A Framework for Benchmarking, Classifying, and Implementing Best Sustainment Practices

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Abstract

This paper develops a methodology for identifying, classifying, and implementing a set of best practices that can increase the quality, reliability, and timeliness of industries that provide maintenance, repair, and overhaul services on products. By cataloguing and documenting these best "sustainment" practices, one can learn from others' attempts to maintain systems and avoid non-value-added processes. The authors identify the knowledge that exists at various research centers and maintenance, repair, and overhaul providers at U.S. corporations - wherever the best practices may reside. The paper specifically focuses on the sustainment of U.S. military systems, but it also draws analogies and conclusions for other global product and service providers.

Introduction

This paper presents a framework for benchmarking, classifying, and implementing best sustainment practices. A number of 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 U.S. Navy's Best Manufacturing Practices Center of Excellence (BMPCOE), 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 maintenance, repair, and overhaul (MRO) services to the commercial and military community, have developed best practices. In an arena of cost reductions, aging systems, and the closure of military bases that sustain the Army, Navy, Marines and Air Force, the community can benefit from the knowledge that exists at centers possessing best "sutainment" practices, wherever those best practices may reside. By cataloging and documenting the linkages to where these best sustainment practices reside, the hope is that the community can learn from others' attempts and avoid costly and time-consuming duplication of effort.

This research specifically focuses on maintenance, repair, and overhaul practices and how these practices can apply to the sustainment of U. S. military operations, but it also draws analogies and conclusions for other product and service providers. First, a brief review of benchmarking practices and issues confronting the sustainment community is offered. Next, the research and methodology section describes how the research was conducted. Then, those practices that would benefit the sustainment community (industries that provide maintenance, repair and overhaul services on goods and products) are identified, classified and related to benchmarking practices for sustainment. In conclusion, an implementation strategy for these practices is presented.

Background

Benchmarking

Benchmarking is recognized as an essential tool for continuous improvement of quality (Dattakumar and Jagadeesh 2003). This is evident by the recent large number of publications in the field. If one looks historically at benchmarking in the U.S., the Xerox Corporation is generally credited with the first major benchmarking project in 1979. Xerox was interested in how Japanese manufacturers produced less costly but high quality photocopier machines. Xerox learned how to increase design and production efficiency and reduce manufacturing costs of their machines from "benchmarking" Japanese manufacturers.

Benchmarking goes beyond just competitively analyzing the competition. It includes analyzing organizational processes and methods to assess how competitors' achieved their positions. The earlier stages of benchmarking developments stressed a process and/or activity orientation. Recently, however, the scope of benchmarking appears to have expanded to include strategies and systems (Yasin 2002). Consequently, a strategy or framework for benchmarking is one of the key issues in this paper.

Issues Confronting the Sustainment Community: Reasons for Searching for Best Practices

Based on a project aimed at dramatically improving U.S. military MRO processes and facilities, and from information obtained by the authors as a result of site visits to military and commercial MRO centers, an observation of the current MRO system revealed critical issues facing the sustainment community. Most of these issues, such as higher than desired maintenance cycle times, are due to "awaiting parts" conditions, where a system cannot be repaired in a timely manner because technicians cannot obtain needed parts to fix the system. In an arena of cost reductions, aging systems, and military base closures, everyone in the sustainment community is indeed working very diligently to support the MRO process. However, systemic problems in the industry are hampering their efficiency:

- The technological obsolescence of parts and systems.
- Diminishing manufacturing sources (industries) and resources (skilled labor).
- A lack of integration of in-service engineering functions with depot maintenance functions.
- A poorly structured performance measurement (metrics) program.
- Contracting philosophies that are inefficient.
- A lack of an integrated information systems architecture.

As a result of these problems, a number of issues have arisen:

a. The sustainment community continues to recreate or reengineer old technology in order to address the issues of diminishing manufacturing resources and parts and systems obsolescence.
b. Limited engineering resources have caused programs to *react* to critical problems instead of *anticipating* them.
c. Ineffective goals and performance metrics may have caused higher sustainment costs and misuse of performance drivers.
d. The current contracting philosophy has resulted in delayed deliveries and higher sustainment costs.
e. The lack of integrated information systems has resulted in a manpower-intensive system that does not function effectively in real-time.

Research Objectives and Methodology

The authors examined the general problems associated with these sustainment issues. They then investigated both government and industry practices that might provide solutions to these problems. The research revealed that there exist over 2000 documented practices that may be of value. Most of these practices are documented in the U.S. Navy's Best Manufacturing Practices Center of Excellence database[1]. The authors focused on finding those practices that are best suited to the MRO environment. The practices that the authors found have come from government organizations as well as commercial industry. These "lean"[2] concepts encompass both reduction in system parameters, such as waste, design time, organizational layers, and suppliers, as well as improvements in flexibility, capability, productivity, and customer satisfaction.

The objective of this paper is to present a framework for identifying, classifying and implementing these best sustainment practices. By cataloguing and documenting these best practices, one can learn from others' attempts to maintain systems and avoid non-value-added processes. The intent is to increase the quality, reliability, and timeliness of industries that provide MRO services on products. The research specifically focuses on MRO practices and how these practices can apply to the sustainability of U.S. military operations, but it also draws analogies and conclusions for other product and service providers.

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[1] http://www.bmpcoe.org

[2] See, for example, Becoming Lean by Jeffrey Liker, Productivity Press, Portland,

To accomplish this objective, the authors develop a new framework for identifying and classifying best sustainment practices. Those practices that would benefit the sustainment community are then identified; and, in conclusion, a road map for how these practices can be implemented is presented.

Best Sustainment Practices: A Definition

First, a definition of a best practice from the perspective of maintenance, repair, and overhaul services:

> *A best sustainment practice is a methodology, technique, or innovative use of equipment or resources that has a proven record of success in providing significant, continuous improvements in cost, schedule, quality, performance or other measurable factors enabling an enterprise to deliver best value to the customer and thus positively impacting overall health & success of the enterprise.*

The authors used this definition to identify the practices that are considered "best-in-class". The following section describes how these practices were identified.

Identifying the Best Practices

A number of organizations possess best practices. Many of these practices can be beneficial to the entire sustainment community if they are identified and documented. So, the first problem is identifying these organizations and documenting their best practices. A few institutions, like the Navy's Best Manufacturing Practices Center of Excellence, exist exclusively to identify and define these practices. The goal is to identify the knowledge that exists at these centers and to make recommendations about those practices that would directly benefit the sustainment community. In this section, the

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Oregon, 1997.

authors offer a framework for identifying these practices in the context of MRO operations. The framework consists of four basic steps, as depicted in Figure 1.

Step 1: Define the Issues and Problems

The first step in the process is to define the issue or problem that the sustainment community is facing. There may be best practices available to help solve the problem. As an example, the parts availability problem that pervades the maintenance, repair, and overhaul industry can be defined in the manner depicted in Table 1. The problem may be slightly different for the supplier of the parts than it is for the MRO operator (government or commercial) who needs the piece or part to fix a subsystem. Further, the problem may also be different for the "customer", in this case the end user of the subsystem. In this table, the authors list the issue for each "user" (supplier, MRO provider, and the customer), the source of the issue/problem, and the metrics that are commonly used to evaluate whether or not the problem exists.

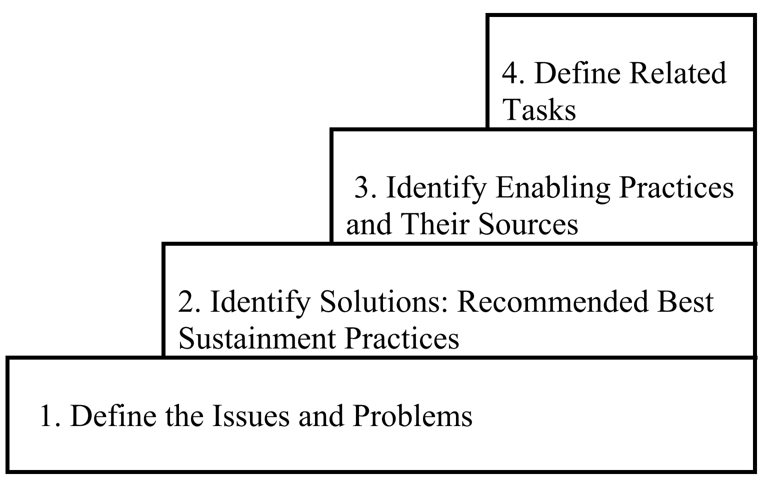

Figure 1
A Framework For Identifying Best Sustainment Practices

Here, it can be seen from the supplier perspective that the parts availability problem is due to technological obsolescence (i.e., changes in the technology that causes older parts to be unavailable) and diminishing manufacturing sources (i.e., Original Equipment Manufacturers going out of business) and/or diminishing manufacturing resources (lack of skilled technicians, etc.).

	SUPPLIER	**MRO PROVIDER COMMERCIAL/ GOVERNMENT**	**CUSTOMER**
ISSUE	Parts Availability Decreasing	Depot Cycle Time Increasing	Operational Readiness Decreasing
SOURCE OF ISSUE (PROBLEMS)	Parts Obsolescence and Diminishing Manufacturing Sources / Resources	Lack of Parts	Spares Availability Decreasing
METRIC	Lead Time (LT)	Logistics Delay Time (LDT)	Mission Capability (MC)

Table 1: Identifying the Issues and Problems

Step 2: Identifying Solutions to the Problem: Best Practices

The next step is to identify solutions that can possibly address the problem. These are the best practices. Since there are three players in the sustainment arena (suppliers, MRO providers, and the customer), the solutions would be different for each. To continue with the previous example, suppose the focus is on the supplier. What best practices would help suppliers with their parts availability problem? In terms of technological obsolescence and diminishing manufacturing sources/resources, the authors have identified three possible solutions (i.e., higher-level best sustainment practices) (Table 2):

- Technology Insertion Management
- Sustaining Manufacturing Capability
- Life-Time Buy

To solve the problem of long lead times in obtaining parts for suppliers, there are four possible solutions:

- Buffer Inventory
- Sustaining Manufacturing Capability
- Technology Insertion Management
- Lean Manufacturing

Finally, to deal with the problem of poor quality piece parts for the supplier, there are two recommended higher-level practices:

- Quality Management Systems (QMS)
- Supply Chain Management

Source of Issue (Problems)	**Possible Solutions: Recommended Higher-Level Best Sustainment Practices**
Obsolescence, Diminishing Manufacturing Sources / Resources (DMS) (DMR)	• Technology Insertion Management • Sustaining Manufacturing Capability • Life-Time Buy
Long Lead Times	• Buffer Inventory • Sustaining Manufacturing Capability • Technology Insertion Management • Lean Manufacturing
Quality	• Quality Management Systems (QMS) • Supply Chain Management

Table 2: Identifying Solutions to the Problem:
Recommended Practices for the Supplier

In the case of the MRO provider, the authors have identified seven recommended higher-level practices to help solve the parts availability problem (Table 3). There are two recommended practices for the documentation problem, one practice for the remanufacturing problem, and one for the resource constraints problem.

Source of Issue (Problems)	**Possible Solutions: Recommended Best Sustainment Practices**
Parts Availability	• Technology Insertion Management • Sustaining Manufacturing Capability • Life-Time Buy • Buffer Inventory • Lean Remanufacturing • Quality Management System (QMS) • Supply Chain Management
Documentation	• Configuration Management • Technical Data Management
Remanufacturing Process	• Lean Remanufacturing
Resource Constraints	• Resource Requirements Analysis

Table 3: Identifying Solutions to the Problem:
Recommended Practices for the MRO Provider

Step 3: Identifying Enabling Practices and Their Sources

The third step in the process of identifying and classifying best sustainment practices is to list the lower-level "enabling" practices that are associated with the class of higher-level practices. These lower-level enablers help to further define the practices and their utility. For example, technology insertion management is a higher-level best practice. Some of the lower-level "enabling" practices within this technology insertion class are:

- Modernization Through Spares (MTS)
- Continuous Technology Refresh (CTR)
- Reduce Total Ownership Cost (R-TOC)
- Costs as an Independent Variable (CAIV)
- Rapid COTS Insertion (RCI)
- Non-Developmental Item (NDI) Strategy

In the following table (Table 4), the authors list these enabling practices along with those institutions that are believed to possess these practices. In this example, the US Army has been identified as one source of best practices for Modernization Through Spares (MTS) and Continuous Technology Refresh (CTR). Similarly, the US Navy and Lockheed Martin possess best practices in the area of Commercial Off-The-Shelf (COTS) insertion of technologies into their processes.

Technology Insertion Management		
Enabling Practices	**Source**	**Related Best Sustainment Practices**
Modernization Through Spares (MTS) Continuous Technology Refresh (CTR)	US Army	Service Life Extension Program (SLEP)
Reduce Total Ownership Cost (R-TOC) Costs as an Independent Variable (CAIV)	US Air Force	
Rapid COTS Insertion (RCI)	US Navy, Lockheed-Martin	Sustaining Manufacturing Capability
Non-Developmental Item (NDI) Strategy	DOD Acquisition Reform	Lean Remanufacturing

Table 4: Identifying Enabling Practices and Their Sources

Step 4: Defining the Best Practice: Related Tasks

The last step in the process of identifying the best sustainment practices is to develop a more specific definition of the practice. One can accomplish this task with a definitive statement, or it can be done through example by listing a set of tasks and processes that are related to this practice. The authors chose the latter approach. Continuing with the example of Technology Insertion Management (TIM) as a higher-level task, TIM comprises the enabling practices that were identified above, and it represents the related tasks defined in the following table (Table 5). In other words, institutions that practice any of these related tasks or processes are implementing Technology Insertion Management as a practice.

Technology Insertion Management	
Enabling Practices	**Related Tasks and Processes**
MTS/CTR R-TOC/CAIV RCI NDI	• Performance Based Specifications • Open System Architecture • Market Analysis • Technology Assessment and Management • Supportability Analysis • Risk Management • Integrated Product Teams/Concurrent Engineering • System Requirements Analysis/System Engineering • Integrated Test and Evaluation • System Modification and Retrofit Installation • Technical Data and Configuration Management • Industry/Government Partnership • Operational Effectiveness Assessment • Warranty • Acquisition Streamlining and Contracting

Table 5: Tasks and Processes Related to Technology Insertion Management

Classifying Best Practices for Sustainment

Once the best practices have been identified, a framework for classifying all this information is needed. The classification is organized in a hierarchical manner, ranging in scope from high-level lean practices to specific enabling best practices that are more context-specific in nature. This classification is illustrated by examining Technology Insertion Management (TIM). TIM, as noted above, is a higher-level best practice. The authors have identified six enabling practices in this category:

1. Modernization Through Spares (MTS)
2. Continuous Technology Refresh (CTR)
3. Reduce Total Ownership Cost (R-TOC)
4. Costs as an Independent Variable (CAIV)
5. Rapid COTS Insertion (RCI)
6. Non-Developmental Item (NDI) Strategy

One can classify these six enabling practices under the general category of Technology Insertion Management, as illustrated in Figure 2.

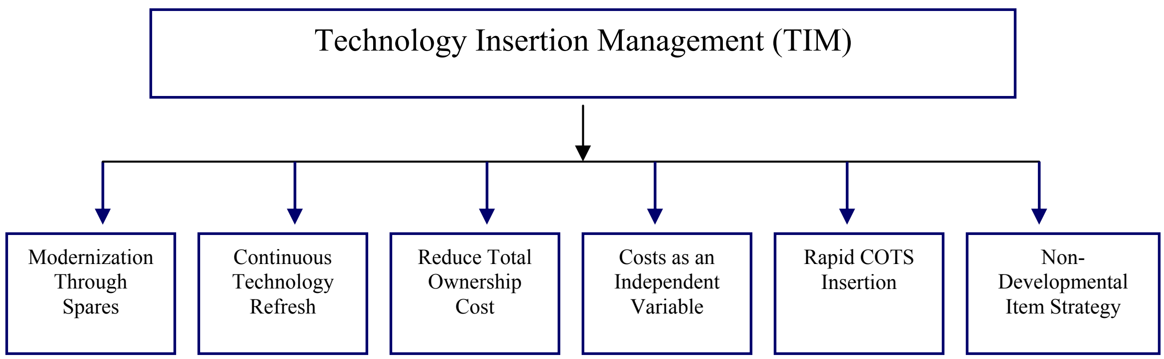

Figure 2: Classifying Best Sustainment Practices

In a similar manner, other higher-level practices can also be classified hierarchically.

Benchmarking Best Practices for Sustainment

The authors have identified a number of institutions that have developed or instituted best sustainment practices. These institutions were identified by searching through information provided by centers and other organizations aimed at increasing the quality, reliability, and maintainability of goods and services. The authors were specifically looking for those practices that relate to sustainment. Site visits were conducted to a number of institutions, including the NASA Kennedy Space Center (FL), Pratt &

Whitney San Antonio (TX), Corpus Christi Army Depot (TX), U.S. Army Materiel Command (VA), and Lockheed Martin Undersea Systems (VA). In this section, three examples of the many best practices that the authors witnessed during the site visits are presented[3]. One is taken from a "research" institution, one from a commercial manufacturer, and one from the U.S. military. The purpose of the site visits was simply to witness the practice, not to validate that the practice was considered "best". The understanding by the authors was that the center initially identifying the site as possessing the best practice had already validated the practices as "best" by their standards.

Example Best Sustainment Practice No. 1
Logistics Capability Assessments

The Space Shuttle traditionally has used Probability of Sufficiency (POS) to determine the number of spare Line Replaceable Units (LRUs) required to support operation of the Shuttle and to assess supply support performance. Probability of Sufficiency, however, does not necessarily provide a good measure of Shuttle logistics support capability. A better method was developed for the Spacecraft Sustainability Model to assess the logistics supportability of Shuttle launch frequency and schedules. Availability is based upon expected backorders, a better measure of item performance than POS because it measures overall system performance and can show times of greatest risk to the launch schedule. The model utilizes item-specific logistics data and launch schedule information to project delays to the launch schedule and to identify potential support problems by projecting when a system may be unavailable due to lack of a spare part. It also provides the capability to assess the availability expected from logistics budget submissions and assess the impact of budget cuts on our ability to perform our mission.

The Long Term Supportability Tool also has been developed to assess logistics support capability. This web-based tool was designed to identify LRUs that pose potential risks to Shuttle supportability by producing graphical displays of their historical removal data and repair turnaround times. This enables the analyst to identify items whose current failure rates or repair cycle times exceed their historical norms and could impact subsystem performance. Enhancements are planned to add more extensive item information, asset tracking capability, and simulation of alternate scenarios.

Source: NASA Kennedy Space Center - Cape Canaveral, FL

The NASA Kennedy Space Center (KSC) facility provides prelaunch checkout, assembly, testing, and processing of the space shuttle fleet, the payloads, and shuttle launch, landing, and solid rocket booster recovery operations. In the present environment

[3] The reader is encouraged to contact the authors for a more complete list of the best sustainment practices that were identified.

to reduce government, balance the Federal budget, and privatize to the maximum extent, KSC faces major challenges. These include reducing its workforce, privatizing the Space Shuttle program, and redefining its role and mission. Given these constraints, KSC committed to excellence in the quality of its products and services for its many customers. Among the best examples cited by the Best Manufacturing Practices Center of Excellence (BMPCOE) were KSC's instrumentation and control, human factors event evaluation model, technical documentation system, payload operations network and network control center, space shuttle logistics, benchmarking, and weather support.

The Kennedy Space Center seized the opportunity to be the leader, and facility of choice, for space launch operations and payload processing. The challenge was to deal effectively with the seeping large-scale privatization changes that are occurring at KSC. From the perspective of the authors, KSC has committed to excellence in the quality of its products and services for its many customers at the system-wide level. Best practices are ingrained into the entire culture of the KSC. During the visit, the authors focused on the following operations and sites within KSC:

a) Logistics Operations
b) Orbiter Processing Facility
c) Vehicle Assembly Building
d) Launch Pads
e) NASA Payload Logistics Depot
f) Space Station Processing Facility
g) Shuttle Logistics Depot

Example Best Sustainment Practice No. 2

Depot Production Operations

Depot production operations were modeled using the Toyota Production System. The modular design of the material flowing between work cells allow for maximum flexibility in implementing unique one-time engineering changes and technical orders into the material refurbishment cycles. This best practice provides a new framework for system modernization by synchronizing technology cycles and maintenance cycles to provide the most cost-effective method to continue system life cycle modernization. Quality management and continuos process improvement procedures are based on the United Technology quality management system. UT sells their quality program and training services.

The depot uses the government supply system and OEM sources for parts and consumable items. Supply chain management has been a problem because of poor configuration accounting documentation provided by the government. The technicians on the floor have been very successful in identifying configuration problems. The technical baseline is continuously improving as each overhaul is conducted. The technician performs a mini-physical configuration audit during the overhaul process. Configuration problems are documented and the engineering change process is used to update engineering, overhaul, and source control and procurement documentation.

The depot has developed "flow lines" based on the overhaul procedures and process. All materials and tools required to overhaul an engine are laid out in the standard U-shaped work cell configuration. Overhaul kits are stored in separate bins placed at each work cell. Separate disassembled parts bins are placed at the applicable work cell. Repairable assemblies are inducted in associated repair shops or shipped to other depots as directed. The depot Turn-Around-Time (TAT) has decreased by 60%. Removed parts are inspected for material condition classification for possible reuse. These inspections are conducted after the disassembly parts bins are rotated and emptied. The depot is a mixed supplier/distribution system. Engines are "pushed" to the depot; and, once inducted, they become a "pull" system for the overhaul and repair operations. Then it is "pushed" to a forwarded buffer stock inventory.

The maintenance concept for these engines includes some preventative and corrective intermediate level maintenance with required scheduled depot level overhauls. Condition based maintenance is not used.

The depot maintains "Engine Risk Kits" as readiness spares to meet unexpected (surge) demands. The US Air Force uses "Buffer Stock" at the operational unit locations to meet these surges. This two-layer approach can be streamlined and reduced with the one-level maintenance concept.

Source: Pratt & Whitney Aircraft, San Antonio, TX

The authors identified the second example, Pratt & Whitney at the San Antonio, Texas site, as an institution possessing best practices in engine repair through an article that appeared in <u>Overhaul & Maintenance</u>[4]. The focus of the article was on operational improvements using cellular manufacturing, Kaisan, and flow lines in the engine centers. The site visit to P&W was to investigate these improvements in the engine repair/overhaul shop. The conventional overhaul process involved a stationary engine bay, where the engine remains for two months. "The parts come in, the tools come in,

[4] Robert Weiner, Pratt & Whitney Engine Services, Interview, Overhaul & Maintenance, January-February 2000.

the parts go out and the tools go out."[5] With the flow lines concept, there are 5 stations where the engine gets torn down and 5 stations where the engine is built up again. Each day, the engine moves down to the next station, where there are dedicated tools, parts, and people. All four of Pratt's engine centers (Cheshire, Singapore, Columbus, and San Antonio) have the cellular flow lines. The concept is the same as the Toyota production system. Flow is a key principle in Lean thinking, and the P&W flow lines use these basic principles. Variations make the process difficult: for example, different configurations of engines, different customer requirements, or the condition of an engine may vary. The lines are modular, grouped by families (e.g., turbine blades). The materials (parts) flow along the lines with the engine, but the employees move about depending upon their expertise. No toolbox is dedicated to an employee. All tool sets are located at the module site. The system uses parts kits, which are placed in carts that are numbered.

The Pratt & Whitney organization adopted a team approach to depot operations and management. They reduced many staff positions by delegating authority to the lowest possible level and by organizing business and operational processes around integrated process teams (IPTs). Management and work cell teams are fully integrated with the day-to-day operational depot processes. Implementation of the Lean systems provides the proper environment in which team operations can occur successfully.

[5] Robert Weiner, Pratt & Whitney Engine Services, Interview, Overhaul & Maintenance, January-February 2000.

Example Best Sustainment Practice No. 3

Integrated Technology Insertion Strategy for Sustainment

The Army has many programs and is currently developing a comprehensive strategy for all phases of the lifecycle. Early concept analysis for Modernization Through Spares (MTS) provides the foundation and framework for this effort. The US Army uses technology insertion as both an acquisition storage and sustainment strategy. Integrating these two-strategies would provide a good framework. Currently there is some conflict with the new strategy of Continuous Technology Refresh (CTR). The spares model used for a new CTR component still uses a life time sustainment computation, which was previously used for legacy systems. The sparing practice is counter to the new strategies of CTR.

Source: U.S. Army, Alexandria VA

The authors identified the third example, the U.S. Army Materiel Command, as an institution possessing best practices in its Continuous Technology Refreshment (CTR) spares procurement strategy, formerly the Management Through Spares (MTS) program. The reason for these improvement programs is that the Army is transitioning from a defense-based industrial base to a commercially oriented national industrial base. The catalysts for this change in military specifications include:

a) The commercial market is driving new technology developments.
b) Defense budgets are declining.
c) Military requirements are expressed in terms of what is needed, not how to make it.
d) Acquisition workforce is aging and decreasing.

The objective is to reduce military specifications on acquisitions as much as possible.

The "MilSpec Reform" means doing business in a new way:

a) Changing the acquisition culture
b) Training the workforce
c) Restructuring management and policy
d) Converting to performance-based acquisition
e) Disposing of obsolete documents
f) Eliminating cost drivers

Implementing Best Sustainment Practices

Discovering best practices at other organizations is a relatively easy task compared to the mission of implementing the practice in one's own organization. To assist in the implementation process, the authors have designed a road map for the task. This structure is presented in Appendix A. The first chart in the appendix summarizes this road map. On the left of the chart are the organizations that possess the best practices related to sustainment. In the center is the benchmarking team that is attempting to discover these best practices. On the right are the organizations (stakeholders) that can benefit from these practices. The Integrated Benchmarking Team (IBT) identifies and documents the best practices. The Rapid Improvement Teams (RITs) are the individuals in the organizations who are responsible for implementing the best practices. The vehicle by which the best practices are catalogued and documented for the community is a best sustainment practice web site.

The second chart (B) in the appendix shows the steps involved in developing this best practice web site. The last chart (C) in the appendix outlines the steps necessary for an organization to implement the best sustainment practices in their own shop. There are five steps to this implementation:

1. Identify Candidate Processes
2. Identify Roles for Critical Enablers
3. Create a Process Innovation Vision
4. Understand and Improve Existing Processes
5. Prototype and Implement the New Process and Organizational Change

Institutions adopting this framework are truly considered to be best-in-class.

Conclusions

This paper has been designed to convey a framework for benchmarking, classifying, and implementing best practices for the sustainment of an enterprise. The framework is aimed at increasing the quality, reliability, and timeliness of the goods and services provided by the maintenance, repair, and overhaul (MRO) community. The preliminary observations about the sustainment system, together with the best practices and their associated framework, are offered in the spirit that they may serve as working hypotheses so that the sustainment system can be improved. The authors believe the approach outlined in this paper offers great promise for guiding future benchmarking activities in all industries. More importantly, the type of systematic, research-based, process now underway should pave the way for developing concrete strategies, actions, implementation roadmaps, and decision-support tools aimed at directly benefiting the international sustainment community in meeting its difficult future challenges.

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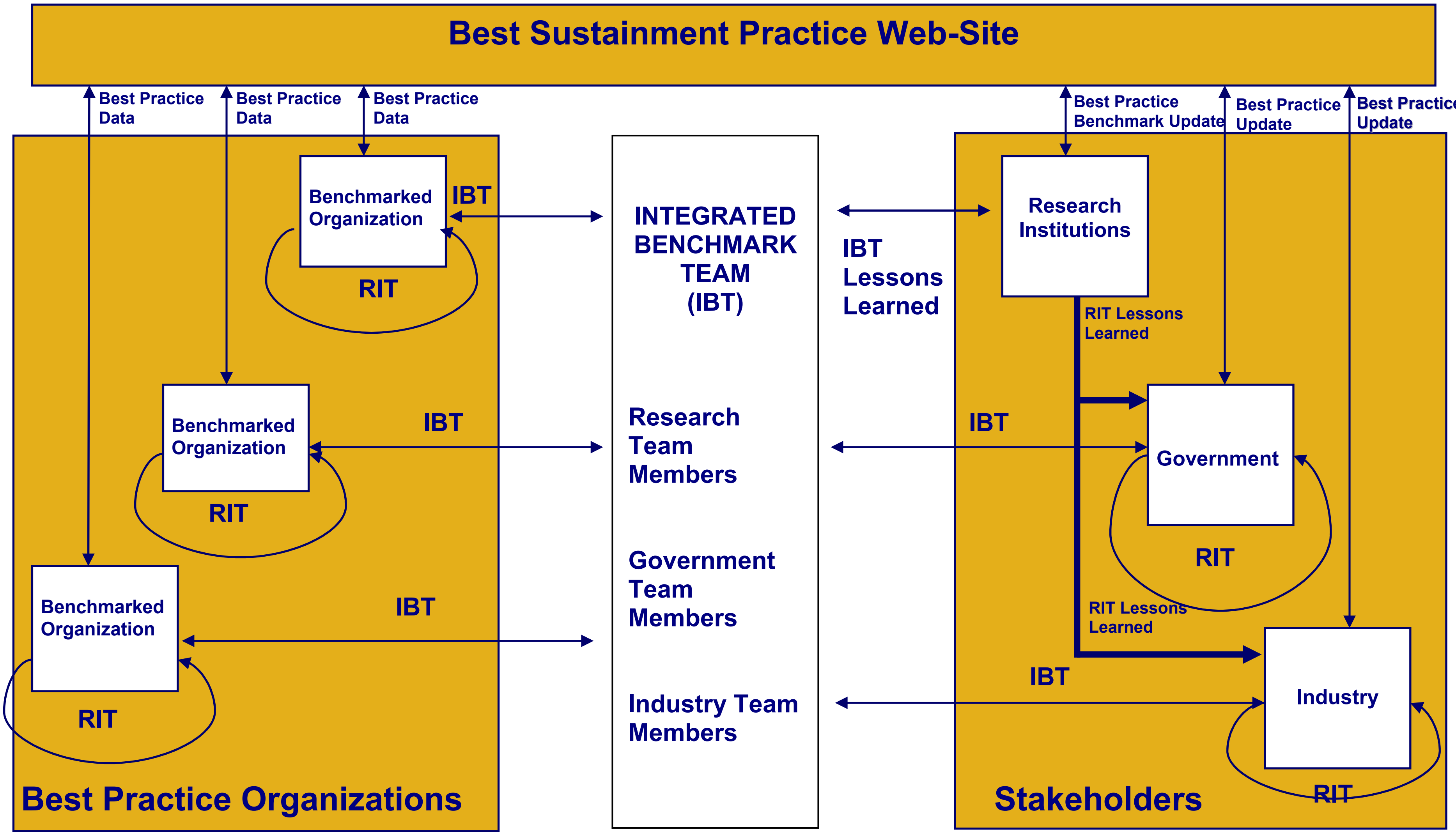
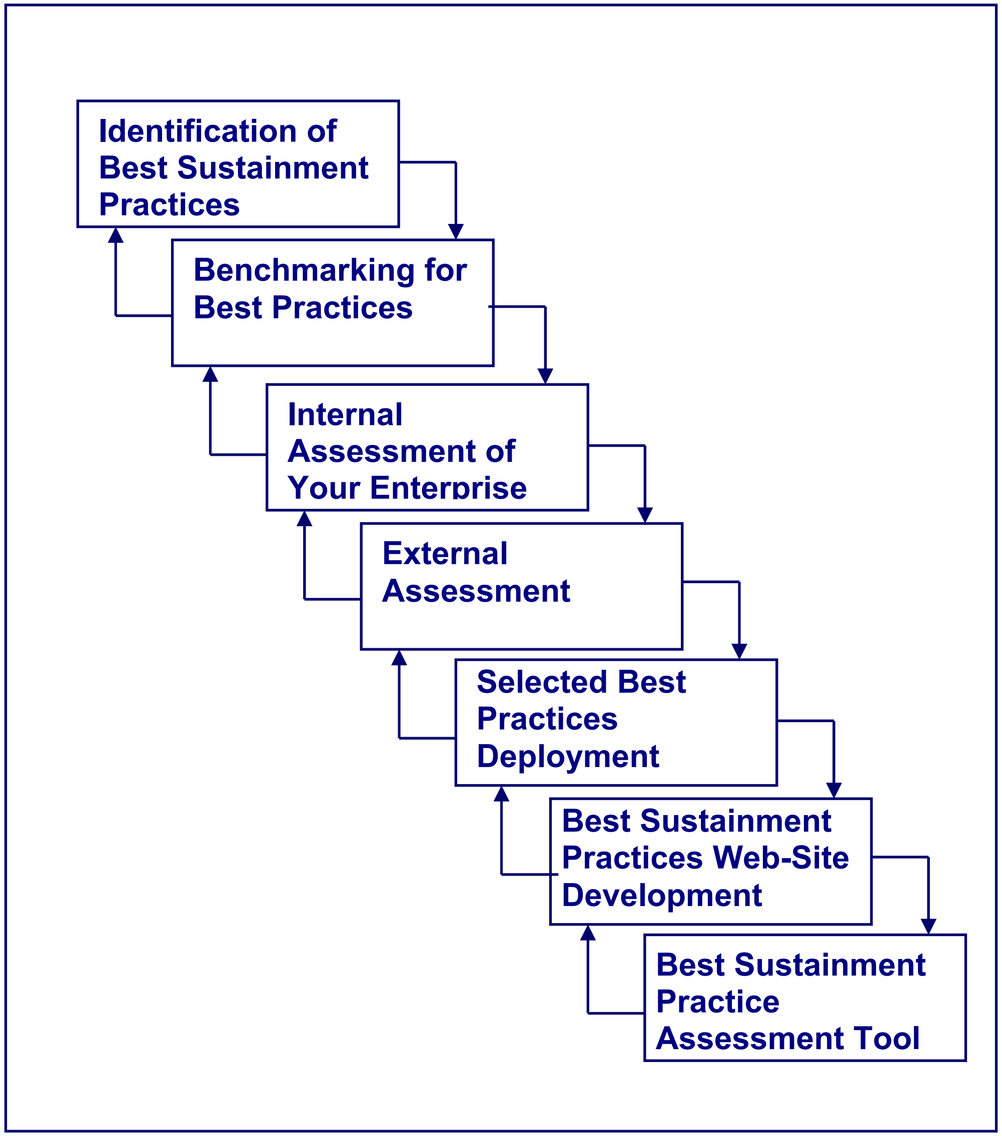
Appendix A
A Road Map for the Implementation of Best Sustainment Practices



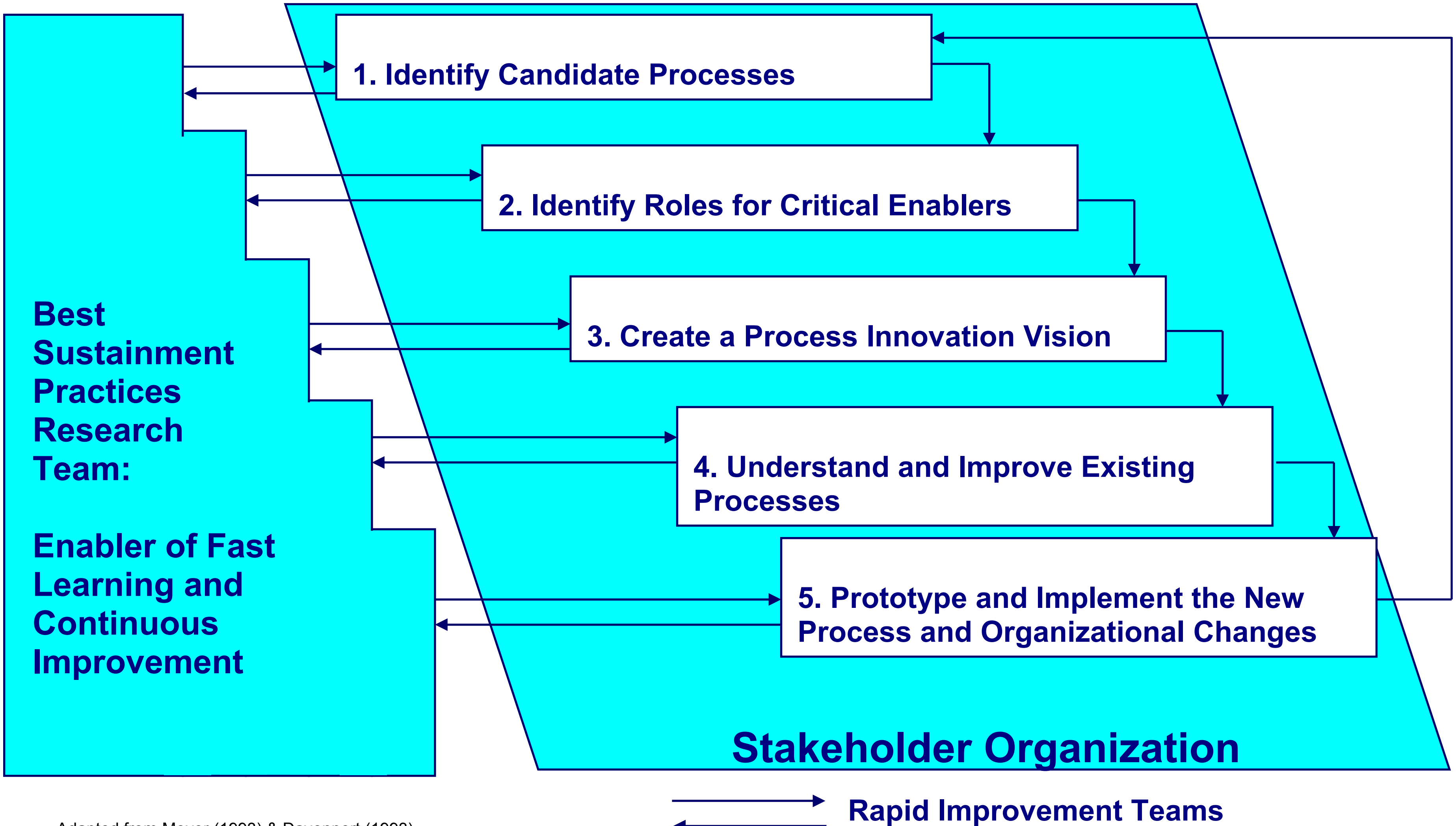
RIT: Rapid Implementation Team
IBT: Integrated Benchmark Team

Appendix B
Development and Deployment of a
Web Site for the Implementation of Best Sustainment Practices



Adapted from Harrington & Harrington (1996)

Appendix C
Implementation Steps for the Best Sustainment Practices



Adapted from Meyer (1993) & Davenport (1993)