NDIA Systems
Engineering Division

Study on

Opportunities for Improving Systems Engineering Effectiveness

within the

Department of Homeland Security

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Background

- **The NDIA Systems Engineering Division, founded in 1997, has conducted numerous "pro-bono" studies related to the effectiveness of systems engineering within an organization.**
  - **Top SE Issues within the Department of Defense (2016-2017)**
  - **Development Planning: Industry Role (2010)**
  - **Effectiveness of Systems Engineering**
- **Industry and Government involvement/participation**
- **Provide recommendations to help improve the utilization and effectiveness within a specific government or military organization.**

Why Are We Here

- **DHS SE Leadership has asked NDIA to look at SE within the components to see if there are any opportunities to improve effectiveness**
- **Government Accountability Office (GAO) reports cite the following within DHS:**
  - **Unclear capability and acquisition program requirements**
  - **Failure to establish or approve requirements**
  - **Unverifiable or untraceable requirements**
  - **Lack of stable development approaches**
  - **Immature system designs**
- **GAO also identified that Systems Engineering is inconsistently applied within DHS**

Why study SE effectiveness?

- **The Systems Engineering Division has found that while SE principles and practices may be known, they aren't always religiously followed during the planning, acquisition and execution of procurements for a number of reasons.**
  - **Insufficient SE resources within the Agency/Component/Activity**
  - **Insufficient up-front funding**
  - **Lack of available schedule**
  - **Program priority demands**
  - **Lack of understanding of the real benefits of SE**
  - **Inconsistent training of SE personnel**
  - **Inadequate SE tools**
  - **Lack of upper management support**

What can this study be used for?

- **Collect and aggregate specific observations on SE effectiveness from field practitioners within DHS components**
  - **Identify existing strengths with the component SE organizations**
  - **Identify possible "shortfalls" in the application of effective SE to programs**
- **Identify industry "best practices" and innovations that may be applicable to DHS**
  - **Potential enhancements to DHS Systems Engineering Life Cycle Guidebook**
  - **Possible augmentation to DHS training curricula**
- **Identify and reducing program risk and Improving program performance**
- **Strengthen ties between SE and Program Managers**
- **Improve credibility of the SE organization and substantiate their position on programs**
- **Surface potential improvements that may be applicable from standpoint of experienced defense industry practitioners**

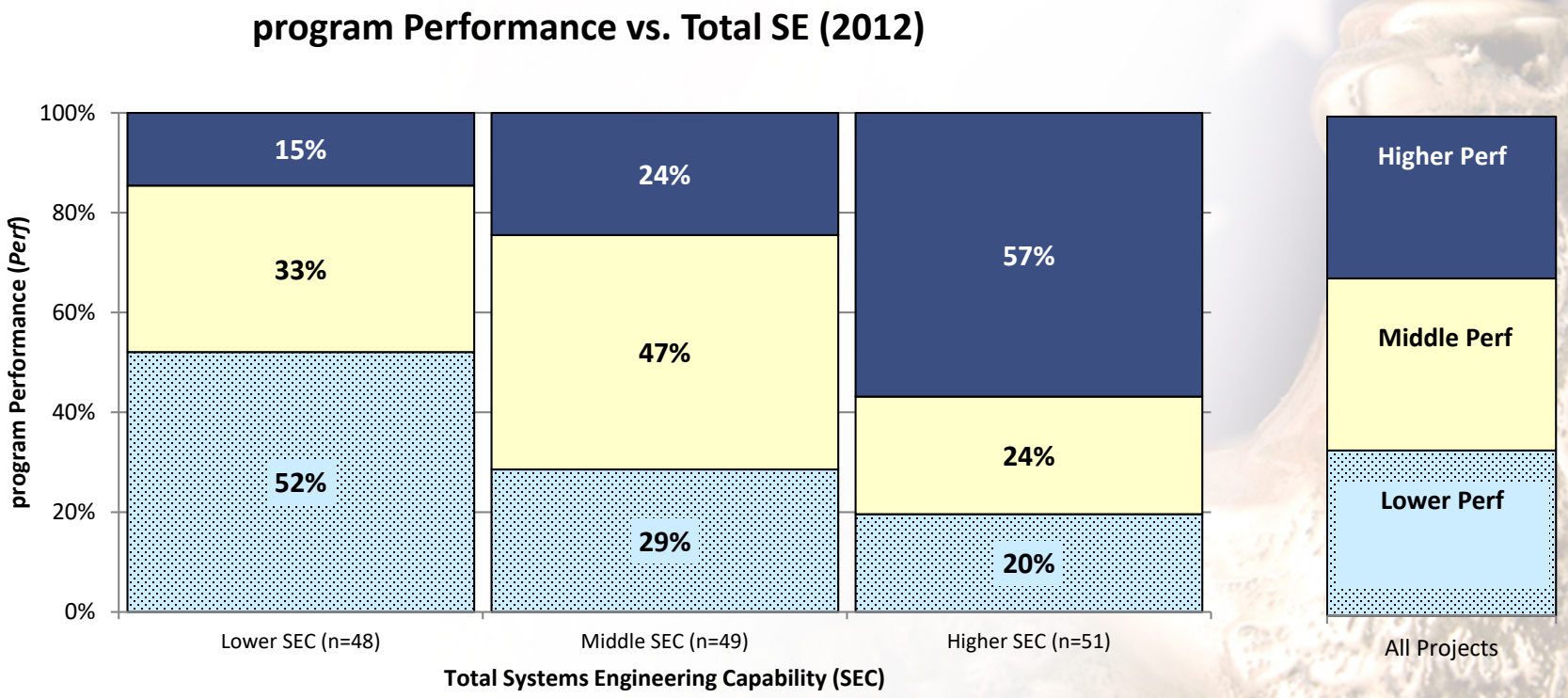
What is the REAL value of SE?

- It is recognized throughout the defense industry, as well as commercial industry, that systems engineering effort, especially up-front, is essential to help assure program success for development programs
  - Other factors, such as inadequate funding or a too-short development cycle, can also hinder program performance
- Systems engineering is the "umbrella" engineering that provides the solid foundation upon which to build an effective program and ensure success across the life cycle
- Several studies have determined that the total SE content on a major development program should be in the area of 15% of the total engineering effort
- The NDIA SE Effectiveness Study (2012) showed that programs with a higher content of systems engineering were more successful than those with less

SE is an "engineering glue" that holds it all together

SE Effectiveness Metrics

The NDIA SE Effectiveness Study (2012) showed strong correlation between the level of SE capability on programs and overall program success



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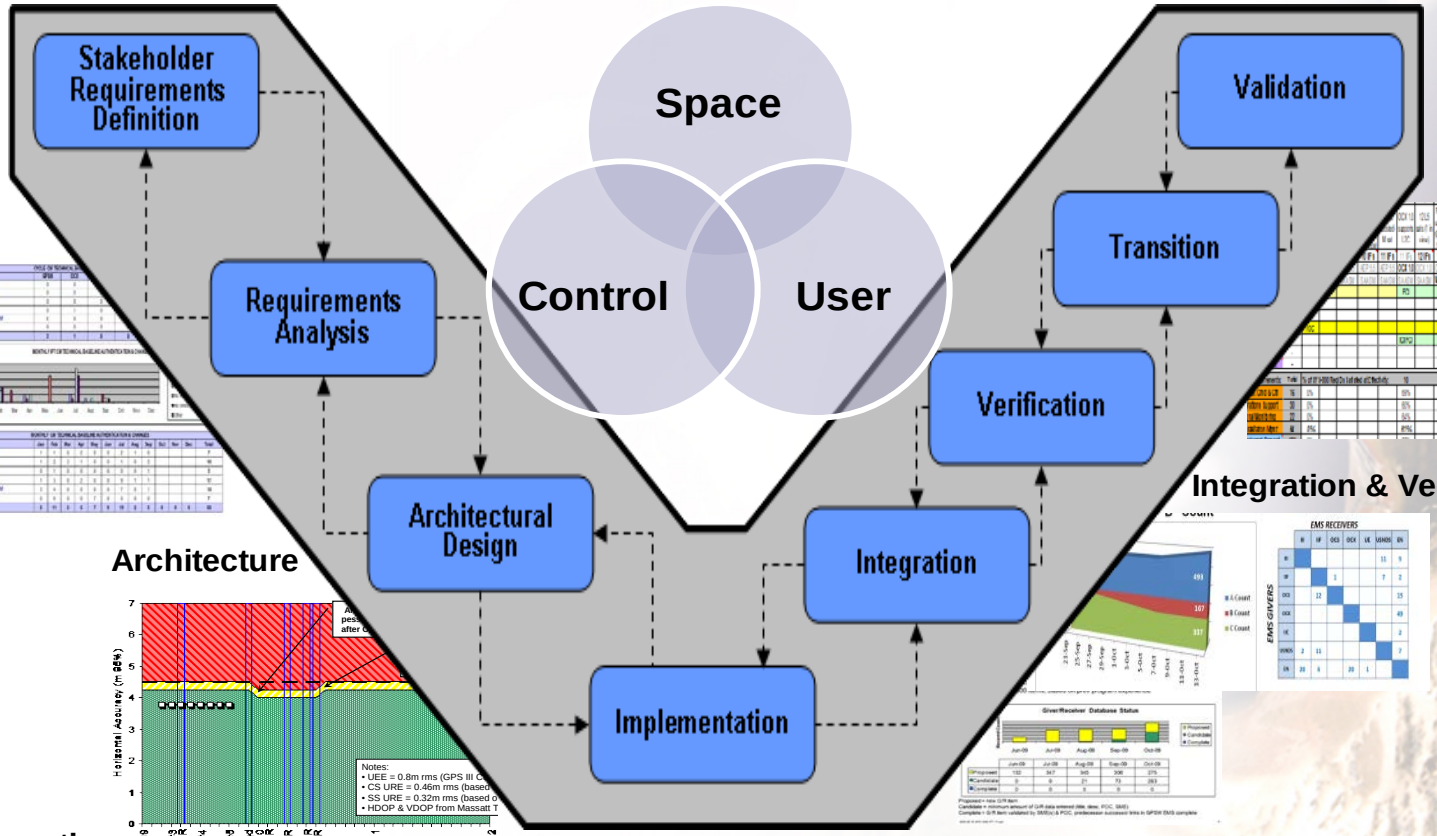
National Defense Industrial Association

Systems Engineering "V" 2017



Requirements Mgmt

Interface Mgmt

Architecture

Integration & Verification

Configuration Management

Risk Management

Tech Assessments & Reviews

Schedule

Folks will soon realize that Systems Engineering really is- - -

Methodology

- **Typical methodology is to conduct studies via a series of workshops with NDIA SE experts and customer personnel**
  - **DoD Issues Study convened a large 2-day workshop with government and industry, for example**
- **DHS methodology will consist of:**
  - **One-on-one ” interviews with selected SE leads or principals to include sample of PMO personnel**
    - **Gather initial “insider view” observations on how systems engineering is applied within their component and discussions on how effective the use of SE is**
    - **Non-attribution**
    - **Several hours each over three (3) to four (4) days**
    - **Conducted at component HQ in DD area**
    - **Who else should we interview to make report all inclusive??**
    - ***May invite a few additional subject matter experts***

Methodology cont'd

• Principals analyze, distill and summarize findings from interviews	Principals only
• Convene 1.5-day workshop with DHS personnel to validate findings and develop initial recommendations for potential improvement for each major finding	All
• Refine findings with consolidation as appropriate and populate specific recommendations; generate written narrative draft	Principals initiate with all participating
• Share draft narrative with group for additional refinement; update narrative	All

Sample Questions

- How much of the DHS SE Lifecycle Guidebook are you able to follow or implement during the course of your job?
- Do you feel your component has developed any “best practices”? Do you share these with DHS HQ or other DHS components?
- Do you share issues/concerns with DHS S&T HQ or other components?
- Do you believe the DHS SE training to be adequate? Lacking? Cumbersome? Effective? Do you have suggestions to improve same?
- Are there adequate SE personnel in your component to effectively influence system/equipment acquisitions and fielding?
- Do you feel your leadership in your component supports your active participation in programs?
- What are your observations relative to the summary GAO findings?
- What are your general observations on how effective your organization is in influencing acquisitions and fieldings, towards the goal of *buying the right thing*, *buying the thing right*, and making each procurement result in a balanced design (cost, schedule, performance) and with each item being both practical and feasible?

Timeline

- **Feb 8, 2018: 1st meeting with DHS**
- **February & March: Interviews scheduled**
- **By Late April: Analyze/distill/consolidate observations**
- **May: Convene workshop**
- **Early-mid June: 1st draft report**
- **July: Refine & finalize by for presentation to DHS management**

NDIA Principals

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DoD Study Summary Results p1

- **Issue 1: Human Capital & Professional Development**
  - **We have inadequate systems engineering capital available to the defense complex to adequately meet the demands of both government and industry**
- **Issue 2: Cyber Resilient and Secure Systems**
  - **System survivability in a cyber contested operational mission environment is critical. We need to elevate the system security risk to the program risk register to ensure a security focus. We need well defined methods, processes, standards, metrics and measures, along with skilled professionals to integrate system security into our product development lifecycle.**
- **Issue 3: Systems Engineering for Rapid and Flexible Acquisition.**
  - **Increasingly urgent demands of the warfighter require effective capabilities be fielded more rapidly than the conventional acquisition processes and development methodologies allow.**

DoD Study Summary Results p2

- **Issue 4: Systems Engineering for Resilient Systems**
  - **Implementation of Resilient Systems requires unique systems engineering expertise which typically does not exist within the current community.**
- **Issue 5: Mission Engineering and Mission Assurance Focus within Systems Engineering**
  - **Systems Engineering within the government and industry need to provide more focus on mission engineering/mission capability in order to field and project a more effective military presence and capability**
- **Issue 6: Early Systems Engineering Engagement**
  - **The increasing complexity of defense systems requires more and more early systems engineering especially in the Development Planning process to help assure effective systems**

DoD Study Summary Results p3

- **Additional Observations**
- **Observation 1: The work group believes that the rigorous implementation of 3rd party evaluations is not adding the anticipated or expected value.**
- **Observation 2: Interoperability between the various model-based systems engineering tools is still not mature or effective.**
- **Observation 3: Life Cycle Cost models still do not have the accuracy, fidelity or maturity to support programmatic decision making.**

This is timely because we just learned that

WalMart has installed Surface-to-Air missiles to shoot down Amazon delivery drones