

Sustaining the Military Enterprise: An Architecture for a Lean Transformation

A Book Manuscript

by

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1. Book Description

1.1 Overview

This document outlines a completed book manuscript entitled Sustaining the Military Enterprise: An Architecture for a Lean Transformation. The manuscript is a comprehensive analysis of the strategies, principles, approaches, and technologies necessary to sustain the military and the weapon systems it develops and utilizes. The book contains 7 chapters with more than 370 pages organized around four major subject categories:

1. Management techniques for transforming the Military Sustainment Enterprise
2. Improving the Enterprise: Process Improvement Initiatives and Benchmarking Best Practices
3. Supply Chain Design and Logistics Operations Management for Integrating the Sustainment Network
4. Activities for Enterprise Transformation

The manuscript is targeted toward a management and engineering audience interested in the principles, strategies and tools of military sustainability. Similarly, academicians wishing to develop courses or centers of knowledge in military enterprise sustainment may be interested in adopting the book.

1.2 Introduction

Sustainment is defined here as the maintenance, repair and overhaul (MRO) practices that keep systems (the products of the enterprise) operating and up-to-date (new technology upgrades) throughout their entire life cycle. The book focuses on the tools that management, product development, and operational support teams should consider in the design, development, operation, and improvement of their products that are cost-effective in all phases of the product's life cycle: from cradle to grave. The goal is to minimize non-value-added activities throughout the entire military sustainment enterprise.

Professionals involved in sustainment need a parallel set of skills and tools. One set should focus on the management aspects of the integration of the support elements and the sustainment issues with other program management functions. The other set should focus on the engineering aspects of sustainment. To date, no condensed, practical, and user-oriented text has been available to meet these two needs. To address this void, the author began to write journal papers describing new approaches specifically designed for the problems currently facing the sustainment community. These papers provide the essential technical skills, methods, and tools to implement many new strategies and principles that are required in order to effectively sustain an enterprise and the products created by that enterprise. Driven mainly by encouragement from readers of these papers, the project resulted in the production of a book manuscript on sustainment.

One enterprise that desperately needs these tools, and needs to reassess how its systems are sustained, is the military. Recently, the Office of the Secretary of Defense (OSD) of the U.S. Government recognized this need and has directed all Department of Defense (DoD) logistic-wide initiatives to undergo a transformation by adopting commercially proven practices and strategies. This directive is a radical departure from the traditional military paradigm, and it is aimed at all enterprises that perform DoD work, including contractors such as Raytheon, Honeywell, IBM, Boeing, and Lockheed. These logistic transformation objectives include the implementation of many commercial best practices, such as lean and cellular manufacturing, systems engineering, and supply chain management. Transformation offices have been established to implement these new strategies. The problem is that these offices have no condensed, user-oriented context to turn to for the necessary tools to implement the strategies. The rush to field new products and systems without settling sustainability requirements continues to plague projects in the government as well as the commercial sectors of our economy. The book was developed with the idea of providing the sustainment community with these necessary tools. The intent is to help develop the management and technical skills necessary to design and implement cost effective, integrated, sustainment networks and agile organizational structures. At the same time, new tools are needed to help address the unique problems facing the sustainment community. These problems include aging systems and commercial-off-the-shelf (COTS) life cycle support challenges. For example, the Lockheed C-5 military transport was designed in the 1960's with a life expectancy to the year 2000. Because of monetary cutbacks in new DoD systems procurement, its life was extended well into the 21st century. How does such old technology sustain itself well beyond its expected life? Another example is the V-22 Osprey tilt-rotor aircraft program, which has had significant operational problems during its operational test and evaluation. What Performance-Based Logistics (PBL) maintenance support program design is best for this new system?

Commercially proven supply chain management and lean enterprise practices have significantly benefited the manufacturing and retail industries, but they have been difficult to apply in the defense industry because of the high degree of variability in both source material and low volume production requirements. Under ideal conditions, a sustainment supply chain network would be responsive and flexible enough to meet varying demand conditions. The right types of material and parts would be available in the right quantities, at the right place, at the right time, at an affordable cost. Parts and material shortages, coupled with increase maintenance requirements, are just some of the issues facing the sustainment community in today's environment. The logistic transformation from a (cold war) "mass production" model into a "lean and agile" model requires significant management and technological change. In much the same way, commercial enterprises supporting the military need to figure out how to sustain themselves during transformations in the DoD enterprise.

The authors have investigated many of these problems and the application of new technologies, tools, and strategies that could be leveraged in providing leaner and agile sustainment networks. The book is structured to provide a life cycle perspective of sustainment from design to production to end-product operational support.

2. Relevant Literature Discussion and Citations

The proposed manuscript is quite different from the “lean thinking”, operations management, or supply chain management books in print. It is different because it integrates new systems engineering principles (e.g., performance based logistics, supportability analysis, and operational effectiveness methodologies) with proven commercial management practices and strategies. The key is that the book provides both a management and engineering view of sustainment. It also differs from the production and operations management texts that treat the production of products apart from the sustainability of the products. Nevertheless, a preliminary literature search was already performed in order to test the hypothesis that this undertaking is unique and fulfills a void in the literature. The search was framed in the following manner:

- Scope
 - Production and Operations Management Texts
 - Supply Chain Management Texts
 - Lean Manufacturing Texts
- Search Criteria
 - Sustainability
 - Manufacturing
 - Production and Operations Management
 - Supply Chain Management
 - Systems Engineering
- Time Frame
 - Past 10 years
- Sources of Data
 - Internet Searches
 - Book Publishers
 - Professional Societies
 - Society of Automotive Engineers
 - Society of Manufacturing Engineers
 - Institute of Industrial Engineers

From this search, a number of citations were found. For the purpose of supporting the author’s hypothesis, the best matches to the project would be the following citations.

Authors	Title	Publisher	Date
Bernus, Nemes, and Schmidt (Editors)	Handbook on Enterprise Architecture	Springer-Verlag, Berlin	2003

Blanchard, Benjamin S.	Logistics Engineering and Management	Prentice Hall, Upper Saddle River, New Jersey	1998
Blanchard, Benjamin S. and Fabrycky, Wolter J.	Systems Engineering and Analysis	Prentice Hall, Upper Saddle River, New Jersey	1998
Blanchard, Benjamin S.; Verma, Dinesh; and Peterson, Elmer L.	Maintainability	Wiley-Interscience	1995
Boyson et al	Logistics and the Extended Enterprise	Wiley	1999
Hessburg	Air Carrier MRO Handbook	Aviation Week	2001
Jordan & Michael	The Lean Company	Society of Manufacturing Engineers	2001
Jordan & Michael	Next Generation Manufacturing	Wiley	2001
Liker	Becoming Lean	Productivity Press	1997
Meyer	Fast Cycle Time: How to Align Purpose, Strategy and Structure for Speed	Free Press	1993
Murman et al.	Lean Enterprise Value	Palgrave	2002
Shapiro	Modeling the Supply Chain	Duxbury	2001
Spewak	Enterprise Architecture Planning	Wiley QED	1992
Womack and Jones	Lean Thinking	Simon & Schuster, NY	1996

These current books offer the following to the sustainment community:

- Basic tools and methods for systems engineering.
- Best practices in supply chain management and the use of data and models to improve supply chain decision making.
- A management understanding of an enterprise and the architectures (information, business) that allow an enterprise to be successful.
- The theory and principles that help guide the transformation of a production enterprise toward being “lean”.
- A reference context on maintenance of systems.

They fall into one of two basic categories: an engineering guide or a management guide. No text offers both perspectives, and no text offers a guide targeted specifically toward sustainability. The main point is that there appears to be nothing in the existing literature that comes close to the authors’ approach on the subject of sustainment. The authors can best explain the uniqueness of their approach by referencing the comments of a high-level civilian, Mr. Deryl Israel, at the US Air Force Warner Robins Air Logistics Center

in Georgia. Deryl is leading a military team that is developing a proposal to compete with Boeing on the sustainment of the C-17 aircraft. (The C-17, now in military service, was built by Boeing to be the transport aircraft replacement for the aging C-141 military transport.) About half of the civilian maintenance personnel that sustain major systems like the C-5 and the C-17 will be retiring within the next few years, and providing training and reference materials to new sustainment managers and engineers is the military's biggest problem today. Mr. Israel has indicated that there is no adequate source of information on sustaining an enterprise for new management personnel and technicians, let alone any source of information on the new tools that are now available for sustainment. This problem pervades most industries, not just the military.

The target audience for the manuscript book would include:

<ul style="list-style-type: none"> • Corporate Management • Program Management • Product Management • Operations Management 	For the management principles and strategies of sustainability
<ul style="list-style-type: none"> • Product Development Engineers • Supply Chain Management • Logistics Management • Maintenance Engineers 	To provide the tools to implement sustainability
<ul style="list-style-type: none"> • Academicians and Theorists 	For research background and developing courses or centers of excellence in enterprise sustainment.

3. Methodology

In addition to the comprehensive literature search, the authors:

1. Performed site visits to enterprises that possess best sustainment practices for their products. The purpose of these site visits was to document their success as case studies.
2. Have written, and continue to write, a series of journal articles that report on new research findings in sustainment. These journal articles have been included in the manuscript and will form the basis for reporting on new technologies and strategies for sustainment.

With respect to the first point, a few major research centers have identified, researched, and promoted exceptional practices, methods, and procedures in the design, testing, production, facilities, logistics, maintainability, and management of products. Some of these centers, such as the Best Manufacturing Practices Center of Excellence

(www.BMPCOE.org) located in Maryland, exist to increase the quality, reliability and maintainability of goods and services produced by American firms. In addition, a number of U.S. corporations, which provide sustainment services to the commercial and military community, have also developed best sustainment practices. In the past six years the authors have visited some of these institutions: NASA Kennedy Space Center (FL), Pratt & Whitney San Antonio (TX), Corpus Christi Army Depot (TX), U.S. Army Materiel Command (VA), Boeing (TX, WA), Honeywell (TX, AZ), Goodrich (WA), Rockwell Collins (CA), U.S. Navy (NAVSEA), and Lockheed Martin Undersea Systems (VA). They were specifically looking for those practices that relate to sustainment. These institutions were identified by searching through information provided by research centers and other organizations aimed at increasing the quality, reliability and maintainability of goods and services. As a result of these visits, they have compiled a number of best sustainment practices. These case studies are included in the book.

With respect to the second point, the authors have written refereed journal articles on new ideas and technologies for sustainment. These papers are the result of research into sustainment over the last four years and will be included in the manuscript:

- a. "A Paradigm for Benchmarking Lean Initiatives for Quality Improvement," Benchmarking: An International Journal, with C. Comm, Vol.7, Issue 2, 2000.
- b. "Developing, Implementing and Transferring Lean Quality Initiatives from the Aerospace Industry to All Industries," Managing Service Quality, with C. Comm, Vol. 10, No. 4, 2000.
- c. "A Lean Sustainment Enterprise Model for Military Systems," Acquisition Review Quarterly, Vol. 9 No. 4, with M. Agripino and T. Cathcart, December 2002.
- d. "A Framework for Benchmarking, Classifying, and Implementing Best Sustainment Practices," with T. Cathcart and C. Comm, Benchmarking: An International Journal, Vol. 11, No. 4, pp 403-417, 2004.
- e. "Sustaining the Military Enterprise," Defense Procurement Analysis, with T. Cathcart and M. Agripino, Logistics Special Focus, Spring and Fall 2005.
- f. "Meeting the Competitive Challenge," with T. P. Cathcart, Dennis J. Stamm, and Mario F. Agripino, Industrial Engineer, Institute for Industrial Engineers, Vol. 37, No. 1, January 2005.
- g. "A Lean Architecture for Transforming the Aerospace Maintenance, Repair and Overhaul Enterprise," International Journal of Productivity and Performance Management, Accepted for publication, February 2005.

In terms of the methodology for organizing the material, the manuscript comprises the four major subject categories mentioned in the overview:

1. Management techniques for transforming the Military Sustainment Enterprise
2. Improving the Enterprise: Process Improvement Initiatives and Benchmarking Best Practices
3. Supply Chain Design and Logistics Operations Management for Integrating the Sustainment Network
4. Activities for Enterprise Transformation

The first two categories provide an overview of the transformation and continuous process improvement principles and practices required to sustain an enterprise and will provide a new framework for defining a lean enterprise. Lean means adding value by eliminating waste, being responsive to change, focusing on quality, and enhancing the effectiveness of the enterprise. Many of the principles and strategies presented will be based upon extensive research conducted in the automotive and aerospace industries. Relevant chapters cover these philosophies along with the key supporting tools and practices for successful enterprise transformation.

The third subject category will review the theory and practice of the core functions of the enterprise that impact the supply chain management and operational logistic support of fielded systems. This chapter provides a basic understanding of the organizational structure and behavior of an “integrated sustainment enterprise network” based upon its design and operations. Recent research results from several fields of studies, such as supply chain management, integrated lean enterprises, and e logistics, are presented. New logistic technologies, tools and application software systems are also explored. This chapter provides the tools and techniques needed to design, implement and operate an effective sustainment enterprise supply chain and support service.

The last category, Enterprise Transformation Activities, is a guide to the Lean Enterprise Architecture (LEA) transformation of a military enterprise that was presented earlier in the book. The LEA uses Lean enterprise, systems engineering, and performance-based methodologies to portray the overall flow of the action steps necessary to initiate, sustain, and continuously refine an enterprise. The intent is to make the subject of Lean transformation accessible and logical to all, and to shift the paradigm from traditional “acquisition think” into one of collaborative, performance-oriented teamwork with a focus on transformation performance, improvement, and innovation, not simply contract compliance. These transformation activities offer the potential to dramatically transform the depot and permit the federal government to tap the enormous creative energy and innovative nature of private industry. Transformation can be daunting, with its discussion of performance work statements, work breakdown structures, and quality assurance plans. This makes learning something new appear more complicated than it really is. The intent of this chapter is to offer a set of step-by-step activities that will guide the reader to a Lean Transformation of the enterprise. Associated with each activity outlined in the LEA is a generic document that has already been prepared to help the reader. These documents are identified in this chapter with a **CD** symbol. The reader will find them in the CD attached to this book or at a website.

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Biography

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