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Subj: Include Systems Engineering Standards in Defense Acquisition System

Dear Ms. Lord,

This email augments my email dated 12/30/19, Subj: Proposed DOD Acquisition Reform: Pair SE Standards with EVM. Please consider the following information and recommendations during completion of the DOD 5000 series policies, and in improving the Defense Acquisition Guidebook under the overarching DODD 5000.01-*The Defense Acquisition System* (DAS). The recommendations are especially pertinent to the pending DOD Instructions on Engineering and Software Acquisition.

Highlights of the earlier email follow.

1. Recommendation to achieve integrated program/project management (P/PM) by pairing the DOD-approved voluntary control standards (VCS) for SE with the new VCS for EVM, the PMI *Standard for EVM*, (ANSI/PMI 19-006-2019) in concert with the PMI *PMBOK® Guide*.
2. DOD started down the right path by adopting SE Standards *ISO/IEC/IEEE 15288*, *IEEE 15288.1*, and *IEEE 15288.2* as VCSs in 2015.
3. The NDIA marched with DOD by participating in the development of the VCSs and by publishing *NDIA Guidance for Utilizing SE Standards* (IEEE 15288.1 and IEEE 15288.2) *on Contracts for Defense Projects* in 2015.
4. In 2017, DOD followed up by publishing *Best Practices for Using SE Standards* (*ISO/IEC/IEEE 15288*, *IEEE 15288.1*, and *IEEE 15288.2*) *on Contracts for DOD Acquisition Programs* (**Best Practices**).
5. In a future email, examples of the attributes of SE outputs, per *IEEE 15288.1*, will be provided along with discussion of how the SE outputs should be included in discrete work packages. In my experience on major acquisitions, SE activities were often treated as level of effort. So, the SE outputs, such as the outcomes of requirements definition, validation, and verification or the outcomes of trade studies were not planned or tracked discretely or placed on the critical path.
6. in the 2009 report, *DOD EVM: Performance, Oversight & Governance Report, EVMS Implementation*, "If the SE standards are contractually implemented but EVM continues to be based EIA-748, then SE and EVM will remain "stove-piped" not "integrated."

Key excerpts from the afore-mentioned sources follow:

Best Practices:

"DOD and the defense industry have found that applying SE processes and practices throughout the system life cycle improves project performance, as measured by the project's ability to satisfy technical requirements within cost and schedule constraints."

15288.1:

1.2 PURPOSE

The government's intent for developing IEEE 15288.1 and 15288.2 with industry was to enable direct citation on contract in order to reflect the government's requirements for SE in acquirer-supplier agreements. IEEE 15288.1 is an addendum to ISO/IEC/IEEE 15288 ...with additional detail specific to

defense acquisition projects. The addendum adds requirements for SE **outputs** and the **attributes (criteria)** for each.

IEEE 15288.1 is the primary document that will be tailored by DoD to define the government’s requirements for SE. It will form the basis of the acquirer-supplier agreement defining the SE activities and tasks to be performed, the outcomes to be achieved, and the **outputs** (engineering products or documents) to be developed.

The following table maps 15288.1 outputs to their respective DAS, over-arching policies.

Mapping of IEEE 15288.1 Outputs to DoDD 5000.01 Defense Acquisition System (DAS) Over-arching Policies	
DAS Policy	IEEE 15288.1 Outputs (partial subset) (Application of Systems Engineering on Defense Programs)
a(e) Actively Manage Risk	6.3.4.4 Risk Management process outputs: Risk Management Plan with the following attributes: mitigation, monitoring 6.4.9.4 Verification process outputs: 2) Verify risks...are mitigated
g(2) Program goals for cost, schedule, and performance parameters will describe the program. Approved program baseline parameters will serve as control objectives.	6.3.1.4 Project Planning process outputs • Technical assessment and control of the project, including required technical reviews and audits and their completion criteria, technical measurement
k Employ Performance-based strategies that support an acquisition approach structured around the results to be achieved as opposed to the manner by which the work is to be performed.	6.3.5.4 Configuration Management process outputs c) Product baseline 6.4.3.4 System Requirements Definition process outputs a) A set of system requirements with the following attributes: 8) Documents decision trade studies (tradeoffs) that balance system effectiveness, affordability concerns, supportability, life cycle cost, schedule, risk, and evolutionary growth potential issues inclusive of obsolescence risk. b) Requirements Traceability Mapping with the following attributes: 1) Includes full bi-directional traceability between the requirements source and the system requirements down to their lowest level.
o(1) Test and evaluation (T&E) will be structured to ...assess attainment of technical performance parameters.	6.3.7.4 Measurement process outputs c) Measurement data with the following attributes: 1) Provides data on established TPMs for use in project assessment and control to support the assessment of the system technical performance, and for an assessment of risk in achieving the measures

o(2) The conduct of T&E, integrated with modeling and simulation, will:

(b) Assess **technology maturity**

(d) Confirm performance against documented capability needs and adversary capabilities as described in the system threat assessment.

of effectiveness or measures of performance and associated operational requirements.

NOTE—TPMs are a subset of measures that evaluate technical progress (i.e., **product maturity**) and support evidence-based decisions at key decision points such as technical reviews or milestone decisions.

2) Provides technical project measurement data for use in project assessment and control to support the assessment of **technical progress toward fulfilling system requirements**.

6.4.9.4 Verification process outputs

a) Planned system verification with the following attributes:

1) Quantitatively verifies that **each system product** ...meets all of its requirements and design constraints in accordance with the verification method for each requirement or constraint in the allocated baseline.

b) Verification results with the following attributes:

- 1) Verify required **performance** of all critical characteristics by demonstration or **test**.
- 2) Verify **risks** identified in the Risk Management process are **mitigated** to levels acceptable for continued development of the system as planned.

d) Acceptance verification data with the following attributes:

- 1) Verifies that each delivered hardware product, each constituent product of a delivered hardware product, and each system product that is used to manufacture, verify, integrate, or deploy end products that are to be delivered meets each of its requirements ...in the maintained, allocated, or **product baselines** in accordance with the applicable verification method or verification requirements.

Use of Outputs in IMS and EVM

The SE outputs should be included as work products that must be completed in the appropriate, schedules and discrete work packages.

Tutorial

For examples of using SE outputs as discrete work products, see the Naval Postgraduate School Lecture, "Integrate SE with Earned Value Management and Program Management, Contractually and Practically," Monterrey, March 11, 2020. (www.pb-ev.com, Articles and Tutorial tab).

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