Integrated System Engineering Framework (ISEF)

NDIA SE Annual Conference

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Current Operating Framework

- Silos of Information
- No Meta Data transfer
- Two Stage Process – Think and then Link
- Lacks Continuous & Lifecycle Traceability
- Lacks Real Time Collaboration
- Translation Loss

ISEF – Overview

Integrated Systems Engineering Framework (ISEF)

WEB enabled Collaborative Environment

Problem Space
- Stakeholder Needs
- Capability Gaps
- Requirements Development

Innovation / Analysis Space
- SE ‘Vee’ Model
- Technical Baseline
- Clarity (Disambiguation)
- Architecture Model (SysML)
- Affordability Lifecycle Model

Solutions Space
- High Quality Visualizations
- Integrated Systems Knowledge

Inputs
- Stakeholder Needs
- Capability Gaps
- Requirements Development

Outputs
- Test Plans
- Trade Study Plan
- M&S Plans

ISEF- Provides Integrated Common Processes/Tools/Methods Across all the Platforms/Portfolios

Framework to Improve SE Effectiveness
An SE framework is a **common environment** that provides an **integrated traceable** systems engineering **analysis capability** throughout the **life cycle** of a program. It provides an essential supporting structure that enables an **iterative collaborative environment** for all stakeholders, practitioners and decision makers to proactively engage in and facilitate **decision making**.
ISEF Software Architecture

Browser

Core Tools | 3rd-Party Tools

Common Components

ExtJS JavaScript Framework w/ DeftJS

Software Services

Apache Web Server

PHP / Yii MVC Framework

Node API

Node Database (SQL Server)

Federated DB APIs

Federated Data Stores

Data Type Configuration
Schema, Templates, Decomposition, Link Rules

Network & Security Infrastructure
**Stakeholder Needs Analysis (SNA) Tools**

**Capability:**
Stakeholder Needs Analysis from multiple sources

**Gap Filled:**
Rapid, integrated single point collaborative stakeholder needs capture and analysis framework

**Tools:**
- Lessons Learned
- Stakeholder Needs
- CNA Gaps
- Source Document Parsing w/ hierarchy and attributes

**Impact:**
10x+ improvement (Lessons Learned) in capture speed and efficiency

Explicit traceability to required capabilities
Capability Analysis (CA) Tool

**Capability:**
Requirements Management

**Gap Filled:**
Methods driven collaborative decomposition and analysis of operational and system requirements

**Impact:**
Consistent pattern based decomposition across platforms/systems
Explicit traceability between operational and system requirements
Increased usability for requirements analysis/reviews
Collaborative requirements development & analysis
**Decision Management (DM) Tool**

**Decision Breakdown Structure (DBS)**

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**Capability:**
Decision-centric knowledge creation

**Gap Filled:**
Integrative collaborative mechanism for SE knowledge – communicate through decisions

**Impact:**
Integrated framework for decision planning, analysis, traceability across system lifecycle data
Decision Analysis Tool

**Capability:**
Comprehensive Decision Analysis framework connecting the problem domain to the solution space via a decision. Provides context and closed loop traceability to all system lifecycle data elements.

**Gap Filled:**
Visualize and facilitate rich derivation traceability between requirements-decisions and plans.

**Impact:**
Improved decision quality, proactive impact change assessment of decisions, requirements, architecture and plans.
Project Recon

**Capability:**
Risk, Issue, and Opportunity Management

**Gap Filled:**

*Risk Recon*: Risk identification, prioritization and mitigation planning.

*Opportunity Recon*: Opportunity identification, prioritization and growth planning.


**Impact:**
Reduced programmatic risk and increased collaboration on issues/opportunities
Most widely adopted ISEF tool
### Compliance Evaluation (CE) Tool

**Capability:**
Requirements Compliance

**Gap Filled:**
Highly visual and collaborative requirements compliance management

**Impact:**
Roll-up of system compliance against operational capability requirements
Reduced processing effort to visualize contractor compliance status

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**Canvas 1: PD linked to CDD**

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<th>PD ID</th>
<th>PD Tier</th>
<th>Section 3 - Requirement</th>
<th>I</th>
<th>T</th>
<th>A</th>
<th>C</th>
<th>Section 4 - Verification</th>
<th>CPD ID</th>
<th>CPD Tier</th>
<th>CPD Requirement</th>
<th>CPD Impact (PD or CPD Action)</th>
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</table>
**Capability:**
Lay S&T Projects, S&T Technology States, and Program of Record Milestones out over time to identify capability gaps

**Gap Filled:**
Communicate technology status and transition plan across agencies

**Impact:**
Increased visibility to leadership PMs about S&T projects to fill capability gaps
**Capability:** Decision Patterns

**Gap Filled:** Rapid jumpstart of projects by framing problem to be solved as explicit decision framework

**Status:** Ground Vehicles, Systems & sub-systems, Enterprise Strategy, Process Capability, & Service Design

**Impact:**
Time, efficiency and completeness (built-in quality). Early control of how to tackle the problem
ISEF Value Proposition

• Improve quality of SE execution
  – Decision Confidence
  – Accelerated Delivery
  – Requirements Compliance
  – Architect for Adaptability, Commonality, Modularity
  – Reduced Risk

• Increased level of knowledge integration
  – Insights from new connections, visualizations and rollups
  – Reduce perceived complexity
  – Focused knowledge, channeled to the appropriate stakeholders
  – Ability to anticipate ripple effect changes through the lifecycle

• Increased efficiency and speed to market
  – Enable seamless, lean business processes
  – Increased level of enterprise collaboration

• Stretch limited resources
  – Capture & leverage SME knowledge as patterns
  – Broaden reach of each individual through recursive methods
  – Reduce enterprise software expenditures

• Government owned IP
  – Under government control; can tailor by government needs forever
  – Continuous access to cutting edge COTS & GOTS tools
  – Framework for government, industry and academic collaboration
  – Leverage multiple sources of methods/tool innovation. Ex: SBIR, SERC, small business

Challenges Addressed

- Community Culture
- Lack of Common Standards & Arch
- System Complexity
- Lack of Enablers

Accelerated and aligned solutions to meet warfighter needs
Questions?

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