdependencies across enterprise levels to increase lean value.
- People, not just processes, effectuate lean value (Murman, et al, 2002).

The mission of the LAI is to:

> Research, develop and promulgate knowledge, principles, practices and tools to enable and accelerate the envisioned transformation of the greater US aerospace enterprise through people and processes. (Lean Aerospace Initiative, 2005).

The LAI furthers its mission through support of industry and government transformation-to-lean projects, enabling a lean value-creating supplier base, education, training, improving effectiveness of enterprise organizations, and sustainment of lean tools and knowledge base through sponsored outreach events. The LAI focuses on three knowledge areas, each with its own products and research goals, to meet current and future challenges:

- Enterprise change – strategic, enterprise-level approach to accelerate effective and sustainable improvement and change;
- Enterprise architecting – create a future lean vision and designing an enterprise to support it; incorporate information, organization, process, technology and strategic dimensions; and
- Product life-cycle – "Pushing the envelope" in the area of designing and development aerospace products in a complex system-of-systems environment to shorten cycle time, reduce cost, and increase delivery of best lifecycle value.

The value of the LAI can be seen most clearly in the significant gains of its members and prime contractors through lean implementations. To further the LAI value proposition, they maintain a standard-setting, forward-reaching, research program that is in its fifth phase of development. Phase V builds off of the previous phase IV drivers, which were:

1. The need to accelerate lean enterprise transformation;
2. The need to design future lean enterprises; and
3. The need to evolve adaptive lean transformation.

As such, Phase V has four core research questions, and seven research threads, that connect to knowledge areas in Phase IV. The core research questions are:

1. How can I understand how my organization / enterprise currently operate within its larger context?
2. How can I define and evaluate the future possibilities for evolving a more efficient and effective enterprise?

3. What are the most effective strategies and tactics to achieve these future possibilities for my enterprise?
4. How can I best manage the enterprise change process?

The seven associated research threads listed below, which support the core questions, are necessary to achieving the LAI vision for enterprise transformation:

1. Actionable characterization of lean enterprise attributes, dynamics and behaviors
2. Purposeful architecting of enterprise future state
3. Value-driven enterprise decision making
4. Effective integration of enterprise elements
5. Value-based enterprise performance planning and assessment
6. Managing uncertainty in complex enterprises
7. Guiding change for lean enterprise outcomes

The focus of this thesis is to define the best methodology for an enterprise assessment of AIR*Speed* and the NAE, with additional benefit to the LAI enterprise assessment research initiatives. Specifically, using the LAI model, the thesis attempts to answer knowledge requirements at the intersection of core question two above (How can I define and evaluate the future possibilities for evolving a more efficient and effective enterprise?), and research thread five (Value-based enterprise assessment).

4. Malcolm Baldrige Quality Program

The Baldrige National Quality Program (BNQP) is named for Malcolm Baldrige, who was a former Secretary of Commerce under President Ronald Reagan. The Baldrige Foundation operates both the BNQP and administers the Malcolm Baldrige Quality Award, which is recognition much sought-after by companies for their quality processes and products. The Baldrige Foundation created the Criteria for Performance Excellence as a tool to help businesses understand whether or not they were making progress in deploying their strategy, vision, mission, values, and plans. The Criteria helps companies answer the questions, "are we making progress," and "how do we know?"

It also helps organizations learn what needs improving. While other approaches might focus on a single aspect, such as leadership, strategic planning, or process management, the Criteria is structured into an integrated management framework that addresses factors that define the organization, its operations and its results (Baldrige National Quality Program (BNQP), 2006).

The Criteria consists of approximately 100 questions grouped into an organizational profile and seven categories. The resulting profile is a snapshot of the organization being assessed, and compiles the key influences of how the organization is operated and the challenges it faces. Organizations can select the criteria that best apply, such as a business, education, health care, or government. The business criteria categories are: (BNQP, 2006)

1. Leadership
2. Strategic Planning
3. Customer and Market Focus
4. Measurement, Analysis, and Knowledge Management
5. Human Resource Focus
6. Process Management
7. Business Results

Figure 6 provides the framework connecting and integrating the Categories.

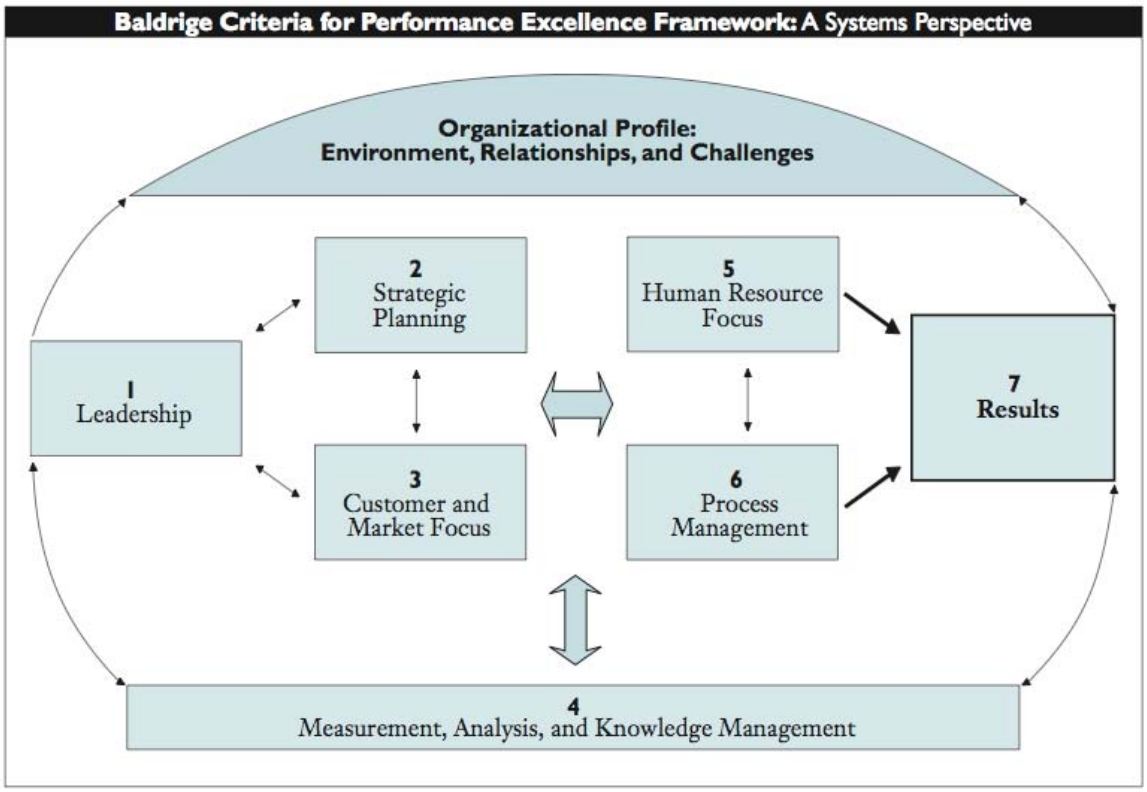

Figure 6. Framework for Baldrige Criteria for Performance Excellence (From Baldrige National Quality Program, 2006)

The organizational profile sets the context for the way that the assessed organization operates. The environment, key working relationships, and strategic challenges serve as a guide for the organization's performance management system.

The six Baldrige Categories in the center of Figure 6 above cover both systems operations and results. Leadership, Strategic Planning, and Customer and Market Focus represent the leadership triad, which are placed together to emphasize the importance of a leadership focus on strategy and customers. Senior leaders set the organizational direction and seek future opportunities for the organization.

Human Resource Focus, Process Management, and Results present the results triad. The organization's employees and key processes accomplish the work of the organization that yields overall performance results.

All actions point toward Results, which is a composite of product and service, customer and market, financial and internal operational performance results, including human resource, governance, and social responsibility results.

The leadership triad is linked to the results triad by the horizontal arrow in the center of the framework, which indicates the critical central relationship between Leadership and Results for organizational success. The two-headed arrows also indicate the importance of feedback for an effective performance management system.

The system foundation is composed of Measurement, Analysis, and Knowledge Management, which are critical to effective organizational management and a fact-based, knowledge driven system for improving performance and effectiveness.

The 2006 Criteria include 19 questions, one for each of the Baldrige Criteria items (above). Any organization can use the Baldrige Criteria to self-assess its performance and improve. The Criteria is designed to help align resources, improve communication, productivity, and effectiveness, and achieve strategic goals. If, for example, the organization is using tools such as Lean or Six Sigma, the Criteria will help align resources with those approaches. The Criteria focus on common requirements, rather than procedures, tools, or techniques in the following key areas of organizational performance:

1. Product and service outcomes
2. Customer-focused outcomes
3. Financial and market outcomes
4. Human resource outcomes
5. Organizational effectiveness outcomes, including key internal operational performance measures
6. Leadership and social responsibility outcomes

These measures are intended to ensure that an organization's strategies are balanced and that they do not trade off among important stakeholders, objectives, or short- and longer-term goals.

The Criteria begins with the Preface, which includes an Organizational Profile, which contains both a description of the organization and its challenges. The assessment then goes into each Category. The assessment uses a point system, with a total of 1000

points possible. Categories are broken down into sub-categories. For example, Leadership is broken down into Senior Leadership and Governance and Social Responsibilities, which has 120 points total. Strategic Planning is divided into development and deployment.

A Self-Analysis Worksheet is included in the Assessment, which is optional. An organization can list its key strengths and opportunities for improvement, and rank them in order of importance. They are then used as a basis for creating goals and a plan of action.

The scoring system uses responses to Criteria Items and is based on two evaluation dimensions: process and results. Criteria users furnish information relating to these two dimensions. "Process" refers to the methods used by the organization to address the item requirements in the organizational performance areas listed above. The four factors used to evaluate process are approach, deployment, learning, and integration (ADLI).

"Approach" refers to:

- The methods used to accomplish the process
- The appropriateness of the methods to the item requirements
- The effectiveness of the use of the methods
- The degree to which the approach is repeatable and systematic (based on reliable data and information)

"Deployment" refers to:

- The approach is applied in addressing item requirements relevant and important to the organization
- The approach is consistently applied
- All appropriate work units use the approach

"Learning" refers to:

- Refining the approach through cycles of evaluation and improvement
- Encouraging breakthrough change to the approach through innovation
- Sharing refinements and innovations with other relevant work units and processes in the organization

"Integration" refers to the extent to which:

- The approach is aligned with organizational needs identified in other Criteria Item requirements
- Measures, information, and improvement systems are complementary across processes and work units
- Plans, processes, results, analyses, learning and actions are harmonized across processes and work units to support organization-wide goals

"Results" refers to the organization's outputs and outcomes in achieving the requirements for performance and improvement in the key areas of product and service outcomes, customer satisfaction, financial performance, human resource outcomes, operational performance, and leadership and social responsibility. Performance levels are compared to those of competitors and other organizations that provide similar products and services.

The four factors used to evaluate results are: (a) current level of performance, (b) rate and breadth of performance improvements (i.e., slope of trend data and how widely deployed and shared), (c) performance relative to appropriate benchmarks, and (d) linkage of results measures to important customer performance requirements identified in the organizational profile. As Process items mature, their description should indicate the learning that occurs, as well as integration with other processes and work units. Results items call for data showing performance levels, improvement rates, and relevant data for key measures and indicators of organizational performance. There should be corresponding results if improvement processes are widely shared and deployed. Results scores are a composite based on overall performance.

Even if an organization does not want to try for the Baldrige Award, the Criteria and assessment provide a way to assess how well it is doing and a guide for further improvement. The Criteria apply to any type of organization, large or small, service or manufacturing, and help to measure performance and planning in uncertain environments.

a. *U.S. Coast Guard and BNQP*

The U.S. Coast Guard (USCG) has used a Baldrige-based assessment process since 1996. They credit their managerial success to the use of the Criteria, which gives them great insight into their management practices. The then-Commandant established an internal quality award program and a framework for assessing performance and sharing best practices. During the first four years, the award process employed a written application and examination process similar to Baldrige. A criteria guidebook was developed, a board of examiners was trained, and they administered the award program.

There was some feeling that the process consumed substantial resources, allocating one half of one year to the application process. They decided to simplify the assessment, with an emphasis put back into improvement, de-emphasizing the award. By the end of 2000, *Government Executive* magazine published a report that the Coast Guard was the only federal agency to receive an "A" on the Federal report card for budget and performance management.

In 2001, USCG unveiled a revamped assessment process, emphasizing collaborative learning and an enterprise focus. They still had qualified examiners in both Baldrige and facilitation behaviors. The entire process was trimmed to three days. Commanding officers liked the new process and most said they gained valuable insight into their own unit operations and made improvements to their managerial processes based on the assessment results. They found that the collaborative process provided an opportunity to capture valuable learning data, as examiners recorded systemic issues such as organizational barriers or challenges that impact the performance of best work.

The most recent change is that all units are expected to assess, plan, and monitor performance using the Criteria. The assessment process was deployed to every medium-to-large unit as an institutional management practice. All units are required to participate in the assessment every two years. There are still challenges, however. Resistance to the assessment process still exists, and scheduling assessment time for unit leaders is a challenge.

The Baldrige process has helped the USCG obtain new funding from Congress for aging ships and aircraft. They believe that the assessment process is a powerful tool to educate leaders and create new behaviors. They believe it can be used in any organization to promote best management practices (Irr, F., Kalnbach, C., & Smith, M., 2003).

5. Capability Maturity Model Integration (CMMI)

Capability Maturity Model Integration (CMMI) is a process improvement methodology for the development and maintenance of products and services throughout their life cycle. When organizations are seeking an appraisal to see where they are and how they can improve, CMMI identifies best practices that an organization can use to address the development and maintenance of products and services during their complete life cycle.

Industry, government, and the Software Engineering Institute (SEI) collaborated to create CMMI. The SEI released the CMMI Framework, which contains a full set of CMMI models. Based on the improvement needed, an organization can obtain a model for systems engineering, software engineering, product development, etc. One has to know the area needing improvement and the content of the model to use them effectively.

SEI recognizes that there are multiple dimensions to a business, consisting of people (with skills, training, and motivation), tools and equipment, and procedures or processes. Processes, however, are what hold everything together. SEI has defined capability maturity models (CMM) that focus on improving process management in an organization. They describe an evolutionary improvement path from ad hoc, immature processes, to disciplined and mature processes with improved quality and effectiveness.

There are a number of maturity models, standards, and methodologies in the marketplace, however, most focus on a specific part of the business. CMMI takes a systemic approach to the problems that organizations face. CMMI integrates various "bodies of knowledge" that are essential when developing products, such as systems engineering, software engineering, and acquisition. This approach provides a comprehensive solution to an organization.

CMMI is designed for product life cycle improvement, and is more robust than other process improvement methodologies. It can be used for either a formal certification or simply to ensure that an organization's processes are disciplined and aligned, with a clear path toward improvement.

CMMs have been developed for systems engineering, software engineering, software acquisition, workforce management and development, and integrated product and process development (Chrissis, Konrad, & Shrum, 2003). The intent of CMMI is to provide a CMM that not only covers product and service development and maintenance, but also provides an extensible framework so that new disciplines can be added. Currently four disciplines are available:

- Systems engineering – covers the development of total systems, with or without software
- Software engineering – development of software systems
- Integrated product and process development (IPPD) – a systematic approach that involves all stakeholders to provide products aligned to customer requirements
- Supplier sourcing – covers acquisition of products from suppliers

Each discipline area has a number of process areas within it. For example, within the systems engineering discipline there are 22 process areas, e.g., configuration management, measurement and analysis, organizational process definition, and project planning.

A CMM allows for different approaches for the models. As long as the model contains the essential elements of effective processes, and describes an evolutionary improvement path, it is considered a CMM. All of the source models for CMMI are considered CMMs, yet each has a different approach.

Two approaches are used within CMMI, called "representations". A representation reflects the organization, use, and presentation of components in a model. All CMMs have process areas that are defined by levels. For example, for the process area of Project Planning, there are two types of representations: (a) staged and (b)

continuous. The "staged" representation uses predefined sets of process areas to describe an improvement path. A maturity level describes this improvement path, which is an evolutionary plateau toward achieving improved processes. The "continuous" representation is used with the systems engineering and IPPD disciplines, and allows for selecting a specific process area and improvement relative to it. This representation approach uses capability levels to characterize improvement relative to an individual process area. Table 1 shows a comparison of Capability and Maturity levels.

Table 1. Comparison of Capability and Maturity Levels

Level	Continuous Representation Capability Levels	Staged Representation Maturity Levels
0	Incomplete	N/A
1	Performed	Initial
2	Managed	Managed
3	Defined	Defined
4	Quantitatively Managed	Quantitatively Managed
5	Optimizing	Optimizing

As is shown in the table, there is a different starting point depending on which representation is chosen. When the continuous representation is chosen, the focus is on selecting a particular process area and the granularity of improvement, i.e., improving both "what we do" and "how we do it." In this context, whether a specific goal is performed or incomplete is important, so the starting point here is "incomplete."

Because the staged representation is concerned about "maturity" of a set of processes, whether individual processes are incomplete or performed is not important. Therefore, the "initial" name is given to the starting point for this representation. Table 2 outlines the definitions of the capability levels.

Table 2. Definition of Capability Levels

Capability Level	Definition
0 – Incomplete	A process that is either not performed or partially performed
1 – Performed	A process that satisfies the specific goals of the process area. It supports and enables the work needed to produce work products.
2 – Managed	A performed (Level 1) process that has the basic infrastructure in place to support the process. It is planned and executed in accordance with policy, employs skilled people who have adequate resources to produce controlled outputs, involves relevant stakeholders; is monitored, controlled, and reviewed; is evaluated for adherence to its process description
3 – Defined	Managed (Level 2) process tailored from standard organizational processes, and contributes work products, measures, and other process-improvement information to the organizational process assets.
4 –Quantitatively Managed	Defined (Level 3) process controlled using statistical and other quantitative techniques. Quantitative objectives for quality and process performance are used in managing the process.
5 – Optimizing	A Level 4 process that is improved based on an understanding of the common causes of variation. The focus is on continually improving the range of process performance through both incremental and innovative improvements

Advancing through each capability level is accomplished by comparing progress against the specific criteria in each level. Each level should be reviewed to see if progressing is applicable and of relevance and value to the organization.

The continuous representation approach offers a more flexible approach to process improvement, and the staged representation is more systematic, offering a one-step-at-a-time approach. Both representations are defined to offer equivalent results.

One of the elements of CMMI is process institutionalization, which is an important concept to this approach to process improvement. Institutionalization implies that a process is ingrained in the way the work is performed and there is commitment and consistency to performing the process. A process that is institutionalized is more likely to be retained under stress.

CMMI recognizes that process improvement efforts must be tied to business goals and objectives. Yet CMMI is a very structured and rigorous set of models, designed with a goal of ensuring that process areas and their interrelationships are captured. For example, if a company wanted to improve the time to produce a product, they might focus on the project management process, which relies on best practices in other areas, such as project planning and process monitoring.

a. *CMMI Appraisal*

As is true for most process improvement efforts, there are principles that are applied when a CMMI appraisal is chosen. These principles are:

- Senior management sponsorship
- Focus on business objectives
- Confidentiality for interviewees
- Use of a documented appraisal method
- Use of a process reference model (e.g., a CMMI model as a base)
- Collaborative team approach
- Focus on actions for process improvement

The most rigorous CMMI appraisal method is called the Standard CMMI Appraisal Method for Process Improvement (SCAMPI). This process uses external personnel to appraise various organizational areas. CMMI also allows for less structured methods, including self-assessments and quick-look or mini-appraisals. Links to a variety of useful information about CMMI are available on the SEI website (http://www.sei.cmu.edu) which help users understand the various methods and tradeoffs associated with each method.

6. International Standards Organization (ISO) 9000

ISO 9000 series standards specifies those requirements to be met by an organization's quality management system to demonstrate its ability to provide consistent products that meet customer requirements, applicable regulatory requirements, and enhance customer satisfaction. It is built on the premise that every organization has processes, and what makes a process work effectively, can be identified, controlled, and

improved (Russo & Russo, 1998). The ISO 9000 series standards help organizations describe the processes they use to achieve success. Businesses can self-assess using ISO 9000 or they can apply for an external certification.

As with many quality programs, ISO 9000 has its roots in human tragedy and a clearly evident need for improvement known as "the burning platform." Understanding this history is important to an understanding of the ISO process and methodology.

During World War II, the British experienced an excessive number of accidental detonations in their weapons factories resulting in multiple deaths and human suffering that could not longer be tolerated. Responding to this unacceptable situation, the British government dictated the use of a standardized production process, overseen by inspectors, that was to be implemented by any vendor hoping to supply parts for British ordnance. The early standards were seen as contractually binding obligations (Russo & Russo, 1998).

In similar efforts, the United States developed MIL-Q-9858A, "Quality Program Requirements," and NATO developed "Allied Quality Assurance Procedures" to improve the consistency of military hardware bought from many suppliers.

By the late 1960's, the British quality movement, with the support of the British government, moved out of the military market by stating publicly that "Quality is everybody's business." In 1971, the British Standards Institute published the BS 9000 standard for the electronics industry, and in 1974, they implemented a more general BS 5179, "Guidelines for Quality Assurance." The BS 5179 standard moved the requirement for inspection from the customer to the supplier base through third-party inspections. Through several revisions, the common ISO 9000:1987 standard was derived from BS 5750 with a focus on repeatable factory floor processes. (British Accreditation Bureau, 2006) The essential purpose of BS 5750 was a demonstration of a controlled production process for quality output, sufficient for contractual arrangements.

The key elements were (Russo & Russo, 1998):

1. Management responsibility
2. Quality systems
3. Contract review
4. Design control
5. Document control
6. Purchasing
7. Customer supplied stock
8. Product identification and traceability
9. Process control
10. Inspection and test
11. Inspection, measuring, and test equipment
12. Inspection and test status
13. Control of non-conforming product
14. Corrective action
15. Handling, storage, packaging and delivery

Satisfying customers and reducing waste are the two basic tenets of the ISO 9000 program, with the assumption that structured quality processes and assurance tasks will meet the expectations of the program tenets. The published standards promoted control over management, as well as providing an efficient methodology for assessment by inspectors. In simple terms they demanded that firms, "say what they do, and then do what they say" (Russo & Russo, 1998). The British, through this period, saw the "Japanese Miracle" (e.g., Toyota Production System). They tried to capture the essence of the Toyota quality programs, but failed, because they did not see the unique nature of what Toyota did --- which was to think differently about the design and management of work (Seddon, 2002). Toyota did try an ISO approach to quality in one of its factories, but quickly pulled the strategy when it had a negative influence on production.

The first worldwide quality standard was attempted in 1992 by ISO with the publication of the guidelines for the ISO 9000 standard. The ISO methodology consists of documenting a standard approved by more than 75 percent of the ISO member

organizations, and compliance actions by organizations that desire certification. Finally, a certified registrar audits compliance by an organization to the standard and issues a certification with periodic reviews to maintain compliance standards. The ISO 9000 series of standards has a convoluted naming convention with numerous recent changes that is beyond the scope of this thesis. The most common terminology was used for this study.

The ISO 9000 standard, which contains ISO 9001:2000, has five sections:

- Quality Management System
- Management Responsibility
- Resource Management
- Product Realization
- Measurement Analysis and Improvement

The standard requires that companies write an organization-specific ISO 9000 quality manual. This manual defines how the company meets each requirement of the ISO 9000 standard, with further definition of quality procedures, policy, and quality objectives. The executive management of a company is asked to define the quality policy through these steps (Russo & Russo, 1998):

- Define the quality policy
- Establish the strategic organizational objectives
- Articulate commitment to quality
- Ensure that everyone in the organization adheres to the policy

ISO defines a quality product or service as (Russo & Russo, 1998):

- The result of an organization's customer focused processes
- Created by employees that understand their function and have the right resources
- Having predictable quality

The certification process can take from two months for the smallest organization to approximately 18-24 months for the largest organization. The process can be grouped into four phases:

1. Decision to get ISO certification with commitment and supporting budget
2. Development or supporting documentation with most resources being expended in this phase. Source selection and contracting for an ISO registrar happens at the end of this stage.
3. Evolution. This is where the workforce adapts to the documented procedures developed from Phase 1 and 2.
4. Continuation. An ISO registration audit is conducted and non-conformance issues are corrected prior to certification. Periodic audits are conducted to maintain certification.

The challenges for enterprises that choose to use ISO 9000 as a quality program are the complexity in the requirements and cost for certification. Extensive written documentation can often be required, which is then not used other than for inspection purposes.

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III. ASSESSMENT TOOLS ANALYSIS

A. INTRODUCTION

This thesis analyzed four performance assessment tools to determine their applicability for assessing the U.S. Navy AIR*Speed* initiative under the Naval Aviation Enterprise (NAE). The research methodology included: (1) a literature review of four prominent organizational performance assessment tools, and others; (2) a comparison of the four tools in terms of organizational fit and ease of implementation; and (3) semi-structured interviews conducted with (10) military and civilian personnel involved with and/or knowledgeable of Lean/Six Sigma principles. Each of the four tools is described below.

B. DOD CONTINUOUS PROCESS IMPROVEMENT GUIDE

On 15 May 2006, the Secretary of Defense released the DoD Continuous Process Improvement (CPI) Transformation Guidebook (Deputy Secretary of Defense, 2006) as a resource for designing and managing CPI efforts. The document is meant to codify experiences using CPI. The Guidebook creates a common lexicon for describing and coordinating individual Service CPI efforts. Its design incorporates best practices from leading industry and DoD experience. The Deputy Under Secretary of Defense (Logistics and Materiel Readiness) (USD (L&MR)) has been directed to take action to institutionalize CPI efforts by certifying CPI experts, providing guidance documentation, and enabling collaboration.

While it is “labeled” a guide, the DoD charges the USD (L&MR) to "institutionalize" CPI. The definition of institutionalize is to “make something an established custom.” It is anticipated that for the Services to achieve institutionalization, more than an invitation to follow document guidance will be needed. It is yet to be seen what specific actions will be taken to meet this direction. (Deputy Secretary of Defense, 2006)

The DoD CPITG can be considered a broad-reaching document that encompasses all the aspects and best practices of CPI. These best practices include long-term cultural change and implementation of specific tools to take action and close the gap from an

organization's current state to a desired future state. The document's overview points largely to initial "islands of success" for CPI application to specific projects and organizations. The DoD CPITG goal is meant to connect these various experiences and to instill a department-wide culture of CPI that will set the stage for greater enterprise-level improvements. The assessment portion, contained in Appendix D, is discussed later in this chapter as part of the appendix review. The DoD CPITG has four areas of focus, listed below and depicted in Figure 7:

- A broad-based, structured CPI implementation method to focus enterprise level CPI activities
- A focus on CPI implementation within a structure of goals that are aligned to warfighter-driven, outcome-based performance metrics to be achieved at the lowest total cost
- Emphasis on the management and integration of CPI projects with periodic progress evaluation and reporting
- Maturity assessments and checklists to determine how well projects and organizations are progressing with CPI initiatives, training, and certification.

The goal of the journey outlined in the DOD CPITG is to create an "in house" CPI process that each Service owns and applies, with trained experts and internal capability, within a reasonable time frame, e.g. one to three years.

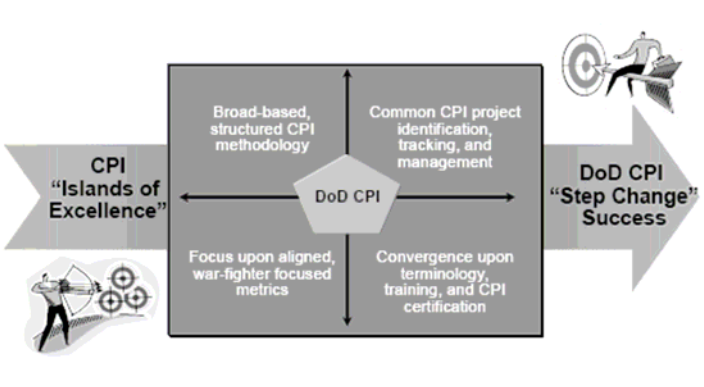

Figure 7. Four areas of DoD CPITG (From Deputy Secretary of Defense, 2006)

The structure of the document contains the following four sections (with emphasis on Sections 2 through 4), depicted in Figure 8 below, covering the introduction of CPI through actual assessment and analysis tools listed in the appendices:

- Section 1: Introduction of CPI and program focus
- Section 2: Framework description of the overall concepts as well as a DoD outline for CPI
- Section 3: Specific roles and responsibilities of participating organizations and elements of the DoD approach to CPI
- Section 4: Attachments covering more in-depth material on specific topics and tools that would be useful to various participants.

Figure 8. Pertinent sections of the DoD CPITG (From Deputy Secretary of Defense, 2006)

1. DoD CPITG Framework Pillars

The DoD framework has evolved from three schools of thought:

1. Lean -- based on continually working to minimizing waste while coming closer to exactly what the customer desires[1]
2. Six Sigma -- evolved from statistical analysis and quality control programs
3. Theory of Constraints -- provides an advanced planning capability through critical chain functionality.

The most important feature of the DoD CPITG is that it is neither prescriptive nor directive in nature. As an example, it speaks to the importance of communication on

[1] In the DoD CPITG the customer is the warfighter, which is widely interpreted to mean single individuals or units such as squadrons for the NAE. Sufficient arguments could be made that the Combatant Commander (COCOM) is actually the customer for the NAE and should be the focus for CPI initiatives.

information management, but does not direct the specific structure of these processes or information systems to be utilized. The DoD CPITG consists of five "areas" listed below:

a. ***Area 1: Fundamental Concepts of CPI***

Several areas are important to CPI implementation and are divided into "musts," principles, a value stream, and culture.

CPI "musts:"

1. Infrastructure established to support CPI implementation through designated Champions, Steering Committees, Support Teams, and Working Groups
2. Goals aligned with strategy, mission related, and adding value for customers
3. Apply the define, measure, analyze, improve, and control (DMAIC) process with a CPI plan of action for all projects
4. A visible and forceful leadership commitment to CPI through an innovative and collaborative organization

CPI principles:

1. Fact-based data analysis to determine the current situation
2. Analysis of variation from known standards
3. Utilize systems thinking to avoid sub-optimization
4. Focus on value-added elements of the value stream such as people, machines, and systems
5. Controlled continuous experimentation
6. Based on long-term improvement as the overall objective
7. Partner with suppliers, customers, and internal and external stakeholders

The successful application of CPI is based on a comprehensive value stream focus for the organization being improved. The DoD enterprise is extremely large, complex, and globally involved with thousands of personnel, nodes, interfaces, initiatives and activities. For CPI to be effective, the value stream is intended to commence at the enterprise level, to manage the gaps between the present organization

and a desired future state. An example of a transition-focused enterprise value stream map (Balazs, James, & Parris, 2002) is shown in Figure 9.

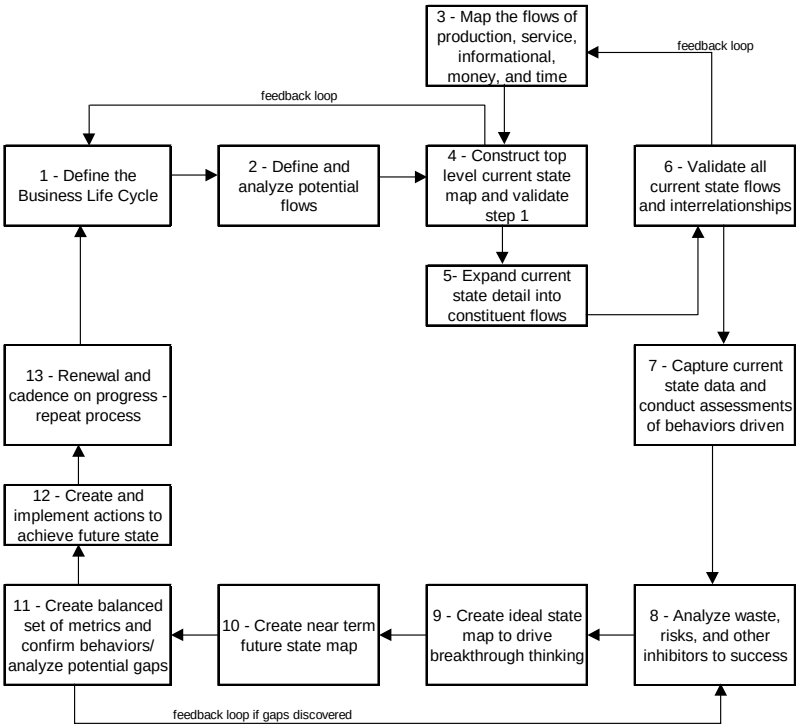

Figure 9. Enterprise Value Stream Mapping Process Example (From Deputy Secretary of Defense, 2006)

b. *Area 2: The CPI Deployment Cycle*

The DoD CPITG reflects an orderly and structured process for the implementation of CPI programs using a four-phase approach[2] as seen in Figure 10. Each of the phases is designed to create continuous refinement and improvement of the previous implementation steps to build a foundation for overall process improvement. As previously shown, the DoD CPITG is meant to keep all applicable processes strategically focused with the appropriate allocation of resources to meet requirements. The result is a dynamic document and/or roadmap pointing the way to ongoing improvements adapted to fit changing customer needs and expectations.

[2] The CPI's four-phase approach is modeled after the MIT LAI Transition-to-Lean Roadmap and directly correlates to the steps within that framework.

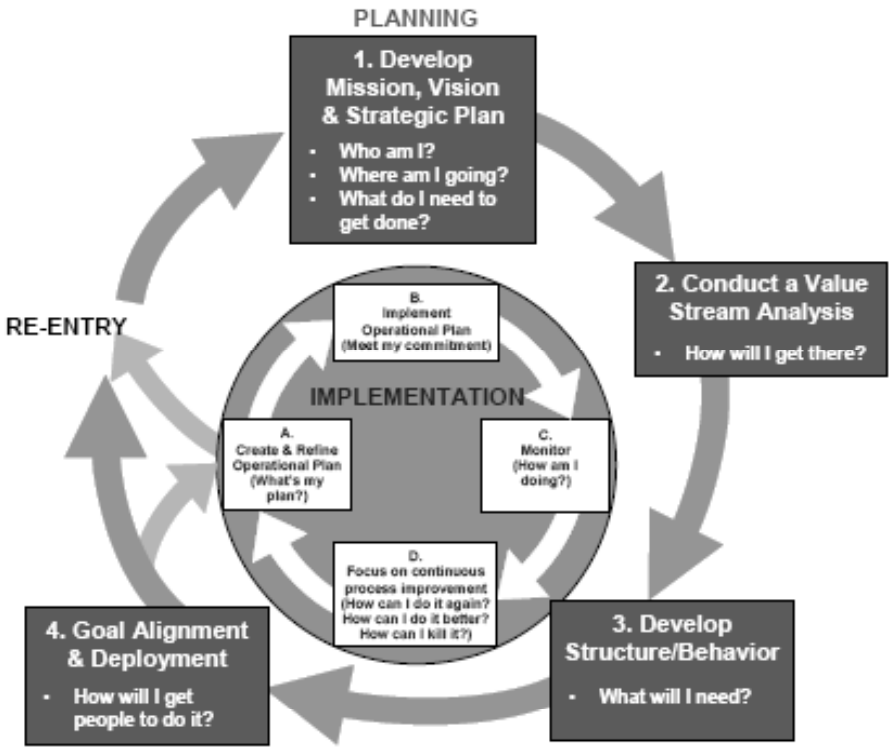

Figure 10. Deployment cycle for CPI programs (From Deputy Secretary of Defense, 2006)

The four steps in the deployment cycle are defined as:

- Develop mission, vision, and strategic plan -- answering the questions: Who are we? Where are we headed? What needs to get done? The strategic vision should be three to five years in length.
- Conduct a Value Stream Analysis -- to see the beginning of value creation through to customer delivery, with all the touch points in the process, and process stakeholders.
- Develop structure and behavior -- necessary to make the implementation happen in the manner expected. Generally this is enacted through a flow-down from champion, to steering committee, to support team, to work group.
- Align and deploy goals -- know what will motivate employees to take correct, timely and informed actions and make performance assessment more visible and measurable.

c. *Area 3: Operational Plan*

As CPI implementation moves out of the planning and strategy areas of development the next step of the plan is to define actionable tasks that are achievable and supported by all the senior executive leadership. The goals are to:

- Provide actions that meet the transformation objectives for the organization
- Capture current best practices as a foundation to minimize the amount of change
- Provide for continuous growth in the CPI implementation to capture expanding areas of the enterprise.

d. *Area 4: Change Management*

The DOD CPITG recognizes the fact that CPI is relatively new for many defense agencies, and will likely require changes across the workforce to meet the demands of new process and work redesign. To adequately address the needs of CPI, a robust change management structure is reinforced in the literature including the following actions:

- Educate leaders (continual education – all grades and ranks)
- Challenge assumptions
- Secure agreements
- Prepare leaders, staff, and organization members for adopting new roles, applying critical thinking, and developing and measuring streamlined processes
- Use the formal process of DMAIC to define, measure, analyze, implement, and control.

To facilitate a large-scale change process, many organizations will need to transition from their "as is" to their desired "to be" state, including being able to measure and show visible changes to the workforce. Making improvements visible is meant to act as a motivating and momentum-generating force. The outcomes and improved designs of one cycle provide the starting point for the next cycle of improvement.

e. ***Area 5: Metrics***

There is probably no more important attribute of a successful CPI implementation than measuring progress. The metrics constitute the lens or the criteria through which success will be measured. The structure and encouragement of a metrics system demonstrates the priorities of senior leadership. The process of collecting data for the metrics process, and translating data into usable knowledge so leaders and managers can enact changes, describes a non-ending cycle of process improvement.

The criteria for evaluating metrics should be:

- Valid to measure the intended process attribute.
- Obtainable in a timely manner with allocated resources.
- Accurate and repeatable, earning the trust of all involved.
- Relevant, timely, and correlated to the actions of the organization.
- Consistent, relevant, periodic cost measurement using logical and transparent cost constructs.

Other considerations:

- Level of aggregation boundaries matter, i.e., defined such that there is comparative consistency across the organization. Cost metrics are sensitive and can be difficult to define.
- Data ownership and sharing roles matter, i.e., clear roles defined for who has responsibility and authority for data collection, maintenance and security, including information-sharing protocols.

2. Roles and Responsibilities

- Champion – a designated relatively senior person assigned to perform change agent activities, sponsored by and having access to senior executive leadership, and knowledgeable of organizational history, mission, vision, goals, and CPI principles.
- Steering committee – a senior, cross-functional team responsible for aligning the new direction of CPI with organizational design elements, including identifying, measuring and obtaining results.

- Support teams – managers who provide training and facilitate DMAIC project management of CPI initiatives.
- Work groups -- process owners who employ appropriate CPI tools to the given situation.
- Peer groups -- share common functional responsibilities and provide an opportunity for sharing information, challenges, approaches, activities, and accomplishments.

Within organizations, these roles and responsibilities can be resident at different levels. Senior leaders set the new CPI direction, ensure appropriate resources and identify desired results, managers modify and improve work design around various functions, and all employees learn and apply the CPI methodology.

Other important items to consider:

- Information technology personnel and vendors manage crucial data in a different way, i.e., result- and knowledge-oriented, secure, and not complicated by "rice bowl" behaviors.
- Contracting is carefully integrated so that organizational cultural changes revolve around critical core processes.
- Facilities management, planning, and budgeting personnel should have early and consistent involvement because waste reduction in operations can create offsetting waste increases in reconfiguring facilities.
- Human resource management increases in importance in terms of the criticality of recruiting, hiring, training and promoting the right people. CPI cannot / must not be perceived in terms of downsizing and/or jobs reduction, or the process will suffer the consequences of cultural alienation.
- Supply chain management increases in importance to ensure a linking relationship among process owners.
- Labor union personnel should have early and consistent involvement to obtain insights and to avoid excessive confrontation.

- Finance and budget management teams should ensure that monetary resources are timed to be available when needed to support CPI initiatives.
- Engineering skills increase in importance at various levels of the CPI effort and should be connected to hiring and training initiatives.

3. DoD CPITG Attachments

The DoD CPITG attachments below provide procedures, tools, and checklists to support CPI efforts. Attachment D, as the assessment piece of the DoD CPITG, is an essential attachment for the purposes of this thesis and is described at the end of this section.

1. Resources: provides lists of applicable books and organizations that can help to build explicit and tacit knowledge necessary to understand and successfully apply CPI activities.
2. Organizational Implementation Planning Framework: provides a checklist for CPI steps and actions as seen in Table 3.
3. Training and Certification: provides steps to facilitate the understanding and skills in the core competencies necessary for successful launch and sustainment.
4. Community of Practice Progress Assessment: provides techniques for assessing CPI performance and maturity level.
5. CPI Toolbox: provides evolution of CPI techniques and common tools.
6. Sample CPI Project Selection Criteria and Project Charter: provides tools to implement specific CPI actions.
7. Terminology: provides recommended common lexicon critical for information sharing across the enterprise.

Table 3. List of CPI steps and associated actions (From Deputy Secretary of Defense, 2006)

CPI Step	Action description
Develop Enterprise Strategic Plan	1.1 Get Leadership Commitment
	1.2 Obtain Expert Help
	1.3 Identify/Select Steering Committee and Support Team
	1.4 Identify Strategic Goals, Vision, Metrics
	1.5 Convey Urgency/Burning Platform
	1.6 Commit to Develop People
	1.7 Focus on Customer Value
	1.8 Communicate
	1.9 Develop a Transformation Strategy
	1.10 Identify and Assign Deployment Actions
	1.11 Conduct a Risk Assessment
	1.12 Identify Funding/Resource Requirements and Sources
Conduct a Value Stream Analysis	2.1 Establish an Enterprise Approach
	2.2 Perform Customer/Stakeholder Analysis
	2.3 Value Stream Map Key Processes
	2.4 Identify Leverage Points
	2.5 Select Pilot Projects
	2.6 Determine How to Measure Benefits
Develop Structure and Behavior	3.1 Conduct Initial Training
	3.2 Identify and Select Additional Champions
	3.3 Establish CPI Support Infrastructure
	3.4 Use the Steering Committee to Share Lessons
	3.5 Organize for CPI Implementation
Align and Deploy Goals	4.1 Deploy Aligned Goals Down Through Organization
	4.2 Align Sub-Organizations Commitments to Goals
Develop an Operational Plan	5.1 Align Plan to Strategy
	5.2 Establish Deployment Funding/Resources
	5.3 Establish Timing and Priorities
	5.4 Identify the Improvement Activities
	5.4 Address Retention/Improvement of Output Quality
Implement the Operational Plan	6.1 Conduct Initial Improvement Activities
	6.2 Baseline Key Processes
	6.3 Focus on Standardization: Policies, Procedures, Processes
	6.4 Focus on Quality
Monitor Progress	7.1 Monitor Performance to Established Organization Goals
	7.2 Coach for Results
Focus on CPI	8.1 Sustain Gains
	8.2 Nurture the Process
	8.3 Establish a Cross-Feed Process
	8.4 Ensure Senior Leader Participation
	8.5 Conduct a Self-Assessment
	8.6 Update Direction and the Plan

4. DoD CPITG Attachment D – CPI Progress Assessment Tool

The DoD CPITG includes three forms of assessment:

1. A quick ten-question assessment
2. A maturity assessment tool for overall evaluation of organizational CPI
3. An advanced assessment tool that is intended for use by organizations striving for world-class excellence

The quick assessment form is simply a list of questions with no scoring. The overall and advanced assessment tools are based on a maturity model with scoring on a one-to-five scale. The advanced assessment includes score weighting to express the leadership's relative value in different CPI functions. Additionally the advanced tool provides a process for gap analysis to a future preferred state. Each tool is designed to be administered internally, or facilitated by an external third party, to yield a measure of the organizations current state and CPI achievement.

The "quick" ten question assessment covers the following topics and can be very effective in early CPI efforts, with few resource demands, to determine the as-is state of CPI.

1. Immediate impressions of "5s"[3] in one implementation for every organizational area
2. Performance against transparent and aligned CPI metrics recognizable by randomly selected employees.
3. Visible kaizen (acceleration of process improvement) events being conducted with quantification of the results.
4. Random assessment of the value added work, to non-value added work, ratio in any selected core processes.
5. Observe ratio of work in progress to visible inventory.
6. Are actions of the CPI champion visible?
7. Does cross-functional teaming predominate over "stovepipe" activities?
8. Are value stream maps visible and continually refined?
9. Is CPI education and training in place to the benefit of the employees?
10. Are the islands of CPI success connected across the enterprise or functioning in isolation?

[3] Based on Japanese words that begin with "S," the 5S philosophy focuses on effective work place organization and standardized work procedures. The five S's are: sort, set in order, shine, standardize, and sustain. (George, 2003)

The overall CPI maturity assessment is more in-depth but still very functional as an internal assessment that can give faster results. The overall assessment has a one-to-five scoring that rate an organization as:

1. Not Yet Started
2. In Process
3. Demonstrated
4. High Visibility
5. Transformation Evident

The scores for the overall assessment are assigned across the following criteria and sub-criteria:

Planning

1. Mission, Vision, and Strategic Planning
2. Conduct a Value Stream Analysis
3. Develop Structure / Behavior
4. Goal Alignment and Deployment

Implementation

1. Create and Refine Operational Plan
2. Implement Operational Plan
3. Monitor
4. Focus on Continuous Process Improvement

The resultant cumulative, average score, from each criterion is ranked as follows:

- Less than three = beginner stage of CPI
- Three to Four = intermediate stage of CPI
- Four to Five = advanced stage of CPI

The advanced CPI assessment tool goes into greater detail to support the weighted scores, and gap analysis necessary to manage the actions of an organization striving for world class excellence. It is based on a tool used extensively for similar purposes by John Allen at Total Systems Development (TSD) and includes concepts from LAI and the Shingo Prize. It is a leadership guide as well as progress measurement process.

In this model, leadership is asked to describe their desired organizational state in two to three years. The resultant scores become the benchmark against which the current

state is measured. The assessment must be led from the top down from individuals who have the vision and influence to sustain the early change effort. The structure of the advanced assessment tool ranks 22 areas of CPI, as seen in Table 4, on a scale of one to five for current state, future state, gap between the two states, and evaluator rating. The final scores are displayed on an eight-axis spider graph (shown in Figure 11) to visually display the current state of the enterprise.

Table 4. Twenty-Two CPI Areas

Para. No.	CPI Area
1.1	Vision
1.2	Commitment
1.3	Policy Deployment
2.1	Leadership
2.2	Steering Committee
2.3	Support Team
3.1	Team-Based Workgroups
3.2	Aligned Organization
3.3.1	PDCA Management Process
3.3.2	Empowering, Facilitating, Coaching Styles
3.4.1	Training
3.4.2	Compensation and Recognition
3.4.3	Selection Process
4.1.1	Employee Attitudes towards Improvement
4.1.2	Cooperation, Trust and Respect
4.1.3	Employment Security
4.2.1	Learning/Continuous Improvement
4.2.2	Suggestion Systems
4.3.1	Selection Process
4.3.2	Certification
5.1	Workplace Organization
5.2	5S Discipline for a Clean Workplace

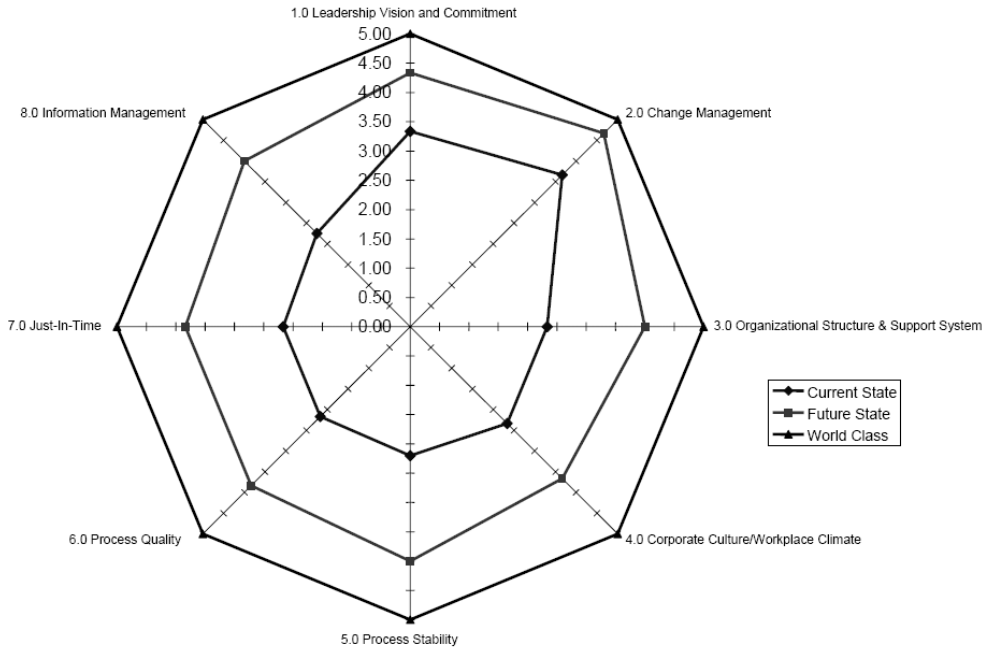

Figure 11. Eight axis spider graph (From Deputy Secretary of Defense, 2006)

C. NAVY PERFORMANCE EXCELLENCE GUIDEBOOK (NPEG)

On May 3, 2006, the Secretary of the Navy, Donald C. Winter, issued a memorandum, "Transformation through Lean Six Sigma" (Winter, 2006) In that memorandum, Mr. Winter outlined the Navy's issues of fighting a war and positioning the naval forces for the future, combined with fiscal pressures urging wise use of taxpayer dollars. Previously in industry, he knew of examples where buyers and sellers who employed Lean Six Sigma (LSS) experienced better efficiencies and higher levels of performance. He sent a clear message that he expects leadership to support the LSS initiative by "injecting it into performance objectives." His goal is to fully employ LSS in Navy organizations.

To assist Navy organizations with their transformation to lean, the Office of Fleet Readiness and Logistics (N4), Office of the Chief of Naval Operations (OPNAV), has drafted the Navy Performance Excellence Guidebook (NPEG). The NPEG as of this writing is in final form, awaiting CNO signature. The NPEG provides Navy leaders with an "easy-to-use" framework for improving performance excellence, intended to guide

them through their continuous process improvement. The NPEG is considered to be a "strategic imperative" for implementing Sea Enterprise. It will help answer the questions, "Do we know what we are doing? Do we need to be doing it? Does it add value? How do we measure success?" (Navy Performance Excellence Guidebook, 2006)

The NPEG is a non-mandatory tool for Navy organizations that complements existing enterprise maturity efforts. Goals of the NPEG are to:

- Help leaders self-assess their management system performance
- Coalesce the results into a Strategic Plan (Execution Plan included)
- Identify opportunities for improvement, and leverage core strengths
- Jump-start and integrate change initiatives
- Provide consistency of focus over time
- Institutionalize a common framework for improvement.

Intended outcomes of using the NPEG are to: reduce non-value added activity, address areas that need improvement, and identify and leverage core strengths. It states it will help organizations to:

- Manage knowledge better
- Boost organizational learning
- Integrate and energize improvement initiatives
- Create value within organizations.

A crucial variable to the success of applying the NPEG is senior leadership understanding and involvement. Senior leaders are recommended to take ownership of the outputs (Strategic Plan and Self-Assessment).

The Navy used validated management practices to create the Performance Excellence Process and Self-Assessment Guide. Some of those practices were drawn from the Malcolm Baldrige Quality Award criteria and capability maturity matrix models.

The NPEG defines five performance excellence process steps, which are shown in Figure 12. The document is organized into five sections, corresponding to the five steps:

Step 1: Organizational Profile: Who we are?

Step 2: Organizational Assessment: What we do.

Step 3: Strategic Plan: Where we are going?

Step 4: Execution Plan: How we get there.

Step 5: Performance Measurement: How we measure our progress.

Each section describes the step, and provides a process table that defines the steps to completion, outputs, and considerations.

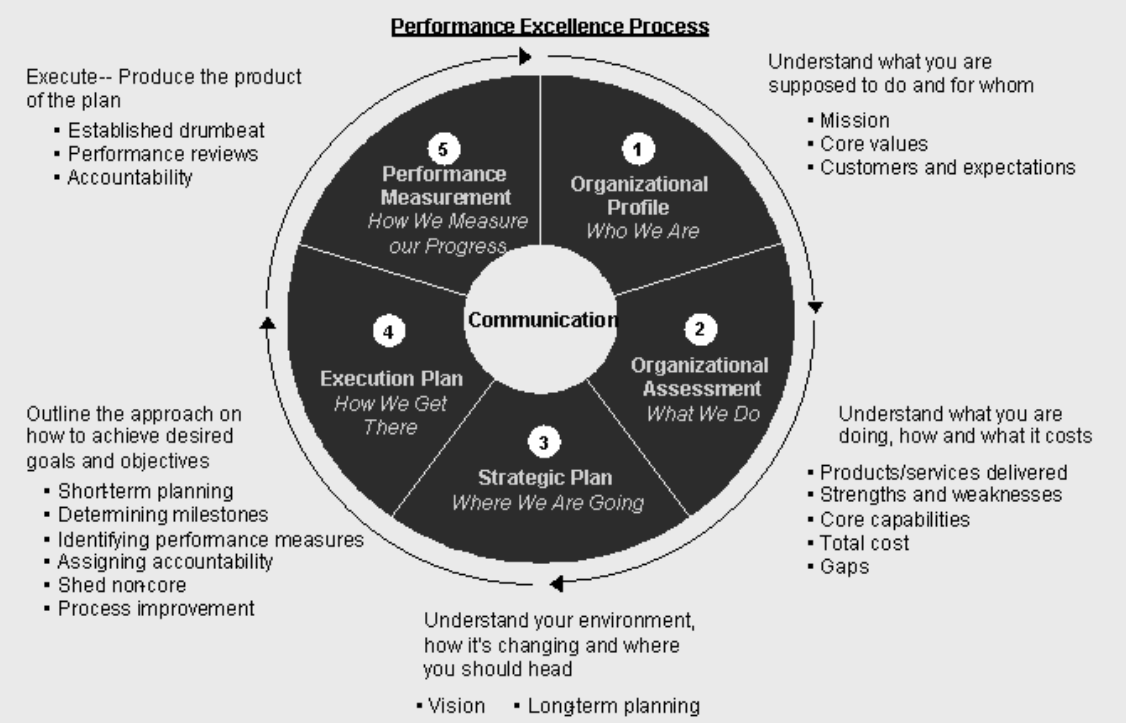

Figure 12. Navy Performance Excellence Process (From U.S. Navy, 2006)

There are two major outputs of the process: self-assessment results and a strategic plan. Even if some organizations are already doing strategic planning or some self-assessment, the purpose of the NPEG is to help integrate those activities into a integrated and aligned management system that does not perpetuate waste.

There are seven appendices in the NPEG:

Appendix A - Glossary of terms

Appendix B - Outlines the performance criteria and the points available for each area of the criteria. This might be a more readable way to see how each criteria area is weighted.

Appendix C - Criteria response guidelines, including the ADLI evaluation factors, taken from the Baldrige criteria

Appendix D - Plan of Action and Milestones Worksheet. Identifies key strengths, opportunities for improvement, and non-value added activities. Used after the self-assessment.

Appendix E - Examples of outputs and additional clarification for what is required to document for each step

Appendix F - Describes how the self-assessment was developed

Appendix G - Resources; readings, websites, and online courses

1. Timelines for using the NPEG

The NPEG provides a suggested process timeline (Figure 13) and how much time is expected for each step:

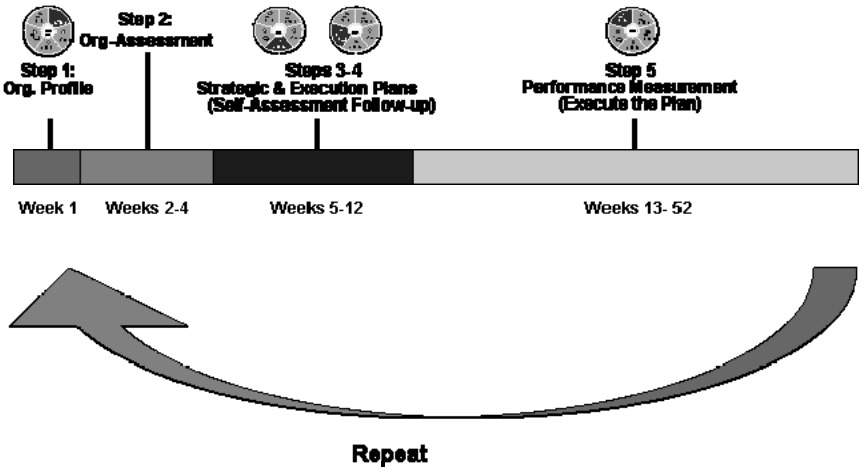

Figure 13. Suggested Timeline for NPEG Steps (From U.S. Navy, 2006)

2. Step 1 – Organizational Profile

The starting point for the process is the organizational profile. The profile outlines the organization, its relationships, operating environment, and the key challenges it faces. It helps delineate what is important to the organization, key influences, and where the organization is headed. It provides a context for understanding the organization before undertaking a self-assessment.

The suggested methodology for creating this profile is to assemble a small, credible group within the organization or enterprise to answer defined questions. The questions are divided into two major sections: organizational challenges and organizational description.

The organizational challenges section addresses the environment in which the organization operates and its important strategic challenges. It also addresses how organizational learning and performance improvement is approached. There are a total of six questions in this area.

The organizational description area identifies key characteristics and relationships that shape the organizational environment. They also address governance, and there are nine questions in this section.

The profile enables an objective depiction of the organization and its context, i.e., why it exists, and where it wants to go in the future. It is designed to assist leaders and managers in making strategic decisions that will shape the organizations future. The process steps for creating the profile are provided in the document, as well as the primary outputs and considerations. (Chief of Naval Operations (CNO), 2006)

3. Step 2 – Organizational Assessment

The organizational assessment analyzes the organization's strengths, weaknesses, opportunities, and capabilities. It indicates whether the organization is achieving performance targets. It also identifies capabilities that the organization must develop to become more effective and efficient. There are two necessary initial steps, which typically take two to three weeks prior to actually conducting a self-assessment. First, senior leadership identifies whether the whole or part of the organization will participate

in the self-assessment, and a small, cross-functional team is formed. Then, the team gets familiar with the NPEG and evaluates the organization using the scoring tables and spreadsheets that accompany the document.

The process to be used for assessing an organization is then outlined in the document. The self-assessment is divided into five process steps, which are the same as in the Performance Excellence Process. A scoring table is provided for each question. They create a composite score for each criterion. Scores are then compiled to determine maturity levels for all five steps of the Process. There are a total of 95 sets of self-assessment questions.

The self-assessment guide is built on a set of core values and concepts:

- Visionary leadership – directions are set and there is a focus on the customer; leaders are role models for their people.
- Customer-driven excellence – the customer assesses quality and performance, so attention to customer requirements demand constant sensitivity.
- Organizational and personal learning – learning is part of the culture; knowledge is shared; directed to better outputs and services.
- Valuing personnel and partners – committing to their well-being and satisfaction; encourage risk-taking and innovation; build partnerships.
- Agility – the capacity for rapid change and flexibility.
- Focus on the future – understand the factors that affect the organization.
- Managing for innovation – becomes part of the learning culture.
- Management by fact – collect and analyze the data that supports good decisions.
- Social responsibility – stress responsibilities to the public, ethical behavior.
- Focus on results and creating value – create balance and value to stakeholders.

- Systems perspective – manage the congruence of variables over which management has full or partial control to allow and encourage cultural adaptation to new ways of achieving and measuring success.

It is noteworthy that most of these core values and concepts match those found and cited in the Chapter 2 literature review.

The self-assessment is divided into the same five steps as the Performance Excellence Process, and four criteria are examined:

1. Senior Leadership – key aspects of responsibilities, and how they communicate and set the vision and values;
2. Governance and social responsibility – outlines key aspects of the organization's governance system and how it fulfills public responsibilities;
3. Customer and Mission Area Knowledge – key processes for gaining knowledge about current and future customers, mission areas, outputs and services, and how pace is kept with changes; and
4. Customer Relationships and Satisfaction – what processes exist for building customer relationships and determining satisfaction?

The criteria and key questions for the steps 1-5 of the Self-Assessment are outlined in Table 5. Some amplification for each criteria and question is provided, as well as the definitions for five levels to be used for scoring criteria. The criteria start at a low level and advance towards "perfection." For example, the Question A Level 1 and Level 5 scoring criteria for Criteria 1.1, Senior Leadership, Vision and Values is:

"How do your leaders approach their responsibility for setting expectations and deploying the mission?"

- Level 1 -- We have no clear organizational mission, vision, or values. Leadership focuses on the organization's short-term survival, and manages by directive. Senior leadership initiatives are driven by personal career motivations. Employees are expected to follow shifting direction and handle daily problems as they arrive. Suppliers and partners are not

engaged in any way with the organization's mission. "Kissing up and kicking down" is the norm.

- Level 5 -- All employees have a strong identification with the mission, vision, and values of the organization and are committed to its goals. Senior leadership is consistent in initiatives and direction regardless of changes in leadership. People think and act like "owners of the business," in their decision-making and communications. An infectious continuous improvement culture has evolved within the organization. Employees are confident in their ability to pursue learning, make decisions, and make changes to improve their organization, confident that their decisions will be supported."

Table 5. Self-Assessment Criteria and Questions

Step	Criteria	Sub-Criteria	Question
1.1	Senior Leadership	Vision and Values	• How do your leaders approach their responsibility for setting expectations and deploying the mission? • How do senior leaders promote an environment that fosters and requires legal and ethical behavior? • How do the organization's leaders create a sustainable and relevant organization with performance improvement, accomplishment of strategic objectives, innovation, and organizational agility? • How do leaders personally participate in succession planning and the development of future organizational leaders?
		Communication & Organizational Performance	• How do the organization's leaders promote improvement, communicate with personnel, promote teamwork, and empower others to do what needs to be done? • How do the organization's leaders focus on action to accomplish objectives, improve performance, and attain their vision?
1.2	Governance & Social Responsibility	Organizational Governance	• How does the organization evaluate its governance system? • How does the organization evaluate performance of senior leaders and how do the leaders use performance evaluations to improve their leadership?
		Legal & Ethical Behavior	• How does the organization anticipate, evaluate, and rectify the adverse impacts of community operations and the environment? • How does the organization use mechanisms for promoting and monitoring of ethical behavior by all personnel? How are breaches handled?
		Support of Key Local Communities	• How does the organization, particularly senior leaders, actively support and help to improve local communities?

Table 5. Self-Assessment Criteria and Questions (cont.)

Step	Criteria	Sub-Criteria	Question
1.3	Customer & Mission Area Knowledge	Customer & Operational Knowledge	• How well does the organization know its customers and relate capabilities to these customers? • How well does the organization use feedback from its customers (internal, external) regarding value, cost, and quality to become more customer focused? • How well does the organization keep listening and learning methods current with operational needs and directions, including changes in external environment?
1.4	Customer Relationships & Satisfaction	Customer Relationship Building	• How do you build relationships with customers to meet and exceed their expectations, while improving financial performance? • How does the organization respond to customer comments and complaints, ensure that it resolves them effectively, and perform improvement efforts?
		Customer Satisfaction Determination	• How does the organization track customer satisfaction and how does it use customer problems to improve processes? • How do you determine your organization's customer satisfaction levels? • How do you keep your approaches to determining satisfaction current with operational needs and directions?

Table 5. Self-Assessment Criteria and Questions (cont.)

Step	Criteria	Sub-Criteria	Question
2.1	Measurement, Analysis & Review of Organizational Performance	Performance Measurement	• How does the organization select, collect, align, and integrate its metrics to track daily performance and achievement of strategic objectives and action plans? To what extent do managers and employees understand and use performance metrics to monitor processes? • How do you select and ensure the effective use of key comparative data for operational and strategic decision-making and innovation? How do you measure cost savings? • How does the organization keep its performance measurement system current with its operational needs and directions?
		Performance Analysis & Review	• How does the organization review and analyze organizational performance and capabilities? How does it assess its ability to respond to changing organizational needs and challenges in the operating environment? • How does the organization use organizational performance reviews as inputs to the strategic planning process and innovation?
2.2	Information & Knowledge Management	Data & Information Availability	• How do you make needed data and information available? How do you make them accessible to personnel, suppliers, partners, customers, and stakeholders? • How does the organization develop and ensure reliable, secure, and user-friendly hardware and software availability? • How does the organization keep its data and availability mechanisms current?

Table 5. Self-Assessment Criteria and Questions (cont.)

Step	Criteria	Sub-Criteria	Question
		Organizational Knowledge Management	• How does the organization maximize performance through knowledge management? How does the organization use management tools and methods for transferring workforce knowledge?
		Data, Information, & Knowledge Quality	• How does the organization ensure that performance data, information, and organizational knowledge are accurate, accessible, reliable, timely, and secure?
3.1	Strategic Development	Strategy Development Process	• How does the organization use a systematic strategic planning process to guide decisions and continuously improve performance? • How does the organization identify strengths, weaknesses, opportunities, and threats during its strategic planning process?
		Strategic Objectives	• How does the organization define strategic objectives and establish timetables for their accomplishment? • How do the organization's strategic objectives specifically address the organizational challenges in its Organizational Profile? • How does the organization's strategic planning process incorporate planning for change management? How does it address the cultural challenges the organization may face in executing the strategic plan?
4.1	Work Systems	Organization & Management of Work	• How does the organization reduce waste and costs, improve customer satisfaction, embrace innovation, promote cooperation, and reward initiative? • How does the organization develop and implement systems that enable it to capture ideas from diverse personnel and knowledge from external sources? • How does the organization encourage open and effective communication and skill sharing across all work units?

Table 5. Self-Assessment Criteria and Questions (cont.)

Step	Criteria	Sub-Criteria	Question
		Personnel Performance Management System	• How does your personnel performance management system, including feedback to personnel, support high-performance work and contribute to the achievement of your Execution Plans? • How does your personnel performance management system support a customer and readiness focus? How do your compensation, recognition, and reward and incentive practices reinforce high-performance work?
		Hiring and Career Progression	• How do you identify characteristics and the skills needed by personnel? • How do you recruit, hire, and retain new personnel? How do you ensure that the personnel represent the diverse ideas, cultures, and thinking needed for your desired workforce? • How do you accomplish effective succession planning for leadership and management positions? How do you manage effective career progression for all employees throughout the organization?

Table 5. Self-Assessment Criteria and Questions (cont.)

Step	Criteria	Sub-Criteria	Question
4.2	Personnel Learning & Motivation	Personnel Education Training and Development	• How does the organization use education and training of personnel to achieve objectives and address key needs associated with organizational performance management? • How does the organization address key organizational needs in such areas as new personnel orientation, diversity, ethical practices, workplace environment and safety, and management and leadership development? • How does the organization receive input on its personnel's education, training, and development needs? • How does the organization deliver education and training programs to personnel? • How does the organization reinforce on the job knowledge and skills of personnel to ensure that they retain knowledge and skills for long-term organizational use? • How do you evaluate the effectiveness of education and training, taking into account individual and organizational performance?
		Motivation and Career Development	• How do you involve personnel to motivate* them and to develop and utilize their full potential? • How does the organization help its personnel attain their job, career, and learning objectives?
4.3	Personnel Well-Being and Satisfaction	Work Environment	• How do you ensure workplace preparedness for disasters or emergencies?

Table 5. Self-Assessment Criteria and Questions (cont.)

Step	Criteria	Sub-Criteria	Question
		Personnel Support and Satisfaction	• How does the organization monitor the well-being, satisfaction, and motivation of its personnel? • How does the organization tailor its personnel services, benefits, and policies to the needs of a diverse workforce? • How does the organization develop measures and indicators of personnel well-being, satisfaction, and motivation? • How do you relate assessment findings to key results to identify priorities for improving the work environment and personnel support?
4.4	Value Creation Processes		• How does the organization identify, understand, and define success for all of its key outputs, services, and value creation processes? • How does the organization identify and meet key requirements for value creation processes and continuous improvement techniques? • How does the organization incorporate new technology, organizational knowledge, and agility into its value creation? • How does the organization use productivity, efficiency and effectiveness measures in the design and implementation of its value creation processes? • With respect to value creation processes, how do you foster innovation and continuous improvement (CI) at all levels? • How does in-process management ensure key process outputs are met? How is stakeholder input used for in-process management? • How does the organization minimize the cost of quality? • How does the management system handle and dispose of non-conforming process output? • How does the organization capture and reinvest cost savings?

Table 5. Self-Assessment Criteria and Questions (cont.)

Step	Criteria	Sub-Criteria	Question
4.5	Support Processes		• How does the organization determine its key support processes? • How does the organization use a system to ensure that processes meet all key requirements and that new technology and organizational knowledge are incorporated into such processes? • How does the organization utilize a wide range of efficiency and effectiveness measures in the design of its support processes? How does it implement processes to ensure that the effects are desirable and that they meet design requirements? • How does your day-to-day operation of key support processes ensure meeting key performance requirements? • How does the management system incorporate input and ensure that in-process measures of support processes are monitored? • How does the internal auditing system for support processes work in your organization? In addition, how does the organization use preventive activities to minimize overall cost of quality? • How does the quality management system handle non-conforming support process output and adjustment to any corrective and preventative action processes (if any)? • With respect to support processes, how do you foster innovation and continuous improvement (CI) at all levels in the organization? • To what extent does the organization have an appropriate system to provide adequate financial resources and alignment to objectives? • How does the organization assess and plan for risks, including financial risks and emergencies? • How does management recognize what portion of its cost is direct labor, material, overhead, general and administrative?

Table 5. Self-Assessment Criteria and Questions (cont.)

Step	Criteria	Sub-Criteria	Question
4.6	Strategy Deployment	Execution Plan Development and Deployment	• How does the organization develop Execution Plans with customers and stakeholders, and evaluate whether those plans meet their operational expectations? • How does the organization base its human resources plans upon short- and long-term implementation objectives and plans? • How does the organization use key performance measures for tracking the progress of Execution Plans, reinforcing our organizational alignment, and addressing all key mission areas and stakeholders?
		Performance Projection	• How does the organization track short- and long-term performance projections using the same metrics that we use for tracking the progress of Execution Plans?
5.1	Output & Service Results		• How does the organization track current levels and trends in key measures of output and service performance that are important to customers?
5.2	Customer-Focused Results		• How does the organization track current levels and trends in key measures or indicators of customer satisfaction and dissatisfaction? • How does the organization track current levels and trends in key measures or indicators of customer-perceived value?
5.3	Financial Results		• How does the organization track current levels and trends in key measures or indicators of financial performance? In addition, how does the organization identify cost drivers and link costs to outputs? • How does the organization track current levels and trends in key measures or indicators of operational performance?

Table 5. Self-Assessment Criteria and Questions (cont.)

Step	Criteria	Sub-Criteria	Question
5.4	Human Resource Results		• How does the organization track work system performance and effectiveness of its human resources with measures/indicators? • How does the organization track indicators of personnel learning and development? • How does the organization track current levels and trends in key measures of personnel well being, satisfaction, and dissatisfaction?
5.5	Organizational Effectiveness Results		• How does the organization track current levels and trends in key measures or indicators of the operational performance of your key value creation processes? This includes productivity, cycle time, supplier and partner performance, and other appropriate measures of effectiveness and efficiency • How does the organization track current levels and trends in key measures or indicators of the operational performance of your other key processes (such as administrative, support, or financial operations)? This includes productivity, cycle time, supplier and partner performance, and other appropriate measures of effectiveness and efficiency

Table 5. Self-Assessment Criteria and Questions (cont.)

Step	Criteria	Sub-Criteria	Question
5.6	Leadership & Social Responsibility Results		• How does your organization make use of metrics for tracking the effectiveness of your organizational, change management, and Execution Plan strategies? • How does the organization measure and track indicators of ethical behavior and stakeholder trust in the senior leaders and overall governance and also how does it track indicators of breaches ethical behavior by all levels of employees? • How does the organization track trends in key measures or indicators for internal and external fiscal accountability? • How does the organization look at measures or key indicators of regulatory and legal compliance? In addition, how does the organization look for important trends in compliance?

4. Step 3 -- Strategic Plan

The NPEG provides an organization with clear guidance showing how to produce a Strategic Plan as an output. It is anticipated that the final Plan will propose a three- to five-year path toward the organization's vision. The process for developing such a Plan is provided, as well as the primary outputs and considerations.

The NPEG does not provide explicit "instructions" for completing the strategic plan, but does provide an outline or template for how it could be completed. Benefits of strategic planning are also described. Suggestions for when planning should be done, preparing for planning, using a facilitator to help with the planning, roles in the process, planning process examples, and how to ensure execution of the plan are given. They suggest that the strategic plan be updated every three years, visiting it annually through an "execution plan".

5. Step 4 -- Execution Plan

One of the outputs from the strategic planning activity is an Execution Plan, which is the current year's focus defined in specific actions for the organization. It provides functional-level detail that supports the organization's vision, strategy, and goals. The process for developing an execution plan is provided, as well as the primary outputs and considerations. A template is provided that outlines the suggested contents of an effective execution plan. It becomes "section 2" of the Strategic Plan.

The Execution Plan contains a description of where an organization is headed in the current year ("where we are headed"), as they relate to goals in the strategic plan. There is an operations section ("how we do it"), which provides an understanding of how the organization's services or outputs are created and delivered to customers. A financial plan ("how we pay for it") is included that indicates a cost profile and metrics to monitor financial performance. The plan management section ("how we update it") serves as a framework for execution and fostering continuous improvement. It defines the accountability needed to keep the plan active.

6. Step 5 -- Measure Performance

This section describes a short process for how performance of goals and objectives is measured. It provides the steps to completion, primary outputs, and considerations used for this process, as well as for the other steps. There are suggested metrics provided in the Appendix E.

The NPEG is a very thorough, comprehensive approach to defining how to assess an organization, from the creation of the organizational profile, development of metrics, and the self-assessment methodology.

D. GOVERNMENT LEAN ENTERPRISE SELF-ASSESSMENT TOOL (GLESAT)

In 2001, the LAI developed the Lean Enterprise Self-Assessment Tool (LESAT) (Murman, et al, 2002), which employs a capability maturity model to measure the "leanness" of an organization. Their focus was to have a tool that would measure the enterprise, versus a particular process. LAI felt that traditional measures were inadequate in portraying progress toward achieving behavior changes or improvement strategies. The team at MIT compared the categories of various assessment tools such as the Malcolm Baldrige National Quality Award and ISO 9004. They also held discussions with Carnegie-Mellon regarding the CMMI. They agreed on the value of the capability maturity model for defining progressively greater levels of capability, as an organization "matures" in its performance of a particular factor.

The LESAT development team gathered extensive requirements from LAI member organizations regarding their needs relative to assessment. From there, LAI developed common a set of user requirements: the assessment tool should be flexible for organizational scope, be easy to understand and apply, must assess degree of "leanness" for an enterprise and its core processes, and must provide feedback for improvement and next steps.

A number of aerospace organizations participated in the testing of LESAT. Various degrees of success were achieved, but they all realized that the lean journey was one of years, not months. As government agencies began participating in the assessment,

LAI realized that another tool was needed, tailored specifically to the government environment. The LESAT was modified and the GLESAT became available in 2005.

1. GLESAT Structure

The GLESAT is based on the enterprise process architecture and the LAI Transition-to-Lean Roadmap described in Chapter 2. The GLESAT is organized into three assessment sections:

- Lean Transformation/Leadership – the process and leadership attributes nurturing the transformation to lean principles and practices;
- Lifecycle Processes – the processes responsible for the product from conception through post-delivery support; and
- Enabling Infrastructure – the processes that provide and manage the resources enabling enterprise operations.

There is a rating system of one to five, with level one being some awareness of lean practices and some ongoing improvement efforts. Level five shows the enterprise doing exceptionally well in applying lean principles and practices, and being innovative in deploying it in the enterprise. The example below (Murman, et al, 2002) shows five capability levels for the factor "Lean Enterprise Vision":

Level 1 – Senior leaders have varying visions of Lean, from none to well defined

Level 2 – Senior leaders adopt common vision of Lean

Level 3 – Lean vision has been communicated and is understood by most employees

Level 4 – Common vision of Lean shared by the extended enterprise

Level 5 – All shareholders have internalized the Lean vision and are an active part of achieving it

The GLESAT maturity matrices are organized as follows, with a total of 54 lean practices to be assessed according to the five-level scale:

Section 1 – Lean Transformation/Leadership

1A. Enterprise Strategic Planning (3 lean practices)

1B. Adopt Lean Paradigm (4 lean practices)

1C. Focus on the Value Stream (4 lean practices)

1D. Develop lean structure and behavior (7 lean practices)

1E. Create and refine transformation plan (3 lean practices)

1F. Implement lean initiatives (2 lean practices)

1G. Focus on continuous improvement (5 lean practices)

Section 2 – Life-Cycle Processes

2A. Set-up the enterprise (4 lean practices)

2B. Build relationships (3 lean practices)

2C. Develop the plan (5 lean practices)

2D. Implement the plan (4 lean practices)

2E. Learn, improve, and sustain (2 lean practices)

Section 3 – Enabling Infrastructure

3A. Lean organizational enablers (5 lean practices)

3B. Lean process enablers (3 lean practices)

2. Assessment Methodology

To ensure effective assessment, LAI recommends a structured methodology to administer the GLESAT, including semi-annual or annual assessment. There are five recommended steps:

1. A facilitated meeting to introduce the tool, and provide materials to the team. Enterprise leaders should be at this meeting.
2. Enterprise leaders examine GLESAT and conduct assessment.
3. Leadership reconvenes to discuss results and determine the organization's present maturity level.
4. Leadership determines their desired maturity level and measures the gap.
5. An action plan is developed and resources defined and prioritized.

Figure 14 shows the process definition, criteria structure, lean practices, and characteristics of the GLESAT, created and maintained by MIT LAI.

Government LESAT Enterprise Self-Assessment Tool (Government LESAT) 1.0

SECTION I SUMMARY SHEET - LEAN TRANSFORMATION/LEADERSHIP

Process Definition: Develop and deploy lean implementation plans throughout the enterprise leading to (1) long-term sustainability, (2) acquiring competitive advantage, and (3) satisfaction of stakeholders.

TTL Link	Lean Practice	Lean Characteristic	Capability Level	
			Current	Desired
I.A. Enterprise Strategic Planning	I.A.1 - Integration of lean in strategic planning process	Lean impacts value delivery in terms of cycle time and capability		
	I.A.2 - Focus on customer value	Customers pull value from enterprise value stream		
	I.A.3 - Leveraging the extended enterprise	Value stream extends from customer through the enterprise to supporting organizations		
		Average		
I.B. Adopt Lean Paradigm	I.B.1 - Learning and education in lean for enterprise leaders	"Unlearning" the old, learning the new		
	I.B.2 - Senior management commitment	Senior management leading it personally		
	I.B.3 - Lean enterprise vision	New mental model of the enterprise		
	I.B.4 - A sense of urgency	The primary driving force for lean		
		Average		
I.C. Focus on Value Stream	I.C.1 - Understanding current value stream	How we now deliver value to customers		
	I.C.2 - Enterprise flow	"Single piece flow" of materials and information		
	I.C.3 - Designing future value stream	Value stream to meet the enterprise vision		
	I.C.4 - Performance measures	Performance measures drive enterprise behavior		
		Average		
I.D. Develop Lean Structure and Behavior	I.D.1 - Enterprise organizational orientation	Organize to support value delivery		
	I.D.2 - Relationships based on mutual trust	"Win-win" vs. "we-they"		
	I.D.3 - Open and timely communications	Information exchanged when required		
	I.D.4 - Employee empowerment	Decision-making at lowest possible level		
	I.D.5 - Incentive alignment	Reward the behavior you want		
	I.D.6 - Innovation encouragement	From risk aversion to risk rewarding		
	I.D.7 - Lean change agents	The inspiration and drivers of change		
		Average		

Figure 14. GLESAT Summary Sheet (From Lean Enterprise Initiative, 2005)

GOVERNMENT LESAT SECTION I SUMMARY SHEET - CONTINUED

Process Definition: Develop and deploy lean implementation plans throughout the enterprise leading to (1) long-term sustainability, (2) acquiring competitive advantage, and (3) satisfaction of stakeholders.

TTL Link	Lean Practice	Lean Characteristic	Capability Level	
			Current	Desired
I.E. Create/Refine Transformation Plan	I.E.1 - Enterprise-level lean transformation plan	Charting the course across the extended enterprise		
	I.E.2 - Commit resources for lean improvements	Resource provision for lean		
	I.E.3 - Provide education and training	Just-in-time learning		
		Average		
I.F. Implement Lean Initiatives	I.F.1 - Development of detailed plans based on enterprise plan	Coordinating lean improvements		
	I.F.2 - Tracking detailed implementation	Assessing actual outcomes against goals		
		Average		
I.G. Focus on Continuous Improvement	I.G.1 - Structured continuous improvement processes	Uniformity in how we get better		
	I.G.2 - Monitoring lean progress	Assessing progress toward achieving enterprise objectives		
	I.G.3 - Nurturing the process	Assure senior leader involvement		
	I.G.4 - Capturing lessons learned	Ensuring that successes lead to more successes		
	I.G.5 - Impacting enterprise strategic planning	Results lead to strategic opportunities		
		Average		

Figure 14. GLESAT Summary Sheet (cont.)

SECTION II SUMMARY SHEET – LIFE CYCLE PROCESSES

Process Definition: Implement lean practices across life cycle processes for defining customer requirements, designing products and processes, managing supply chains, producing the product, distributing product and services and providing post delivery support.

TTL Link	Lean Practice	Lean Characteristic	Capability Level	
			Current	Current
II.A. Set-up the Enterprise	II.A.1 - Leverage Lean capability for new opportunities	Exploiting new opportunities arising from lean enabled capabilities		
	II.A.2 - Optimize the capability and utilization of assets	Lean enables mission growth through the redeployment of assets		
	II.A.3 - Provide capability to manage risk, cost, schedule and performance	Success follows effective risk management		
	II.A.4 – Allocate resources for program/ project development efforts	Teaming for success		
		Average		
II.B. Build Relationships	II.B.1 - Define and develop relationships with stakeholders	Aligning stakeholder values through relationships that build credibility		
	II.B.2 - Optimize the relationship	Creating effective relationships to achieve customer value		
	II.B.3 - Foster innovation and knowledge-sharing	Incentivizing innovation through stakeholder involvement		
		Average		

Figure 14. GLESAT Summary Sheet (cont.)

SECTION II SUMMARY SHEET – LIFE CYCLE PROCESSES - CONTINUED

Process Definition: Implement lean practices across life cycle processes for defining customer requirements, designing products and processes, managing supply chains, producing the product, distributing product and services and providing post delivery support.

TTL Link	Lean Practice	Lean Characteristic	Capability Level	
			Current	Current
II.C. Develop the Plan	II.C.1 - Establish a requirement definition process to optimize life cycle value	Stakeholder pull *vs.* technology/product push		
	II.C.2 - Capture data from the extended enterprise to optimize future requirement definitions	Closed loop processes are in place to capture operational performance data		
	II.C.3 - Incorporate *stakeholder value* into design of products and processes	Understanding stakeholder value facilitates fewer development perturbations		
	II.C.4 - Incorporate downstream *stakeholder* values into products and processes	Understanding downstream stakeholders allows value to flow seamlessly		
	II.C.5 - Create a multidisciplinary approach	Breaking down of functional silos enables seamless communication and value flow		
		Average		

Figure 14. GLESAT Summary Sheet (cont.)

GOVERNMENT LESAT SECTION II SUMMARY SHEET - CONTINUED

Process Definition: Implement lean practices across life cycle processes for defining customer requirements, designing products and processes, managing supply chains, producing the product, distributing product and services and providing post delivery support.

TTL Link	Lean Practice	Lean Characteristic	Capability Level	
			Current	Current
II.D. Implement the Plan	II.D.1 - Utilize knowledge and capability in decision making	Strategic leveraging of stakeholder capability		
	II.D.2 - Foster lean behavior throughout the value stream	Promoting stakeholder innovation and flexibility		
	II.D.3 - Align customer requirements and expectations with the extended enterprise	Aligning customer and stakeholder expectations		
	II.D.4 - Transition product/service in a lean fashion	Right product for a ready customer		
		Average		
II.E. Learn, Improve, and Sustain	II.E.1 - Enhance value of delivered products and services to customers and the enterprise	Responding to the voice of the customer		
	II.E.2 - Provide post delivery service, support and sustainability	Providing customer solutions		
		Average		

Figure 14. GLESAT Summary Sheet (cont.)

SECTION II SUMMARY SHEET – ENABLING INFRASTRUCTURE

Process Definition: To achieve a successful lean transformation, the enterprise infrastructure must support the implementation of Lean principles, practices and behavior.

TTL Link	Lean Practice	Lean Characteristic	Capability Level	
			Current	Current
III.A. Lean Organizational Enablers	III.A.1 - Financial system supports lean transformation	Lean requires appropriate financial data		
	III.A.2 - Enterprise stakeholders pull required financial information	Data on demand		
	III.A.3 - Promulgate the learning organization	Learning organizations create a flexible workforce		
	III.A.4 - Enable the lean enterprise with information systems and tools	Facilitate the flow of information and knowledge		
	III.A.5 - Integration of environmental protection, health, and safety into the enterprise	"Cleaner, healthier, safer"		
		Average		
III.B. Lean Process Enablers	III.B.1 - Process standardization	Strive for consistency and re-use		
	III.B.2 - Common tools and systems	Assuring compatibility, reducing costs		
	III.B.3 - Variation reduction	Reduce uncertainty by reducing variation		
		Average		

Figure 14. GLESAT Summary Sheet (cont.)

E. NAVAIR ALIGNMENT ASSESSMENT TOOL (NAAT)

In 2005, NAVAIR contracted with GENESYS Solutions to help prepare and administer a survey to all employees to measure alignment. Senior leadership, i.e., the Vice Commander and the head of Command Staff, championed the assessment. In the words of Vice Admiral Wally Massenburg, Commander, NAVAIR (Moore, 2005):

> …the truly great organization is one that takes the time to look at itself with a critical eye, make hard changes, and improve its processes to provide the best support to its customers at the least cost. This alignment assessment is a chance to make that happen.

Admiral Mike Mullen, the Chief of Naval Operations, says (CNO, 2006),

> Alignment is the degree to which resources, processes and communications support vision and mission. A properly aligned organization can accomplish anything it attempts.

NAVAIR felt that an alignment assessment was necessary to confirm that the organization was doing what it said it would do, and to make sure that the employees understand the leadership's objectives. They wanted meaningful data to support continued improvements in alignment across the NAE. They felt it would both measure the degree of alignment and help create alignment. They also felt that the questions and structure of the survey would clearly communicate expectations to the workforce.

The NAAT is based on the model described in the book, "The Power of Alignment," by Labovitz and Rosansky (1997). They state that alignment links "strategy and people [by] integrating them with customers and process improvement." NAVAIR changed their model slightly with four areas of mission, people, processes, and "those we serve" (customers). The Mission area focuses on the strategies and goals of the organization as defined by leadership. The People area focuses on the management teams and staff charged with executing the mission. The Processes area focuses on the methodologies used to execute the mission. Those We Serve focuses on the customers or "beneficiaries" of the mission. Vertical alignment is necessary to show the extent to which People can successfully execute the Mission. The horizontal alignment is

necessary to show the extent to which each business Process adds value to Those We Serve. Figure 15 depicts the NAVAIR alignment model.

Figure 15. NAVAIR Alignment Model (From Ward & Tuck, 2005)

Alignment is not considered to be a "normal" state in any organization. Measuring alignment is needed because external, constant pressures of change tend to force an organization out of alignment. Changes to mission are driven by mandates, strategic planning, changing threats, alliances, and externally imposed issues. Changes to people are driven by organizational demographics and mobility, shifting skill sets, and turnover. Process changes are driven by the continual need to re-engineer, new technology, and cost. Evolving needs drive customer changes.

The questions used in this assessment model were developed at NAVAIR, with support from GENESYS contractors. Leadership was involved with the development and grouping of the questions, and they also suggested topics to be assessed.

The methodology for the assessment was a number of statements, grouped by factor, and assessed on a seven-point scale, from Strongly Disagree (1) to Strongly Agree (7). The seven-point scale was then converted to a 100-point scale for reporting purposes.

The numerical results described how often and consistently the organizational design is followed.

There were four defined dimensions, based on the alignment model, which devolved into 20 factors (based on NAVAIR goals), and then broken into 114 total statements to be answered. There were two open-ended questions to answer. The four dimensions and 20 factors were organized as shown in Table 6.

Table 6. Assessment Dimensions and Factors

Dimensions	Factors
Mission	• Current Readiness • Future Readiness • Cost of Doing Business • Agility • Enterprise Alignment • Metrics
People	• Performance Management • Local Leadership • National Leadership • Supervision • Workforce Shaping
Process	• Competency Alignment • Naval Aviation Enterprise • Virtual SYCOM • Human Capital Strategy • AIRSpeed
Customer	• Customer Focus • Partnerships • Responsiveness to Fleet

The results from the 2005 survey showed that 61 percent of NAVAIR personnel participated in the survey (Ward & Tuck, 2005). The overall alignment rating was 64.6 percent, which was considered average for an organization beginning this process and consistent with first measurements across other Navy commands. Action plans can be developed from the results, depending on the analysis done. The 2006 survey utilized the

same statements, which (when analyzed) should help provide a trend line and opportunities for improvement.

Also, in the 2005 survey, there was a four to eight percent rating given to the command's capability to execute initiatives such as NAE, AIR*Speed*, human capital strategy, and the "virtual SYSCOM." The low percentage was perceived to reflect the early stages of the initiatives. Also, it is believed that on a case-by-case basis, higher levels of capability exist, especially among senior levels of the organization.

The survey's message was that NAVAIR needs to continue to build stronger alliances with Fleet customers, improve the communication process within the command, promote innovative thinking, develop better metrics, and collect the right data. Senior leadership and supervisors were encouraged to engage more in direct interaction with the workforce rather than "broadcasting" when sharing information.

Within the rest of NAE, specifically Naval Air Forces, the survey has, to date, been conducted only once. When the results from the Naval Air Forces survey were analyzed and compiled, they showed that the organization's alignment around Current Readiness was identified as needing improvement (Ward & Tuck, 2005). Drilling down further into the analysis, the key barrier was identified as a lack of innovative thinking.

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IV. ASSESSMENT TOOLS AND INTERVIEWS ANALYSES, AND INTERNAL ORGANIZATIONAL ENVIRONMENT

A. INTRODUCTION

This chapter draws from our literature review and interviews and analyzes the following four self-assessment tools: Department of Defense, Continuous Process Improvement Transformation Guidebook (DoD CPITG); Navy Performance Excellence Guidebook (NPEG); Lean Aerospace Initiative, Government Lean Self-Assessment Tool (LAI GLESAT); and NAVAIR Alignment Assessment Tool (NAAT). We discuss the extent to which the various tools can provide value to the AIR*Speed* Merge initiative. We provide interview results and summarize key learning points.

Our analysis includes an overview of the current environment within the Naval Aviation Enterprise (NAE), using a systems construct as our theoretical foundation (Senge, 1990). Systems theory posits that the extent to which an organization's direction (mission, goals, strategy) fits or is congruent with its external and internal environments, better performance results. The internal environment is framed from our individual viewpoints within the NAE: the Commander, Naval Air Forces Staff, San Diego, CA, and the Naval Air Warfare Center, Weapons Division, China Lake, CA.

Finally, we provide our assessment of the four assessment tools by comparing their structure, how they relate to the key concepts outlined in Chapter 2, and their positive and negative aspects against particular criteria.

B. ENVIRONMENTAL ASSESSMENT

As we evaluate the four enterprise assessment tools against the needs of AIRSpeed Merge initiative, it is essential that we have a sense of environmental forces, trends and capabilities in the Naval Aviation Enterprise (NAE). Knowledge of the NAE internal environment is therefore an interdependent variable in terms of anticipating how well a particular tool or methodology is likely to fit or become aligned with the organizational design (structure and processes).

Part of this "environment" includes the objectives and plans of internal and external stakeholders in the following commands:

- Commander, Naval Air Forces (CNAF) (NAE Chief Executive Officer)
- Commander, Naval Air Systems Command (COMNAVAIRSYSCOM) (NAE Chief Operating Officer)
- Deputy Commandant for Aviation, Headquarters Marine Corps (HQMC)
- Commander, Naval Air Forces, U.S. Atlantic Fleet (CNAL)
- Chief of Naval Air Training (CNATRA)
- Director, Air Warfare Division (OPNAV N88) (NAE Chief Financial Officer)
- Director, Fleet Readiness Division (OPNAV N43)

Due to time and space limitations, we will consider environmental assessments for Naval Air Systems Command (NAVAIR) and Commander, Naval Air Forces (CNAF) as generally representative of the overall NAE environment.

It appears to be common knowledge that the overall viability and culture of an enterprise is shaped by its communication structure, i.e., the ability of leaders and managers to clearly transmit both organizational direction and operations, in terms of strategies, goals and objectives, and rewards. Other non-strategy focused, uncoordinated, and unfiltered communications can, and often do, create unintended "noise." Various components of distracting noise may be relevant and/or useful in their own right, but if, where the structure to clarify and dedicate scarce resources towards organizational priorities is flawed, employees are forced to react to the loudest problem and to compete for resources. In summary, communication of too many initiatives, constantly changing initiatives, and pervasive admonitions from external and internal sources that everything is urgent and important translates into scattered focus and poor performance. Managers and employees become confused, rework increases, and workers bounce from critical issue to critical issue, much like fire fighters. The "signal to noise" ratio may be high in the enterprise under study.

What follows is a sample of the number of initiatives or "noise" that the current NAVAIR and CNAF management, staff, and workforce are receiving.

1. NAVAIR Environment

In the current environment, there are several initiatives in place at NAVAIR Headquarters and at the business unit level that require time, energy, personnel expertise, facilities and dollars – in short, numerous priorities. Managers try to juggle resources and shield employees from excessive noise, but on net, our assessment is that many workers perceive the amount of activity as "chaotic." A few of those initiatives are described below:

a. *Base Realignment and Closure (BRAC)*

In 2005, a decision was made by Congress as part of the BRAC process to move all weapons and armament work to China Lake, CA, and form the Navy Weapons Center of Excellence. In the process, there are no actual bases being closed, but weapons workload is being moved from seven DoD sites to China Lake. However, it is now a year later, and the work being moved is still undefined. This is a disturbing change affecting peoples' lives and work. The unit has suffered considerable loss of personnel in the last year because of the BRAC decision. The "mental noise" surrounding the BRAC decision acts as a filter or impediment, preventing employees from being genuinely involved, learning about and implementing lean activities.

b. *Enterprise Resource Planning (ERP)*

NAVAIR implemented ERP for financial and human resource processes over three years ago. Since then, we rely upon it for timecards, training registration, and for financial tracking. The system has not achieved what was expected. The Navy has four pilot ERP implementations that are merging within the next two years. NAVAIR is once again taking the lead to implement the merged ERP first. With "merged ERP," we will have our processes changed again and that transition is not expected to be easy, again introducing competition to Lean transformation.

c. *National Security Personnel System (NSPS)*

NSPS is the new DoD personnel system, which is changing performance management, pay, and promotion processes. Besides apparently being strongly contested by the unions, part of the workforce is in NSPS and the other part is spread across two

other performance management systems, once again creating noise and distraction for managers and employees.

d. *Total Force Readiness (TFR)*

TFR was previously called, "Human Capital Strategy." The Navy in general, and NAVAIR specifically, is focused on determining and adjusting the quantity and quality of military and civilian employees, including the array of needed skills, emerging new products and services, and planning for the long-war. There are conflicting data calls within Headquarters, which results in increased business unit tasking, which demands urgent and complex deliverables.

e. *Leadership Change*

In December of 2006, NAVAIR senior leadership is changing. The Commander is retiring, and a new Commander will replace him with a new style of leadership and focus, including a new Vice Commander in 2006. Past experience dictates that the new leadership will attempt to make its mark by introducing greater change and accompanying urgency. Systems thinking and acting describes this type of phenomenon as a vicious cycle (Senge, 1990). The answer involves intervention in the cycle to prevent further erosion, i.e., prioritized ranking of issues and involvement and commitment from the top.

2. CNAF Environment

The CNAF organization, as part of the NAE, is a focal point for many of the cultural, organizational, and process changes in the DoD and the Navy. In addition to externally-driven CNAF initiatives, there are also internally influenced changes. Again, our net assessment appears to revolve around the communication structure, i.e., the extent to which CNAF personnel and subordinate commands understand their priorities, including a process to reduce unwanted noise, will be related to successful performance. Several examples of competing initiatives are described below:

a. *Defense Readiness Reporting System (DRRS)*

The DoD capabilities based readiness reporting system, which will fundamentally change the process of valuing and reporting force readiness. The Navy previously measured readiness at the unit (squadron) level, across broad mission areas, by using the Status of Resources and Training System (SORTS) to assess the amount and condition of assigned resources. The new DRRS system mandates readiness reports based on unit and organizational capabilities, which are defined by specific performance criteria for assigned missions, tasks, conditions, and standards. The transition could be compared to US Steel developing new accounting procedures for its year-end reports, in a new language, which does not use money as the unit of measure. Each aircraft community in the Navy is now in the process of redesigning its readiness reporting system to provide capabilities based, readiness reporting to comply with DRRS.

b. *Board of Directors (BOD) and Cross Functional Teams (CFT)*

The NAE is developing its processes and is organized into a Board of Directors (BOD) consisting of Naval Aviation's senior leaders and three Cross Functional Teams (CFT) (Moore, 2005):

1. Naval Aviation Readiness Integrated Improvement Program (NAVRIIP) CFT, led by Commander, Naval Air Force, U.S. Atlantic Fleet
2. Cost Management CFT, chaired by Mr. Garry Newton, OPNAV, Director of Air Warfare (N88) and Director Fleet Readiness (N43).
3. Total Force Readiness, led by RADM Shannon, Director of NAE Total Force Readiness

Additional structures are provided under each CFT to manage specific tasking from the top level CFT. Decisions and actions that can not be easily resolved are tasked to Barrier Removal Teams (BRT). Both CFTs and BRTs form and operate from outside of the command structures from which they draw their members. The CNAF personnel leading, or assigned to a CFT or BRT, must still, however, perform the primary command jobs to which they have been ordered. Needless to say, the competing demands

involved in tasking and prioritization of work between the CFT/BRT, and the requirements of command leadership can, and does, generate substantial confusion and "noise." Matrix organizations can experience the same conflict between project management teams and the competency functions within the same command.

c. *Fleet Response Plan (FRP)*

The Fleet Response Plan (FRP) is a flexible U. S. Navy operational concept that is designed to more rapidly develop and sustain readiness in ships and squadrons. In the case of a national crisis or contingency operation, the Navy can then quickly surge significant combat power to the scene. FRP changes the way we operate, train, man, and maintain the fleet. CNAF has the responsibility of manning, equipping, and training Naval Aviation forces. Previously these functions were based on an 18-month readiness cycle. The advent of FRP and its flexibility puts CNAF in the position of making long-range planning decisions based on greater uncertainty.

d. *Naval Aviation Readiness Integrated Improvement Program (NAVRIIP)*

The NAVRIIP is a management structure for readiness and cost drivers. It is a NAE CFT. The goal is to provide *aircraft ready for tasking at reduced cost*. The business rules and metrics, on which readiness and cost are measured, cut across command structures and can create discontinuity in focus and budget processes at the unit level if not aligned to local processes.

e. *Staff Reorganization*

CNAF evolved from a staff reorganization of Commander, Naval Air Force, U.S. Pacific Fleet and Commander, Naval Air Force, U.S. Atlantic Fleet, each with its own cultures, policies, procedures, and leadership styles. CNAF, in its current state, is one bi-coastal command with some functional codes split between coasts. While decisions and policies are made collectively, the CNAF command structure remains divided by coast with some remaining legacy processes and policy. The discontinuity between newly-formed command structures and the legacy environment is at the heart of needing improved vertical and horizontal communications.

C. INTERVIEWS

1. Interviews Provided Qualitative Data

Approximately 10 semi-structured interviews were conducted to develop a deeper understanding of enterprise assessment concepts and to collect information on the specific use of the various assessment tools discussed in this thesis. The process allowed for secondary pursuit of topical information and broadly applicable insight, by asking follow-on questions and probing for previously unforeseen issues.

An additional driver for a qualitative approach was the fact that the DoD CPITG and NPEG tools have recently been signed or submitted for signature, respectively. Because of their infancy as CPI tools and processes, there were no implementations that could be measured to compare against the LESAT/GLESAT and NAAT. Most of the respondents were experienced with LESAT/GLESAT or internally-developed enterprise assessments. The NAAT was administered to the authors of this thesis, through the course of their command assessments, allowing direct reporting on its use and implementation.

2. Interview Candidates

The individuals interviewed represented a multi-service and aerospace industry view of enterprise assessment, across senior to middle management levels of their organizations. Interviewees were chosen based on their experience in lean transformation and in using one of the assessment tools being researched. They all had direct experience with the LAI LESAT or GLESAT and their answers are based on the use of that tool. The DoD CPITG and NPEG tools are new; therefore no one was interviewed who had direct experience with these tools. Consequently, interviewees were not selected for specific tool usage, rather for their experience with Lean assessments and their use of other Lean assessment tools.

The following were interviewed:

- Six individuals from three large aerospace firms from middle level management up to a business area vice president

- Two individuals from the Air Force, one active duty officer and one government civilian
- One active duty officer from a Naval Aviation Depot
- A senior Navy civilian from NAVAIR

3. Interview Questions

The interview questions were developed subsequent to the development of the Chapter 2 key concepts for enterprise assessment. The tools and our ability to evaluate surrounding business processes were then assessed based on a consistent set of criteria.

The responses to each question were summarized to focus on the key observations given after each stated question. The purpose of this approach was to ensure that essential issues could be fully described without direct attribution. To do otherwise would have violated the confidentiality of proprietary business processes used to deliver value to their customers.

a. *Was there a particular event or "burning platform" that led your company to do Lean and Enterprise Assessments?*

Three processes emerged as the most common stimuli for adopting a lean methodology of continuous process improvement and enterprise assessment:

- Direction from company leadership with the authority to enforce the activity and set an enterprise vision.
- An internal success story with dramatic improvements that made the success clearly evident to the surrounding organization.
- Compliance with some external influence such as customer contractual requirements, market forces that increased competition and reduced revenue, or a pending budget reduction or termination.

The leadership push for enterprise lean processes and assessment generally came from observation of successful lean practices either done externally, or isolated cases internally. In all the responses there was a visible stimulus for change or visionary direction by senior leadership.

The preexisting leadership philosophy and culture in the organization, and its tendencies for continuous process improvement, defined the level and length of stimulus required for change. In all interview cases, without leadership involvement there was no ability to graduate to enterprise CPI and utilize assessment processes. The general consensus seemed to be that business units would accept CPI functions for their benefit, but had no time for enterprise assessments, as they could not see the value in their daily work. One senior official stated, "Without the boss's support for implementation of assessments, I would have been fired in the first three days!"

b. ***What tool did you use to do your assessment?***

Only two of the four tools being considered in this thesis are being used in government or industry: the LAI LESAT (with GLESAT variation) and the NAAT. Beyond the tools being considered for comparison in this document, there are other internally-developed assessment tools and processes that are being used by industry. In some instances these internally-developed assessment tools were built from systems already resident in an organization. In other instances, they were built from scratch using current quality programs and maturity models as their core structure.

c. ***What process did you use to choose a tool for assessment?***

The consistent response to this question was that there was not a process of selection. The assessment processes utilized were either directed by leadership with an organizational connection to LAI's LESAT/GLESAT, resulted from an internal development project, or in one case, the tool was recommended by "word of mouth." While there was one instance of using an existing tool and then switching to an internally developed program, the process was not designed as a decision-making process for assessment selection, it was simply trial and error.

d. ***How did you scope the use of the tool: At the enterprise level, or did you start with small group?***

The implementation of the assessments that were used was generally scoped to major programs or lines of business, which tended to be smaller groups in relation to the larger enterprise. The industry participants indicated that one reason for

limiting the scope to the business unit was a concern that above this level it would be hard to generate actionable data that would have an effect on the bottom line. The government participants also indicated that the assessments were utilized at a functional business level.

e. ***What process did you use to administer the tool and how was the assessment received?***

The method for implementing an assessment was completely dependent on the workforce's familiarity with the language of the assessment and the process for collecting the data. In all cases but one, the first implementation required full facilitation by trained experts. Often the individuals involved in this process came out of the quality assurance functions within a company and would be augmented, or even led by authors of the assessment tool, as outside experts.

It was commonly noted that the facilitated events produced better results. First, because the observation of a third party, sometimes in an off-site setting, provided oversight to ensure a quality input. Secondly, the facilitator was there to help teach and inform when the participants had confusion over the intent of a question, or section, of the assessment. One industry interviewee noted that the use of recognized experts in the field of CPI such as certified Six Sigma Black Belts lent credibility to the process.

The amount of time dedicated to a fully facilitated assessment was at most two days at the program office level. In one instance, the assessment was delivered as part of a program review meeting because all the required participants were already assembled. Where the senior leadership was involved, generally one half-day was all that could be spared from busy schedules. In one case, a web-based presentation of the assessment was created to allow individuals to complete the work on their own schedule. In another case the initial assessment was completed using data extracted from other quality programs in an attempt to save time and reuse previously acquired information.

The remaining issue for implementation of an enterprise assessment is data reduction, analysis, and feedback. All respondents reported that there is a balance between speed and quality that must be found. Generally, the best approach seemed to be

a quick-look qualitative response (most tools have a fast tabulation capability) followed by a formal debrief with both quantitative, and qualitative, analysis of the findings.

f. ***Was the complexity of the assessment tool worth the return to your organization?***

In circumstances where the assessment process was dictated by leadership, there was little or no attempt to justify the value of assessment. One of the mid-level managers interviewed remarked, "When the boss says do it, your return on investment is not an issue." In the cases where assessments were being used as part of an overall CPI strategy or incentive program, the complexity of the process was reported to be worth the effort because the resultant learning and improvement could be seen and trusted by the organization. In one case, the company trusted its processes so implicitly that project bids were based on the knowledge that lean and CPI would achieve the increase in efficiency and effectiveness necessary to meet future expectations of lower priced bids. In another case, annual performance targets and strategies resulted from the assessment process, and lean targets were included in the annual performance evaluation process for individuals.

g. ***Did the assessment require a dedicated team? Is the team permanently assigned?***

The consistent response across all interviewees was that a dedicated assessment team was required, with some portion of the personnel permanently assigned to manage the overall CPI process. The common perspective was that the combination of full time support and a consistent message from leadership maximized the authority of the assessment team.

In some instances local agents were utilized to augment the permanently assigned assessment team. One senior manager said, "If you don't have a technically adept person who lives and breathes it for the organization, it will fall short." Another tactic that was utilized to facilitate implementation of an enterprise assessment was assignment of an outside third party facilitator with expertise in CPI. In this case an industry respondent utilized a senior Black Belt certified employee respected in another business sector to lend his name and reputation to the assessment process.

h. ***Have you used the tool more than once to measure your progress?***

In most cases the assessments were conducted more than once. In a couple of instances, the leadership transitioned between assessments. When the new leader did not place emphasis on the assessment, it fell into disuse. The key driver for completion of the assessment at the business unit level was the degree to which the data and metrics from the assessment were embedded in the daily business processes.

Where the assessment was imbedded in either the normal strategy development process, part of long-range planning, or included in the CPI processes, it was repeated on an annual or semi-annual basis. In some instances where feedback or resulting action from an assessment was delayed, the assessment would fall out of the normal business cycle. In one case the company is considering a bi-annual assessment process.

i. ***Is your company using more than one tool to assess your lean activities?***

In most cases the organizations only used one enterprise assessment tool and process due to the investment of time and resources to train the workforce on the logic and language of the chosen tool. It was usually difficult enough to gain acceptance for one tool, much less separate tools.

j. ***How involved was leadership in the assessment(s) direction, analysis, and communicating the results?***

In all cases leadership was stated as a requirement to ensure compliance with the assessment process. Most of the preceding questions also established the importance of a leadership presence in the opinion of the interviewees. It was noted by half of the respondents that as the leadership's resolve weakened, its ability to enforce policy, and consequently the enterprise assessment process, was also weakened.

On the opposite end of the spectrum, where there was strong leadership, the organizations remained focused on conducting the assessment and using the results in its business process. In one case there was a punitive termination of a senior employee because he refused to institute a lean process prescribed by the assessments.

4. Interview Themes

A number of key points, that were common to all the interviewees, need to be addressed to gain a more complete view of the implementation of enterprise assessment.

- Enterprise assessments were generally connected to other strategic enterprise functions for CPI such as strategic planning, supply chain management, and Value Stream Mapping.
- Where the enterprise assessment tools were applied to more narrow business unit functions, the fact that the assessment process was tied to a larger CPI process kept them applicable across the broader enterprise.
- In many cases, the challenge of using an externally-developed assessment tool was interpreting its lexicon. If the terminology was not consistent with the organization, there was a great deal of familiarization and training required before participants could make sense of the tool. Facilitation was the used to mitigate this conflict.
- It was noted that the use of local agents for CPI and coordination of assessment issues was more efficient because they managed the daily alignment of assessment processes. The local agent also is a key individual for managing early adoption and training of a new assessment initiative.
- The influence of an outside observer tended to mitigate some of the rivalry and intra-departmental power conflicts that can become apparent in an assessment process.
- In two cases where local agents argued for internal tailoring of LESAT, the leadership denied their request with the goal of eliminating variation in the collected data induced by changing assessment structure over time.
- In both the civilian and government sectors, it was noted that frequent turnover of leadership and employees is a barrier to effective enterprise assessment and behavior.

D. ANALYSIS OF SELF-ASSESSMENT TOOLS

In analyzing each tool, we kept in mind the research questions and the value each tool could provide to AIR*Speed*'s progress and maturity. Each tool needed to be able to measure the "lean" maturity of the enterprise and enable implementation of the key concepts. We used these factors as a baseline for our analyses. We evaluated the "pros and cons" of each tool within the individual analysis area.

To ensure that we were aligned with our stated thesis goals, we did an analysis of the AIR*Speed* concepts, goals, and objectives. From those, we compiled a new set of AIR*Speed* key concepts to compare against the key concepts derived from the literature review. This created a bridge from the internal NAE communication to the literature review. The AIRSpeed Key Concepts and our Assessment Key Concepts from the literature review are compared in Table 7.

Table 7. Comparison of AIR*Speed* Key Concepts and Assessment Key Concepts

<table>
<tr><td colspan="2"><u>Vision</u>
The NAE overall vision is the enterprise target to focus the thought and actions of all personnel: To deliver the right force, with the right readiness, at the right cost, at the right time – today, and in the future.</td></tr>
<tr><td colspan="2"><u>Strategic Goals</u>
• Balance current and future readiness
• Reduce the cost of doing business
• Improve agility
• Ensure alignment
• Implement fleet driven metrics</td></tr>
<tr><td><u>AIRSpeed Key concepts</u>
• Decrease inventory
• Decrease cycle time
• Improve reliability
• Decrease operating expenses
• Strategic linkages of CPI projects
• Standard set of tools, applied effectively
• Communication and change management
• Manage key interfaces across industry, Department of Defense, and academia
• Alignment of metrics and supporting data systems
• Change agents
• Increasing productivity
• Uses systems-of-systems
• Active leadership involvement
• Promotes learning by building new skills in a focused manner</td><td><u>Assessment Key Concepts</u>
• Knowledge management, change management, and culture
• Systems thinking perspective
• Well designed, mature processes
• Value for employees and partners
• Differentiates between a product / service and Fleet Readiness Center (manufacturing) environment
• Incorporates lean concepts
• Fit - does the organization have the time and resources to conduct the assessment
• Measures provide actionable information (maturity level/DMAIC)
• Promotes alignment – AIRSpeed as a corporate leadership value
• Waste-wise readiness, not readiness with disregard for waste
• Rights to assessment product are wholly owned by the enterprise
• Is the enterprise “signal-to-noise” ratio measured for effective communication</td></tr>
</table>

1. Comparison of Self-Assessment Tools

Table 8 contains a comparison of the DoD CPITG, NPEG, and LAI GLESAT attributes. We compared their processes, how many questions and categories were contained in the assessments, and how maturity levels were defined. We did not compare the NAAT against the other three tools, because it is not a maturity assessment but simply a survey tool that is used to return a percentage score of answers.

We compared all four tools against the key concepts described in Chapter 2. All of the maturity-level based tools incorporate all the key concepts. The NAAT is self-defined and developed by the organization, so the organization defines what concepts or questions it wants to ask, so it can not be assessed in the same way as the other three tools.

As can be seen in the table, all three of the maturity-level tools have multi-step processes within a defined framework. Both the GLESAT and the DoD CPITG have their origins in the LAI Transition-to-Lean Roadmap. The NPEG takes as its origin the Malcolm Baldrige Quality Award structure. All utilize a five-step maturity level assessment. All are considered to be enterprise-level tools, and are based on a framework that assess the enterprise based on specific categories, with synergy in the topics of strategic planning, leadership, performance measurement, and process quality. All provide an enterprise self-assessment that is divided into various numbers of categories and questions.

2. Self-Assessment Tools Pro's and Cons

Table 9 outlines each of the tools' pro's and con's. Analysis was based on the following factors:

- Whether or not the tool could be applied to an enterprise
- A solid foundation exists based on an industry-tested tool
- It incorporates Lean or CPI as part of the assessment
- Utilizes a maturity level-based approach

- Ease of use and application
- The requirement for facilitation
- Level of resources required for administration

We did not apply a scoring factor to the tools, but applied a simple objective assessment of each tool.

Table 8. Comparison of Maturity-Based Self-Assessment Attributes

DOD CPITG	**NPEG**	**GLESAT**
Four-step process, in a performance management framework, developed from LAI Transition-to-Lean Roadmap	Five-step process, incorporating performance management framework based on Malcolm Baldrige National Quality Award	Three major sections, created by LAI/USAF, based on LAI "Transition to Lean" Enterprise Roadmap and LESAT
Maturity Assessment: Eight categories, 34 questions	Maturity matrices: 19 Criteria, five-level maturity matrix, 2-3 weeks to complete Utilizes the Approach-Deployment-Learning- Integration technique from Baldrige	Maturity matrices: Three major sections, 54 questions: • Enterprise Leadership, • Life cycle and enabling processes • Enabling infrastructure
Maturity level definitions: 1 – Not yet started 2 – In-process 3 – Demonstrated 4 – High Visibility 5 – Transformation Evident	Different self-assessment criteria and five maturity levels are defined for each section	Maturity levels range from lean principles not evident within the organization to lean principles are part of the culture; levels are designed for each category

Table 8. Comparison of Maturity-Based Self-Assessment Attributes (cont.)

DOD CPITG	NPEG	GLESAT
Advanced CPI Assessment Tool, based on eight areas, with five-level scoring ranging from absence of the element to world-class implementation; takes 45 minutes Categories: • Leadership Vision and Commitment • Change Management • Organizational Structure & Support system • Corporate Culture/Workplace Climate • Process Stability • Process Quality • Just-in-Time • Information Management Scoring uses a gap analysis, measuring current state, future state, gap, importance, and evaluator rating	Self assessment categories: • Organizational profile and strategic direction • Organizational assessment • Strategic planning • Execution planning • Performance measurement and results	Structured for tracking Entry level assessment (“as is”) and Re-Entry level (“to be”), measured using summary sheets Addresses elements of: • Strategic integration • Leadership and commitment • Value stream analysis • Change management • Structure and systems • Lean transformation planning, execution and monitoring

Table 9. Pro's and Con's of the Self-Assessment Tools

Self-Assessment Tool	Pro	Con
DoD Continuous Process Improvement Guidebook (CPI)	• Enterprise level, scalable within defined enterprise areas • Developed from LAI Transition-to-Lean Roadmap • Five-level maturity model • Incorporates an performance measurement model • Contains CPI checklists • Specifically addresses implementing and measuring Lean implementation • Addresses key concepts of knowledge management, change management • Assessment requires facilitation	• Contains a 10 question quick assessment, but would take facilitated interpretation to apply • Resource intensive to administer • Requires "critical mass" of trained CPI resources • Untested within DoD
Navy Performance Excellence Guide (NPEG)	• Enterprise level, scalable to a defined enterprise • Five-level maturity model • Provides an organizational performance framework • Based on a proven industry model (e.g., Baldrige) • Contains a self-assessment, requires facilitation • Addresses key concepts of alignment, KM, change management	• In draft form as of this writing, so untested within Navy except for limited beta-test • Could be resource intensive to implement • Leadership may not have patience to go through all five steps (could take over a year)

Table 9. Pro's and Con's of the Self-Assessment Tools (cont.)

Self-Assessment Tool	Pro	Con
LAI GLESAT	• Designed as an enterprise level self assessment, part of a larger lean enterprise performance framework • Thoroughly tested within aerospace industry, and within program teams in US Air Force • Provides opportunity for government and industry program teams to conduct assessments based on common framework and lexicon	• Takes a lot of training for participants to understand the terminology • Can be time-consuming and "painful" to administer • Resource intensive process to analyze results • Cumbersome when not tailored specifically to the language of the organization
NAVAIR Alignment Assessment Tool	• Survey tool, providing easy distribution for wide use • Designed for web presentation	• Designed with too many questions, categories • Participants worried about attribution • Not a maturity-level tool

E. ASSESSMENT SUMMARY

In this chapter, we described the current NAE environment by outlining some of the issues in two major enterprise commands. Based on all of the initiatives in place within the NAE, it is possible that the "signal-to-noise" ratio might be such that key messages are being lost in all the activity. Knowledge of the current environment must be understood for further analysis on the best approach for NAE self-assessment. The aggregation of the 10 interviews into cogent themes provides additional necessary information to reach viable conclusions on our primary thesis question. The final analysis in this chapter compared the self-assessment tool attributes, side-by-side, with an estimation of their pros and cons. We now move to Chapter 5, where we answer our research questions and provide conclusions and recommendations.

V. CONCLUSIONS AND RECOMMENDATIONS

A. INTRODUCTION

In this chapter we derive conclusions and recommendations for our primary and subsidiary research questions. Based on our findings, we suggest areas for further study that fill knowledge gaps for AIR*Speed* CPI self-assessment.

In Chapter 1, we explained the purpose of the thesis was to evaluate four self-assessment tools that could be used to ascertain the maturity of the AIR*Speed* initiative within the Naval Aviation Enterprise (NAE). The four tools analyzed were: Department of Defense (DoD) Continuous Process Improvement Transformation Guidebook (CPITG), Navy Performance Evaluation Guide (NPEG), Lean Aerospace Initiative Government Lean Enterprise Self-Assessment Tool (LAI GLESAT); and the NAVAIR Alignment Assessment Tool (NAAT). Our primary question was: which self-assessment tool(s) and methodology can best capture the crucial aspect of measuring continuous improvement in the NAE? We also addressed the following subsidiary questions: How can the NAE leverage work being accomplished by the Massachusetts Institute of Technology (MIT) LAI. How can our conclusions be used to assist the LAI in their lean enterprise transformation? To what extent can one tool be scaled for use across the NAE?

In Chapter 2, we provided a literature review and defined key concepts applicable to the field of organizational performance measurement, including tools and methodologies relevant to emerging Defense efforts for enterprise transformation. We explained the potential value and benefits of organizational assessment, specifically in terms of evaluating how an organization aligns its performance initiatives and operations with its intended results, i.e., culture, outputs and outcomes. Are we accomplishing our goals, and obtaining desired or intended consequences?

In Chapter 3, we provided an overview of each of the four self-assessment tools, including a discussion of various structural and process elements. In Chapter 4, we analyzed the relative advantages and disadvantages of each tool, including alignment

with incremental and transformational concepts and improvements. We provided the results of interviews conducted with senior and middle managers within major aerospace companies, and civilian and active duty personnel in the U.S. Navy and U. S. Air Force.

B. PRIMARY RESEARCH QUESTION

Which self-assessment tool(s) and methodology best captures the crucial aspect of measuring progress of continuous process improvement within the NAE?

1. Conclusion

Three of the four assessment tools have applicability in terms of being able to reasonably and efficiently measure AIR*Speed* maturity: the Department of Defense Continuous Process Improvement Transformation Guidebook (DoD CPITG), Navy Performance Excellence Guidebook (NPEG), or the Lean Aerospace Initiatives' (LAI) Government Lean Enterprise Self-Assessment Tool (GLESAT).

All of the tools (except the NAAT) are based on a maturity level construct and a performance management framework, and all are modeled after world-class industry self-assessment tools such as Malcolm Baldrige Quality Program or Capability Maturity Model Integration (CMMI). They all can be used to measure enterprise progress towards higher performance, including "lean" and transformative maturity.

Two conclusions drawn from interviews are noteworthy:

(1) The purpose of an assessment can be achieved, only to the extent to which it is effectively communicated to the workforce; and

(2) Trust in the intent of the assessment process appears to be crucial for mid-level managers and employees, i.e., personnel need assurances that any actual or perceived negative findings will be treated as opportunities for improvement.

To the extent to which distrust and doubt surrounding findings are present, the assessment tool becomes suspect as participants may skew inputs to maintain positive outcomes. Obviously, these types of behaviors and coping mechanisms would be detrimental to serious or sustained performance improvements. This finding crosses over

into aspects of organizational culture, which includes how the organization responds to defects, errors, and even downsizing that may be associated with cost-cutting initiatives. Therefore, performance assessment or use of an assessment tool can depend on organizational climate and culture, including positive and negative reward processes. Obviously, a decline in organizational morale would be an unintended consequence of not understanding the importance of communications and intent concerning organizational assessment.

Summarizing conclusions derived from the literature, organizations must align their measurement systems to their strategic intent (Ancona, 2005). Changing a culture is complex, and a new culture emerges when there is "fit" among key organizational variables such as strategy, structure, and results. All of the organizational entities need to align their measurement activities for overall "fit," i.e., with their communications and awards system. These findings can be generalized whether it is business performance, "lean" initiatives, or strategic transformative goals and initiatives.

Another related conclusion (gleaned primarily from our interviews) is that the information and knowledge gained from a self-assessment process must be communicated expeditiously to participants to maximize the benefits. Specifically, by receiving timely feedback, actions can be better applied to strategic planning and budget formulation efforts. Waiting for longer-term results may cause involved personnel to forget and/or postpone usable, relevant knowledge. Quite simply, leaders and managers would want to build-in short-term and medium-term visible improvements to maximize the intended positive effects on a participating workforce.

2. Recommendation

a. *Establish an Organizational Performance Framework*

An organizational performance or management system framework (such as defined in the Malcolm Baldrige Quality Award or the NPEG) should be established by the NAE before any formal assessment process is implemented. The rationale would be to align all NAE entities alongside a single strategic tool and process containing cascading goals and objectives.

In the near term, each NAE Echelon III Command (Wing and above, Warfare Centers, etc.) would complete the NPEG Step 1 (Organizational Profile) and Step 2 (Organizational Assessment, minus cost). The NAE would benefit by applying a performance management framework across its system, which would identify short and longer-term improvements, as they become apparent. Knowledge management concepts and ways to promote organizational learning (Senge, 1990) could be simultaneously incorporated to capture maximum value.

By completing Steps 1 and 2 of the NPEG, the NAE would have an initial self-assessment of their entire enterprise against world-class criteria and show alignment with SECNAV and CNO guidance and goals. NAE leadership will be able to see the enterprise as a "system" and have useful indicators for alignment to customers, stakeholders, and strategic goals. In the long term, all NAE commands could complete the five-step NPEG Performance Excellence process. The deliverables include command-generated and aligned strategic plans and execution plans, and a complete self-assessment against baseline data.

b. *Utilize LAI GLESAT for Lean Organizations*

The NAE functional areas that have adopted lean principles, with visible and validated results, should apply the LAI GLESAT tool within their "enterprise," using the appropriate facilitation (e.g., LAI facilitator or trained Black Belt).

Assessments should be performed at least once a year for three years, to enable visible progress through maturity levels, based on quality data. Additionally, by implementing an assessment across multiple business cycles, efficiencies can be gained based on a learning curve theory for the participants.

c. *Implement CMMI for RDT&E Organizations*

In addition to NPEG and GLESAT for the larger enterprise, CMMI could be effectively implemented within the NAE research and development, test and evaluation (RDT&E) organizations across "like" functions. CMMI integrates systems engineering, software engineering and acquisition, and integrated product and process development. The use of CMMI within the RDT&E organizations would provide an

extensible framework and an evolutionary path towards improvement through the maturity levels. It would provide mature, documented processes across the NAE within the technical disciplines.

d. *Annual Use of NAAT for the NAE*

We recommend that NAE use the NAAT yearly, but the number of questions and categories should be reduced based on feedback received after the last survey from employees and managers. Also, interviews with NAVAIR personnel revealed that having to manually organize the comments submitted took a number of days. Utilizing a restructured tool, method, or survey that could quickly translate written comments to common threads, would be more valuable in providing timely and actionable information.

e. *Resource Commitment and Change Agents*

One of the criteria for analyzing the four tools was the amount of resources required to administer the tool within an organization. Organizational assessment with any of the tools demands substantial resources: facilitators, managers, program team members, time, and data analysis. With the current environment of excess organizational "noise" where essential messages or "signals" can become lost within the NAE, it is doubtful that applying a complex, total enterprise self-assessment could be successfully accomplished, due to the level of support required to educate and prepare NAE personnel to a point where useful information could be collected. We recommend that any self-assessments be targeted to "high value targets" identified through the NPEG Step 1 and 2.

Dedicated local change agents that could administer organizational self-assessment could provide the return on investment to ensure acceptance and focus. Each tool has a level of complexity that does not lend itself to just being given to groups or employees and having them accepted and used. The tools are powerful when administered by a trained user, such as a LAI facilitator. An internal change agent, such as one of the AIR*Speed* Black Belts, after the appropriate familiarization and training,

would be a good choice to administer any of the maturity-level tools within a particular program or organization.

C. FIRST SUBSIDIARY QUESTION

How can the NAE leverage work being accomplished by the MIT LAI?

1. Conclusion

LAI is an active consortium that brings together major aerospace companies and government to share, enhance, and improve their CPI efforts. There are many ways that the NAE can leverage the work the LAI is doing. LAI has created a toolset (which includes the GLESAT) that is designed for enterprise lean transformation. LAI has an active research program, which is currently in its fifth phase, which has three key drivers: 1) the need to accelerate lean enterprise transformation; 2) the need to design future lean enterprises; and 3) the need to evolve adaptive lean enterprises. To support these key drivers, the current phase of research has four core questions:

- How can I understand how my organization/enterprise currently operates within its larger context?
- How can I define and evaluate the future possibilities for evolving a more efficient enterprise?
- What are the most effective strategies and tactics to achieve these future possibilities for my enterprise?
- How can I best manage the enterprise change process?

In addition, the yearly LAI Plenary Conference provides opportunity for building relationships with members and taking advantage of knowledge sharing. There are a number of MIT students that present their work in progress on lean topics, as well as opportunities to have one of those students study NAE processes and provide their knowledge to help NAE grow and mature in lean efforts.

2. Recommendation

As explained above, AIR*Speed* could utilize the GLESAT within those functional areas that have visible "lean" results. LAI could assist and train a Black Belt to lead the assessment. The Air Force has effectively implemented LESAT and it GLESAT version, across the C-17 enterprise. The use of a common assessment tool as part of the overall MIT LAI enterprise transformation strategy using the Transition to Lean (TTL) and Enterprise Value Stream Mapping (EVSMA) helped the C-17 to create a common view of the enterprise, with actionable data to fix gaps between the current state and the desired state in the program.

Participating in the yearly LAI Plenary Conference would provide NAE personnel with the opportunity to meet and talk with many members of leading aerospace companies and share success stories and experiences of their "lean" journeys. We found those contacts essential when we conducted our interviews. We also utilized the results of some of MIT's doctoral and master's research studies in enterprise lean transformation in our work. We will be sharing the results of this thesis work with LAI, which strengthens the NAVAIR and NAE relationship with them.

D. SECOND SUBSIDIARY QUESTION

How can our learning be translated to provide value to the MIT LAI research in lean enterprise transformation?

1. Conclusion

We have shown during our analysis that the use of the LESAT and GLESAT tools has helped both industry and government focus their lean efforts and determine the maturity of their progress. During the research phase of our thesis, we conferred with a number of master's and doctoral MIT students who were doing research in the lean enterprise transformation area. We also discussed our findings with regard to the LESAT tool with LAI. During this year's Plenary Conference, we met many MIT students who were looking for further opportunities to interface with industry and government in order to complete their theses.

2. Recommendation

We believe that the NAE should encourage additional personnel pursuing graduate education studies (theses or group projects) in the area of Lean and enterprise transformation. Those efforts could augment the current research being conducted by the LAI.

Students in the Product Development for the 21st Century (PD-21) Program at the Naval Postgraduate School could do follow-on research in the LAI lean enterprise transformation areas.

MIT students who are doing research in "lean" transformation could be invited to do a "tour" or short assignment within NAE to share their knowledge and gain new knowledge in AIR*Speed* accomplishments in lean.

Our recommendation to LAI is that they form a LESAT/GLESAT User's Group so that those companies and government activities that have utilized the tool could provide feedback and learning to help improve the tool.

E. THIRD SUBSIDIARY QUESTION

Can a single tool be scaled for use across the NAE?

1. Conclusion

Our research has shown that assessment tools by themselves are not the panacea to achieving the desired cultural change to a lean or transformed enterprise. Senior leaders and managers are influenced to view their organizations as systems of interdependent variables working toward a common purpose, as such, assessment interventions must be aligned with other key organizational variables; coupled with tremendous effort to ensure that work design improvements match customer requirements and internal strategy. The cognitive act of "choosing" a tool and process must be followed-through with the more mundane aspects of clear, consistent communications and continuity across commanders' intent.

The NAE has various organizational functions and structures. As a result of analyses and interviews, "enterprises" are defined as a single program office or a

complete organization. A single tool such as the NPEG could be effectively scaled within the NAE; it was designed with the broad definition of "enterprise" in mind. Also, the DoD CPITG and the GLESAT were designed to be used by and within enterprises, and they could be scaled for use as well.

2. Recommendation

Using our Assessment Key Concepts, proactively determine the best fit for self-assessment tools by functional business area. Once this is done, the process and tool can scale to the targeted business area within the NAE. Using the NPEG would be the best way to start the assessment process for AIR*Speed*.

F. AREAS FOR FURTHER RESEARCH

The following questions could be answered by future research:

1. What is the maturity level of AIR*Speed* across the NAE? By applying the GLESAT tool within select areas that have been on the "lean journey" for a number of years, a preliminary level of maturity could be obtained as well as information for organizational learning.

2. Can the principles of High Performance Organizations (HPO) provide additional value to AIR*Speed*? HPO has been widely used within the NAVAIR community, specifically within the software engineering department and Depots. HPO concepts would seem to provide a level of the performance management framework that could be of value to NAE and help shape positive behavior of leadership.

3. During the interviews, we discovered what seemed to be the two most common organizational barriers to true enterprise behavior: a rigid budget-focused business planning process and misaligned management award and reward policies. This observation was consistent across government and industry.

The budget-focused organization can be the most obstructive to enterprise transformation because the barriers to enterprise thinking are embedded into the daily management and tracking processes at the business unit level. Managers define success by obtaining funding and protecting budgets. Because their decisions are not focused on

overall enterprise metrics, they sub-optimize decisions for local benefit. In some cases, performance awards are designed to support this behavior.

To begin transformation from a budget-focused culture the NAE comptroller organizations must be fully integrated into the NAE CPI process. They must be included or knowledgeable of all the non-financial decisions and design of enterprise work.

We recommend that the NAE use Lean Six Sigma tools to review the budget structure and processes to define the barriers to positive enterprise behavior. This review should not be lost in detail and should stay at the macro process level – above numbers -- where behaviors, attitudes, and accepted counter-enterprise practices can be identified for removal by senior staffs.

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