Employing a Repeatable Systems Approach for Developing Performance-based Requirements for Policy Implementation, Acquisition for Services, and Product Development

Wednesday, October 29, 2014
2:40 – 3:15 PM
Agenda

• Learning Objectives
• Systems Thinking Primer
• Common Systems Approach Description and Examples
  – Product Development
  – Acquisition for Services
  – Policy Implementation
• Summary
Learning Objectives

• Employ systems approach for:
  – Product Development
  – Acquisition for Services
    • Vehicle/Aircraft Maintenance Services
    • IT Back Office Support
  – Policy Implementation

• Hierarchical decomposition
  – Large and unmanageable into smaller manageable pieces
  – Top-level bounded scope traces down to measurable outcomes
  – Measureable outcomes provide measured data to feed performance dashboards
  – Performance information used by decision-makers to make timely course corrections in order to arrive at the desired end-state
• Recognizes the interconnectedness and interdependencies of systems
  – No such thing as a small change to a complex system

• Hierarchical depiction provides means to deal with complexity by breaking down a large and unmanageable problem into smaller manageable pieces
  – Decompose
  – Allocate
  – Bi-traceability

• Methodology provides consistency and repeatability; thereby attaining greater efficiencies and effectiveness
The Methodology

Validated Need

Derive, allocate, & trace

Performance dashboards to monitor and control

Measureable outcomes generate measureable data

Feedback loop

Mission Accomplished

Level 0

Level 1

Level 2

1.0

1.1

1.2

1.1.1

1.1.2

1.2.1

1.2.2

Measureable outcomes generate measureable data

Derive, allocate, & trace

Performance dashboards to monitor and control

Feedback loop

Mission Accomplished
Validated Need

• Begin with the end in mind...
  – What do you want to accomplish?
  – What do you need to be accomplished?
  – Do we know and understand what is needed?
  – How do you know when reached the desired end state?

• Scope the need – bound the problem
  – Cost
  – Schedule
  – Performance
  – Risk
  – Complexity
  – Criticality
Start with simple hierarchy

What needs to be accomplished

Elements

Sub-elements

1.0

1.1

1.2

1.1.1

1.1.2

1.2.1

1.2.2

1.1.2

1.2.1

1.2.2

- Decomposition stops at level when a specific sub-element cannot be decomposed any further
- Sub-element should perform a series of **time-phased** activities in order to satisfy the sub-element goal or outcome
- Time-phased activities correlate with measurable outcomes
Defining Information Requirements

Information is needed to support the decision-making process

1. Need a home
2. Scope the needed home
3. Award contract primarily based on:
   - Scope
   - Cost (spend plan)
   - Schedule (progress)
4. Track status of actuals vs. planned
5. Analyze trends
6. Monitor and control risks

The “Material Solution”
Performance Dashboard

Measureable Data
Feedback Loop
PRODUCT DEVELOPMENT
DoD Product Development

- Capability Requirements Process and Acquisition Process Interaction

Legend:
- ▲ = Decision Point
- △ = Milestone Decision
- 📋 = Requirements Document
- ⚖️ = Requirements Authority Review

* Or Equivalent Approved/Validated Requirements Document.
Systems Engineering Process

Mission Profile Breakdown

- Validated operational need to transport passengers and cargo
- Need a material solution to conduct an assigned mission
- Develop a mission profile in order to translate operational requirements into system-level technical requirements
Requirement Analysis Example

Example:

- Identified functions:
  - Provide passenger access
  - Facilitate boarding of passengers
Functional Allocation

Pre-flight

Combined allocation
- Provide passenger access
- Facilitate boarding of passengers

Fuselage door

Separate & distinct allocation
- Provide passenger access
- Facilitate boarding of passengers

Fuselage door
Adjustable Passenger Stairway

Next step: Developing performance requirements that include measurable outcomes
ACQUISITION FOR SERVICES
Acquisition for Services

• Validated need to acquire Aircraft Maintenance Services
  – Goal is to ensure sufficient number of aircraft available to fulfill mission requirements
• Performance-Based Logistics (PBL)
  – Operational Availability ($A_o$)
Accomplishment Criteria:

Need sufficient number of aircraft to support mission requirements

Aircraft Sustainment Key Performance Parameter (KPP)

\[ A_o = \frac{MTBM}{MTBM + MMT + MLDT} \]

Mean Logistics Delay Time (MLDT)
Mean Maintenance Time (MMT)
Mean Time Between Maintenance (MTBM)
Performance Criteria:
Sufficient number of aircraft to support mission requirements?

Key Performance Indicators (KPIs)
- Collectively track and manage to ensure accomplishment criteria will be satisfied
- Positive KPI performance will positively impact Operational Availability, \( A_o \)

Establish contractual KPIs to reduce fleet-wide:
Mean Maintenance Time (MMT)
Mean Logistics Delay Time (MLDT)
Aircraft Maintenance Services

LEVEL 2

Supporting Measures:

Associated with a specific aircraft

Process improvement opportunities:
• Lean Six Sigma
• Business Process Management (BPM)

Incentive for Contractor for each aircraft to:
Reduce Maintenance Time (MT)
Reduce Logistics Delay Time (LDT)
Increase Time Between Maintenance (TBM)
Achieving Operational Availability ($A_o$)

$$A_o = \frac{MTBM}{MTBM + MMT + MLDT}$$

### Scenario #1

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$A_o = 51\%$

$A_o = 81\%$
POLICY IMPLEMENTATION
DoD Issuances

DoD Policy

- A set of principles and associated guidelines to direct and limit DoD actions in pursuit of objectives, operations, and plans.

DoD Instructions

- A DoDI that **implements** policy established in a DoDD or a policy DoDI by providing general, overarching procedures for carrying out that policy.

Management Plans

- Implements DoDI procedural requirements to define how a program/project is initiated, planned, executed, monitored & controlled, and closed. Extent of content is based on the **scope** of program/project.

Reference: DoD Issuances website (http://www.dtic.mil/whs/directives/)
Policy Implementation Summary

Policy is established to apply systems engineering across the product life cycle.

Procedural Instructions designate the OPR for establishing and maintaining the capability to perform and execute SE processes.

Systems Engineering Plan (SEP) is a living document that describes how the SE process will be applied and tailored to meet the objectives for each product development life-cycle phase. Process, product, and progress measures will be used to support the decision-making process.
Definitions – “Establish and maintain”

- **Establish**: Develop policy, work instructions, or procedures to implement process activities
- **Maintain**: Planning the process, providing the resources, assigning responsibilities, training people, managing configurations, identifying and involving stakeholders, and monitoring process effectiveness
DoD Systems Engineering Process

Enables a balanced approach for delivering capability to the warfighter
DoD Risk Management Process

- Risk Identification
- Risk Analysis
- Risk Mitigation Planning
- Risk Mitigation Plan Implementation
- Risk Tracking
Risk Burn-down Metric

Status & Analysis Report

Risk Exposure Indicator

Summary

• Employ systems approach for:
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