Welcome to Metrics

This lesson addresses the role of system sustainment metrics in the development of the initial product support strategy. As you may recall, the focus of the Technology Development phase is on reducing risk and defining achievable performance and sustainment requirements. This begins with the analysis of alternatives that include examining alternative operating and system support concepts, with specific consideration of performance based requirements. Success is demonstrated by identifying key performance and related sustainment metrics as design requirements that affect the overall capability of the system to perform and endure in the required mission environment. In addition to the Sustainment Key Performance Parameter (KPP)/Key System Attributes (KSA), the metrics can include other supportability, maintainability, interoperability, manpower or footprint measures.

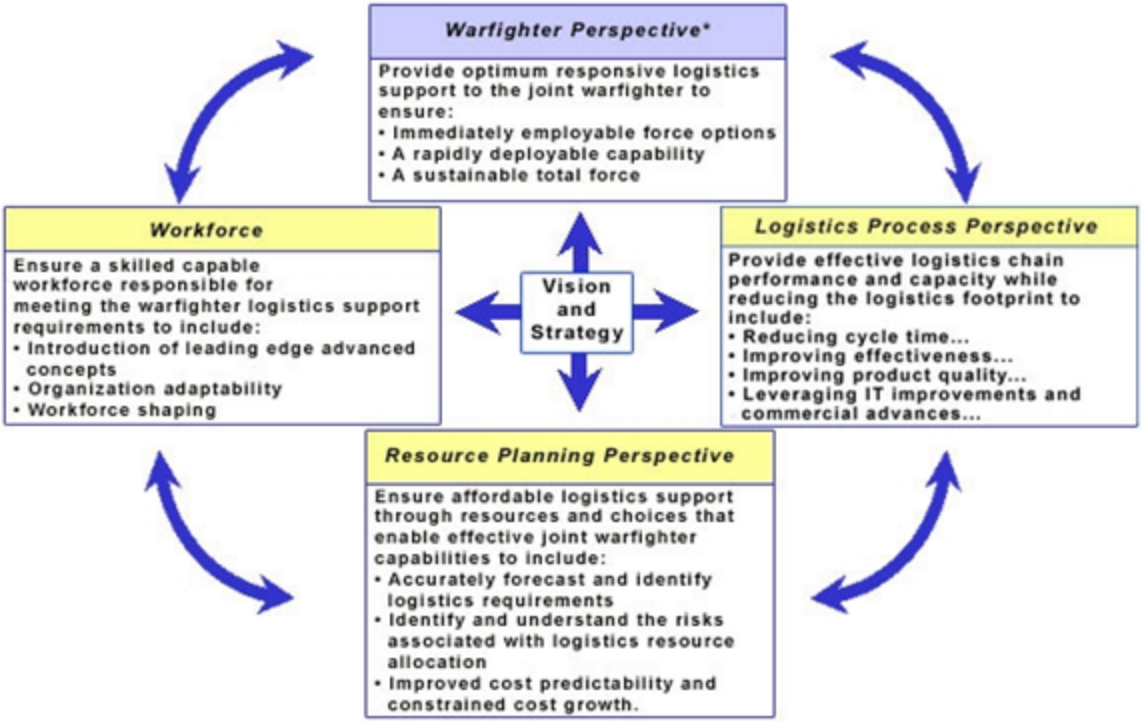
Objectives

Upon finishing this lesson, you will be able:

- Identify in which key program documents produced at the end of the Technology Demonstration phase sustainment metrics should be included.
- Identify essential supportability key performance parameters (KPPs).
- Identify essential characteristics of key performance parameters (KPPs).
- Identify the steps involved in developing the sustainment KPP and KSAs.

Metrics and Product Support Strategy

Recall that the objective of the Defense Acquisition System is to acquire quality products that satisfy user needs with measurable improvements to mission capability at a fair and reasonable price. With this in mind LCLs construct their product support strategies based on a balanced scorecard metrics approach to achieving their program's vision and strategy. The graphic depicts the various perspectives the LCL will consider.



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Long Description

The balanced scorecard approach to achieving program vision and strategy, as presented in the DUSD (LM&R) briefing to the Navy Logistics Conference, May 2004.

There are four boxes forming a circle. The boxes are located at 0°, 90°, 180°, and 270° on the circle. Clockwise from the top, they are titled “Warfighter Perspective”, “Logistics Process Perspective”, “Resource Planning Perspective”, and “Workforce”. There are double-headed arrows between each adjacent box, further emphasizing the concept of a circle. At the center of the diagram is a box with the words “Vision and Strategy”. Arrows point from this box to each of the boxes that form the circle.

The Warfighter Perspective focuses on providing optimum responsive logistics support to the joint warfighter to ensure immediately employable force option, a rapidly deployable capability, and a sustainable total force.

The Logistics Process Perspective focuses on providing effective logistics chain performance and capacity while reducing the logistics footprint, including reducing cycle time, improving effectiveness, improving product quality, leveraging IT improvements and commercial advances.

The Resource Planning Perspective focuses on ensuring affordable logistics support through resources and choices that enable effective joint warfighter capability, including accurately forecasting and identifying logistics requirements, identifying and understanding the risks associated with logistics resource allocation, and improving cost predictability and constrained cost growth.

The Workforce Perspective focuses on ensuring a skilled capable workforce responsible for meeting the warfighter logistics support requirements, including introducing leading edge advanced concepts, organizational adaptability, and workforce shaping.

Key Program Documents and Sustainment Metrics

The key exit documents for the Technology Demonstration phase that incorporate sustainment metrics are:

- **Capability Development Document (CDD)**
  - Recall that the CDD documents the information necessary to deliver an affordable and supportable capability using mature technology. Accordingly, the following sustainment drivers information should be included
    - System maintenance/support profiles and use case scenarios
    - The corresponding support and maintenance effectiveness measures
    - Description of the specific capabilities required to achieve the support concept and/or to reduce risks in achieving the values required to meet the operational requirements. It should include metrics for each of the key enabling technologies (e.g., reliability/maintenance rates, diagnostics/prognostics effectiveness measures)
- **Test and Evaluation Master Plan (TEMP)**
  - Recall that the TEMP focuses on the overall structure, major elements, and objectives of the Test and Evaluation program. Accordingly, the TEMP will include the identification of the metrics and enabling/driver technologies to be evaluated in subsequent phases, the approach for evaluating them, and test points.
- **Acquisition Program Baseline (APB)**
  - The APB documents program goals. It includes a description of the sustainment metrics, criteria, and logistics funding requirements.
- **Life Cycle Sustainment Plan (LCSP)**
  - The LCSP documents the evolving product support strategy. It includes a description of the key sustainment metrics and also documents logistics funding requirements.

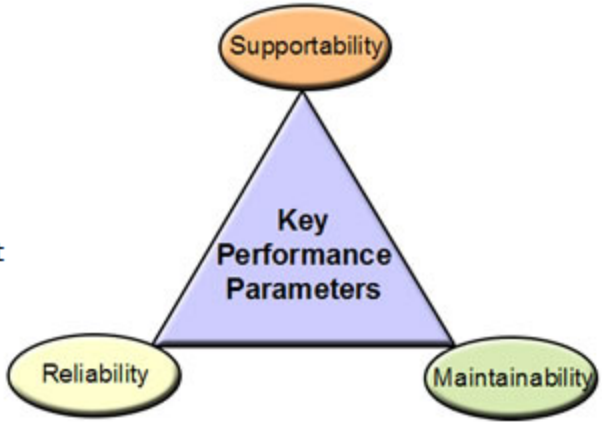
Key Performance Parameters (KPPs) and the Product Support Strategy

Recall that the CDD states the system specific technical and sustainment-related performance attributes necessary to provide the operational capabilities required by the warfighter. These are attributes so significant they must be verified by testing and evaluation or analysis. Key Performance Parameters (KPPs) are those attributes or characteristics that are considered critical or essential to the development of an effective military capability. KPPs are described in more detail below and in the following pages.

Recall that KPPs are comprised of thresholds (minimum acceptable performance values) and objectives (optimum desired performance values). They are validated by the Joint Requirements Oversight Council (JROC) for JROC Interest documents, and by the DoD component for Joint Integration or Independent documents. KPPs are included verbatim in the acquisition program baseline.

The CDD provides sufficient detail about the program's KPPs to capture the minimum operational effectiveness, suitability and supportability attributes needed to achieve the overall desired capabilities.

Failure to meet a KPP threshold may result in cancellation, reevaluation or reassessment of the program or a modification of the production increments. KPPs are that important.



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Long Description

A graphic of a triangle with the words, “Key Performance Parameters” inside. There are three ovals, one at each point, with the words, Supportability (at the top), Maintainability (bottom right) and Reliability (bottom left).

KPP, Cont.

The threshold value for an attribute, KPPs included, is the minimum acceptable value considered achievable within the available cost, schedule and technology at low to moderate risk. Performance below the threshold value is not operationally effective or suitable.

The objective value for an attribute, again including KPPs, is the optimum desired performance achievable but at higher risk in cost, schedule and technology. Performance above the objective does not justify additional expense. The difference between threshold and objective values is defined as trade space. By definition, any performance value achieved in this realm is acceptable to everyone involved in the system's acquisition; user included. Advances in technology or changes in joint concepts may result in changes to threshold and objective values in future increments.

To read recent guidance on KPPs, view the following documents:

JR161-06 (17 Aug 06)

OCM Sustaining Material Readiness Brief (Sep 06)

Life Cycle Sustainment Outcome Metrics DUSD(LM&R) Memo – Signed 3-10-2007

JCIDS Manual, Appendix B, Enclosure B

Knowledge Review

What defines the authoritative, measurable and testable capabilities needed by the warfighters to support the Engineering and Manufacturing Development phase?

- [ ] Key Performance Parameters (KPP)
- [ ] KPP and CDD
- [x] Capability Development Document

Check Answer

The **CDD** defines the authoritative, measurable and testable capabilities needed by the warfighters to support the Engineering and Manufacturing Development phase.

Understanding the Essential Characteristics of KPPs

Some essential characteristics of key performance parameters (KPPs) are listed below.

- Attribute
- Function
- Definition
- Sponsor

Popup Text

Attribute

The attribute is a necessary component of the system's capability required KPPs (statutory, JOpsC or net-ready) for it is essential for defining its the required capabilities; respond logistics attributes may be directly linked to net-ready KPPs information sharing.

Function

It contributes to significant improvement in war fighting capabilities, operational effectiveness and/ or operational suitability. – For example, autonomic logistics performance attributes could contribute significantly to battlefield commander's logistics command and control.

It is achievable and affordable (total life cycle costs) – some reliability attributes may have to be balanced with what is technologically achievable within cost constraints.

It is measurable and testable – it is important to understand how supportability performance, especially KPPs will be measured and tested during the test and evaluation process given that some support attributes may include not just inherent weapon system capabilities, but capabilities of the logistics enterprise.

Definition

The definition of the attribute and the recommended threshold and objective values are supported by analysis – while it is commendable to focus on improved reliability, the reliability thresholds and objectives should be established based on supportability analysis conducted during the Materiel Solution Analysis and technology development phase – with a focus on a balance of technology risk/ maturity and cost.

Sponsor

The sponsor is willing to consider restructuring the program if the attribute is not met – before identifying

supportability attributes as KPPs, it is important to make sure that the sponsor(s) deem supportability as a factor critical to the war fighting capability…i.e. not meeting the supportability requirements, would entail a program restructuring… for example would not meeting logistics footprint performance attribute be equally important as weight for an aircraft capability?

Developing Supportability KPPs

The LCL should understand how to develop supportability KPPs. One approach for developing KPPs is by following a series of steps, outlined below.

In the case of supportability KPPs, they will normally be a rollup of many supporting attributes. For example, KPPs such as logistics footprint would be based upon a rollup of the reliability and maintainability (R&M) designed into the system, the test and support equipment requirements, and the levels of planned maintenance that drive manpower and spares requirements, just to mention a few.

Popup Text

Step 1

List required capabilities for each mission or function as described in the proposed CDD. This review should include all requirements the system is projected to meet, including those related to other systems in a family of systems (FoS) or systems of systems (SoS) context. It shall also include all relevant performance metrics identified in initial capabilities documents (ICDs) for which the CDD is providing a capability.

Step 2

Prioritize these capabilities.

Step 3

For each mission or function, build at least one measurable performance attribute.

Step 4

Determine the attributes that are most critical or essential to the system(s) and designate them as KPPs. (Note: A KPP need not be created for all missions and functions for the system(s). In contrast, certain missions and functions may require two or more KPPs.)

Step 5

Document how the KPPs are responsive to the performance attributes identified in the ICDs and integrated architectures.

Examples of Navy Supportability Key Performance Attributes

System supportability KPPs shall be based upon performance parameters as described below:

- Mission Capable/Full Mission Capable (MC/FMC) rates, focused on primary mission areas may be used as supportability performance parameters in CDD/Capability Production Documents (CPDs) for aircraft or ship platforms.
- Supportability may be a KPP for selected systems as jointly determined by the program sponsor and the Fleet Readiness and Logistics Sponsor (CNO (N4)). Program sponsors should assume a default consideration for a supportability KPP unless they obtain prior agreement with CNO (N4).

For legacy system modifications, supportability should be a performance parameter or a KPP for only those sub-systems being upgraded.

Examples of Navy Supportability Key Performance Attributes, Cont.

Manpower may be a KPP for selected systems as jointly determined by the program sponsor and the Manpower Sponsor (CNO (N1)). Program sponsors should assume a default consideration for a manpower KPP unless they obtain prior agreement with the CNO (N1).

Readiness thresholds, normally supportability performance parameters or KPPs, should account for all system downtime, including scheduled maintenance.

Diagnostics effectiveness thresholds should be established for systems whose faults are to be detected by external support equipment or built-in-test (BIT). Threshold parameters should include percent correct fault detection and percent correct fault isolation to a specified ambiguity group. False alarm parameters should state thresholds in time (i.e., Mean Time Between False Alarms) or in percent.

Measures of operational system reliability should consist of both mission and logistics reliability parameters, as appropriate. Mean time between operational mission failure (MTBOMF) should be used as the mission reliability parameter. Mean time between failure (MTBF) should be used as the logistics reliability parameter. These parameters should be used as the operational system reliability parameters during OT&E, including initial operational test and evaluation (IOT&E) (OPEVAL).

Knowledge Review

Which of the following Technology Demonstration phase exit documents incorporate sustainment metrics?

- [ ] Test and Evaluation Master Plan
- [ ] Capability Development Document
- [ ] Acquisition Program Baseline
- [x] All of the answers are correct

Check Answer

The Test and Evaluation Master Plan, Capabiliy Development Document, and Acquisition Program Baseline **all** incorporate sustainment metrics.

Metrics Summary

You have completed Metrics and should now be able to:

- Identify in which key program documents produced at the end of the Technology Demonstration phase sustainment metrics should be included.
- Identify essential supportability key performance parameters (KPPs).
- Identify essential characteristics of key performance parameters (KPPs).
- Identify the steps involved in developing supportability KPPs.

Lesson Completion

You have completed the content for this lesson.

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