# The Human Systems Integration Framework (HSIF)

*Defining a New Role to Enhance Cross-Domain Collaboration*


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# Outline

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- The HSI Framework (HSIF) Overview
- HSIF Evolution
- HSIF Objectives
  - Develop an interactive HSIF application
  - Define and scope activities: HSI Integrator Role
  - Vet and adjudicate HSIF design and content
  - Develop training materials
- Recap of HSIF Benefits
- Technical Vision and Next Steps



 711th HUMAN PERFORMANCE WING

# HSI Process Challenges

- HSI and Systems Engineering have established technical processes
- Coordination and integration challenges
  - Extensive HSI-related policy, standards, and guidance
  - Inconsistent application of HSI guidance and best practices
  - Stove-piped technical efforts within HSI domains
- Impacts
  - Lack of synchronization with SETR Events and Acquisition Milestones
  - Missed opportunities to reduce HSI re-work via collaboration
  - Misalignment of HSI technical priorities with program/project cost, schedule, and performance

# Challenge: Extensive HSI-related policy, standards, guidance

## A sample of HSI-related documents by Service

| Service | Name | Title |
|---|---|---|
| DoD | DAG | Defense Acquisition Guidebook |
| DoD | See Tit | DoD Joint Software Systems Safety Engineering |
| DoD | DoI | |
| DoD | DoI | |
| DoD | DoI | |
| DoD | MIL | |
| DoD | MIL | |
| DoD | MIL | |

| Service | Name | Title |
|---|---|---|
| Navy | NETCINST 1510.4 | Naval Education and Trainir Duty Task Analysis User Gu |
| Navy | OPNAVINST 5100.19E (vol 1) | Volume 1: Navy Safety and Health Program Manual for |
| Navy | OPN | |
| Navy | OPN | |
| Navy | SECN | |
| Navy | SECN 5100 | |
| Navy | SPAV | |

| Service | Name | Ti |
|---|---|---|
| Army | AR 40-5 | Preve |
| Army | AR 40-10 | Healt Supp Deci |
| Army | AR 70-75 | Survi |
| Army | AR 71-9 | Warf |
| Army | AR 385-10 | |
| Army | AR 570-4 | |
| Army | AR 602-2 | Acquisition Process |

| Service | Name | Title |
|---|---|---|
| Air Force | AFD-090121-054 | Air Force Human Systems Integration Handbook |
| Air Force | AFD-090121-055 | USAF HSI Requirements Pocket Guide |
| Air Force | AFD-100122-034 | Human Systems Integration in Acquisition: Acquisition Phase Guide |
| Air Force | AFI 38-201 | Management of Manpower Requirements and Authorizations |
| Air Force | AFI 63-101/20-101 | Integrated Life Cycle Management |
| Air Force | AFI 63-1201 | Life Cycle Systems Engineering |
| Air Force | AFI 99-103 | Capabilities-based Test and Evaluation |
| Air Force | AFMAN 63-119 | Certification of System Readiness for Dedicated Operational Testing |
| Air Force | AFPD 63-1/20-1 | Integrated Life Cycle Management |

| Service | Name | Title |
|---|---|---|
| NASA | NASA-JSC-65995 | Commercial Human Systems Integration Processes (CHSIP) |
| NASA | NASA-STD-3001 (vol1) | Volume 1: NASA Space Flight Human System Standard |

161 HSI-related documents

- When are these documents relevant?
- What can be learned from other services? From non-DOD HSI?

# HSI Process Opportunities: The HSI Framework (HSIF)

- The HSIF consists of process diagrams that display HSI Domain activities across the DoD Acquisition Life Cycle
  - Includes references, products, cross-domain collaborations
  - Extracted from HSI-related guidance, standards, and best practices across DoD Services and non-DoD organizations
  - Displayed in a timeline format, referenced to Systems Engineering Technical Reviews and Acquisition milestones
- HSI Opportunities and HSIF Benefits
  - Serves as a coordinating mechanism between HSI domains
  - Makes HSI tasks and products explicit to other stakeholders: Program Managers, Technical Authority, System Engineers, and Prime Contractor
  - Leverages HSI best practices across services, organizations
  - Ensures continuity of HSI support throughout the lifecycle

# The HSI Framework (cont.)

- Intended uses for the HSIF
  - Describe the who, what, when, and why of ensuring human-centered system acquisition
  - Align HSI activities with Systems Engineering processes
  - Develop a roadmap of HSI workflow processes
  - Plan and scope HSI activities across the entire acquisition cycle
  - Represent what other domain SMEs are or should be doing at various points in time
  - Identify integration/trade-off opportunities between HSI domains
- HSIF is not
  - A decision-making, risk analysis, or tradeoff tool
  - A guide on how to conduct HSI activities
  - A set of HSI requirements: Activities must be tailored to program/project risks and available HSI funding

# The HSI Framework (cont.)

- Example user groups
  - HSI Domain SMEs / Practitioners
  - Logisticians
  - Program Managers
  - Technical Authorities / HSI Integrators
  - System Engineers
  - Prime Contractors
- Prerequisites for use
  - Basic knowledge of HSI and the Defense Acquisition System
  - Example experience: DAU Acquisition 101 Course, DAU Systems Engineering 101 Course, DAU HSI Course (CLE062), NPS HSI Certificate

# HSIF Evolution: Precursor HSI Methods

**HSI ACTIVITIES GUIDE**

Note 1. This guide was developed to assist the program manager in determining the HSI acquisition requirements. This guide may be tailored to fit the needs of each program.

| HSI Activities by Acquisition Phase | 0 | I | II | III |
|---|---|---|---|---|
| Identify mission and function requirements | X | | | |
| Provide HSI inputs to new system/NDI/PI decision | X | | | |
| Identify HSI constraints and issues | X | | | |
| Establish the HSI data base | X | | | |
| Identify HSI high cost drivers and lessons learned from predecessor system | X | | | |
| Identify system requirements that impact on the human role | X | X | X | |
| Identify HSI technology requirements | X | | | |
| Identify tools/data bases/analyses/methodologies to be employed | X | | X | |
| Provide HSI inputs to the assessment of alternative concepts/designs | X | X | | |
| Develop HSI exit criteria considerations for each milestone | X | X | X | X |
| Conduct HSI studies, analyses, and tradeoffs | X | X | X | X |
| Conduct HSI front-end analysis for each alternative concept/design | X | | | |
| Describe how HFE and SS/HH lessons learned will be applied | X | | | |
| Identify HSI technical risks for each alternative concept/design | X | | | |
| Identify manpower requirements and state manpower sources | X | X | X | X |
| Define requirements for new occupational specialties/high quality personnel | X | X | X | X |
| Identify training requirements and evaluate training system effectiveness | X | X | X | X |
| Provide HSI assessment and tradeoff of alternative concepts/designs | X | | | |
| Provide HSI inputs to life-cycle costs | X | X | X | |
| Budget MPT life-cycle costs | X | X | X | |
| Identify and manage HSI cost, schedule and design risk areas | X | X | | |
| Incorporate HSI considerations into the acquisition strategy | X | X | X | |
| Identify HSI test and evaluation requirements | X | X | X | |
| Identify HSI inputs to procurement packages | X | X | X | X |
| Provide HSI inputs to affordability constraints | X | X | | |
| Provide HSI inputs to affordability assessments | X | X | X | |
| Provide HSI inputs to the Concept Baseline | X | | | |
| Prepare the HSI plan | | X | | |
| Provide earlier phase products which are required in Phase I | | X | | |
| Refine manpower, personnel and training requirements | | X | X | X |
| Prepare the Manpower Estimate (ME) | | X | X | |
| Provide HSI inputs to the Development Baseline | | X | | |
| Conduct HSI test and evaluation on prototypes | | X | | |
| Review/update HSI plan | | | X | X |
| Provide earlier phase products which are required in Phase II | | | X | |
| Provide HSI inputs to the Proposed Production Baseline | | | X | |
| Provide earlier phase products which are required in Phase III | | | | X |
| Conduct HSI follow-on test and evaluation | | | | X |
| Include HSI requirements into engineering change proposals (ECPs) | | | | X |
| Acquire HSI lessons learned | X | X | X | X |

**Department of the Navy (DON) Defense Acquisition Deskbook, Feb 1997**

**HSI Activities Guide**

- 40 HSI activities across 4 acquisition phases
- Developed to be tailored by the PM

**Acquisition Phases:**

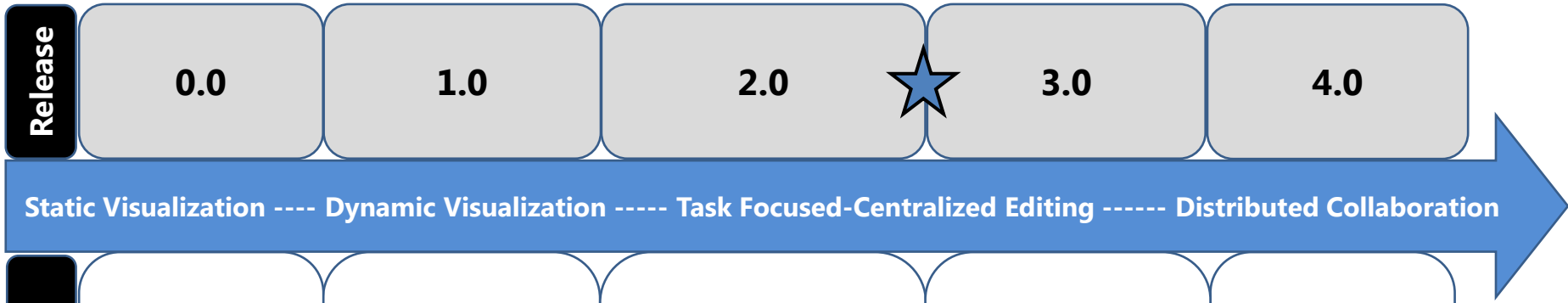
- **Phase 0:** Concept Exploration
- **Phase I:** Program Definition and Risk Reduction
- **Phase II:** Engineering and Manufacturing Development
- **Phase III:** Production, Fielding/Deployment, and Operational Support

- Identifying phase-dependent HSI activities has been done as early as 1997
- The HSIF combines and presents existing guidance in new and useful ways to accommodate changes in acquisition strategies and HSI policy

# HSIF Evolution: Analysis of existing HSI Process Tools

| Tools | Similarities | Differences |
|---|---|---|
| DAU Timeline | • Based on acquisition lifecycle<br>• Linked to SE processes<br>• Does not identify much HSI process | • Does not outline cross domain collaboration |
| Air Force HSI Guidance Documents | • Based on acquisition lifecycle<br>• Linked to SE processes<br>• Tool for HSI practitioners<br>• Identifies inputs and outputs | • Not interactive (text based)<br>• Does not outline cross domain collaboration |
| Naval Postgraduate School Defense Acquisition Framework | • Based on acquisition lifecycle | • Developed as an educational tool for coursework |
| Naval Ordnance Safety and Security Activity – Web-based Interactive Safety Environment (WISE) | • Based on acquisition lifecycle | • Solely dedicated to safety domain<br>• Does not outline cross domain collaboration |
| NASA: H-FAST | • Process based | • More of a knowledge management tool<br>• Focus on HFE<br>• Does not outline cross domain collaboration<br>• Intended user is non-practitioner |

# HSIF Evolution: Roadmap




| Release | 0.0 | 1.0 | 2.0 | 3.0 | 4.0 |
|---|---|---|---|---|---|
| Development | • Process diagrams<br>• Static visualization of content (Visio) | • Interactive application<br>• Dynamic content visualization (Adobe AIR) | • Edit capability, HSI Knowledge Management<br>• HTML5 / JavaScript<br>• Client-server architecture | • Search Indexing<br>• Saving and retrieving<br>• Import/Export<br>• Generate Reports<br>• New content | • Sharing and collaboration<br>• Alternative Acquisition Frameworks<br>• Product templates |
| Analysis | • 8 HSI Domains<br>• Acquisition Life-Cycle (Post-MDD)<br>• Activity-level content | • HSI Integrator Role<br>• SETR Activities<br>• HSIF content refresh | • Pre-MDD content<br>• Validation (Internal)<br>• Environment | • HSI product and reference traceability<br>• Rules for HSI domain collaboration<br>• Validation<br>• Training | • Alternative Acquisition Frameworks<br>• Develop data models to support ROI and MBSE |

# HSIF Evolution: Collaboration w/ Navy HSI (SPAWAR)

| Date | Version | Description |
|---|---|---|
| Mar 2009 | HSI Practitioner's Guide | A **43-page HSI guide** for integrating human factors into DoD acquisition lifecycle to better communicate consistent program support activities |
| May 2009 | HSI Framework 1.0 | **Visualization of the practitioner guide** activities over the acquisition lifecycle, to include MPT domain activities |
| Sep 2009 | HSI Framework 1.3 | **Added HSI domain collaboration points**; drafted Safety and Occ Health domain activities; expanded integrated acquisition row to include documentation |
| Nov 2010 | HSI Framework 1.4.1 | **Added input documentation and output products** to each activity box for HFE row |
| Dec 2011 | HSI Framework 1.5 | Refined activity boxes to align with SPAWAR **HSI Work Package development** |

Early HSIF focus areas
- HFE and MPT
- IT-related Navy systems

# HSIF Evolution: Collaboration w/ USAF HSI (711th HPW)

| Date | Version | Description |
|---|---|---|
| Feb 2013 | AF HSIF 0.0 | **Included Safety, Occ Health, Survivability, and Habitability domain activities** in collaboration with USAF HSI (711th HPW) |
| Aug 2014 | AF HSIF 1.0 | Developed an **HSIF interactive application**. Defined and scoped technical activities for an **HSI Integrator Role.** Conducted a full **vetting and adjudication of all HSIF content**. |
| Aug 2015 | AF HSIF 2.0 | Developed **web-based application** with search, tracking, library, and edit capabilities. Validated **Environment domain** and scoped **pre-MDD activities**. |

AF HSIF 2.0
- 8 HSI Domains + HSI Integrator Role
- 386 Activities across 6 Acquisition Phases
- 161 Unique References
- 215 Unique Products

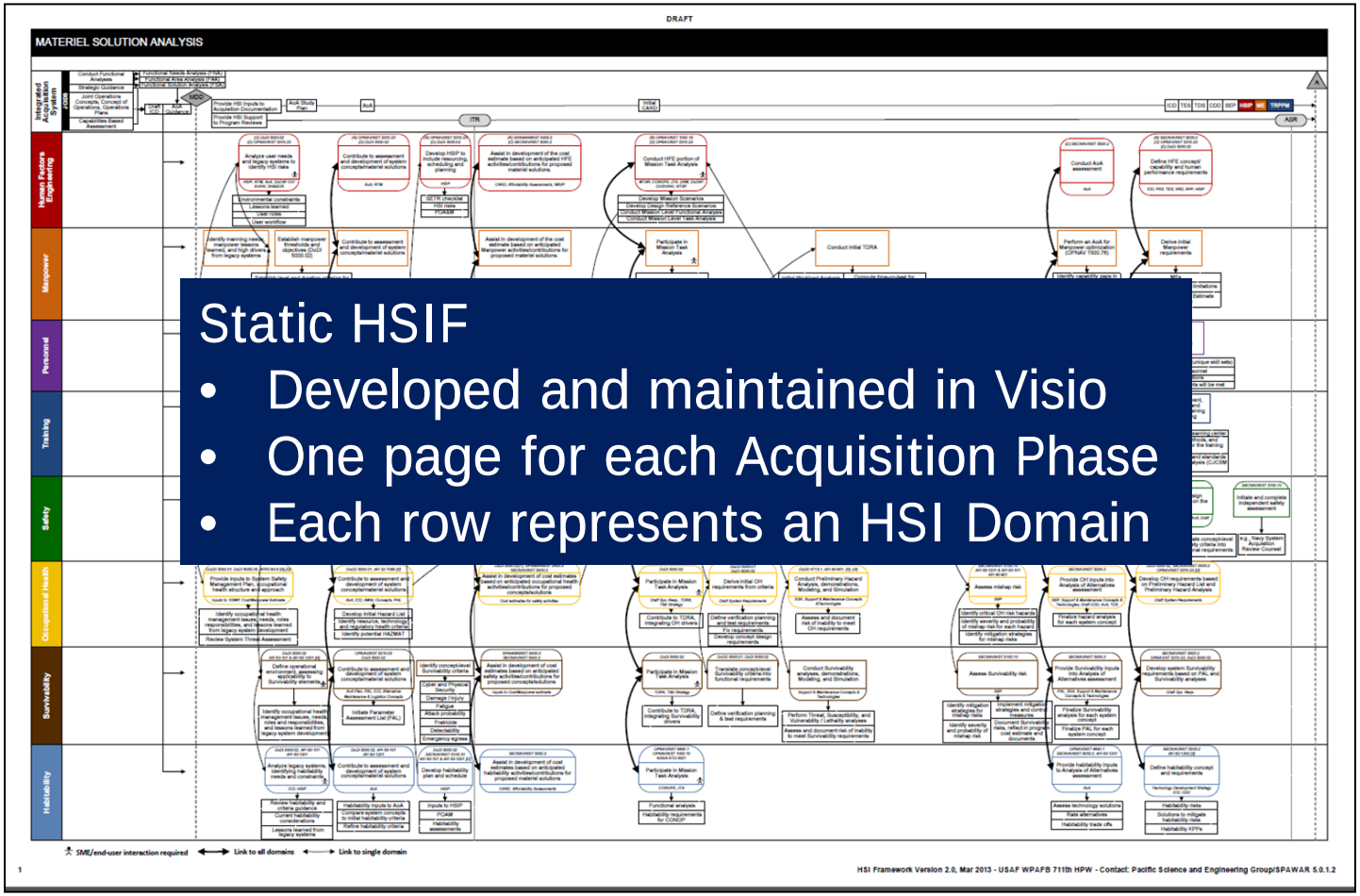
# Use Case: HSI Practitioner

| Role | User Stories |
|---|---|
| HSI Practitioner | **As an HSI Practitioner,** I need to identify content, timing, and collaboration points for HSI activities within the Acquisition Life Cycle, so that I can support Systems Engineering efforts timely and effectively.<br><br>• **Multi-service inputs:** As an HSI Practitioner, I need to identify guidance and best practices across services so that I can conduct technical activities efficiently and accurately.<br><br>• **Product traceability:** As an HSI Practitioner, I need to identify guidance and best practices across services so that I can conduct relevant technical activities.<br><br>• **Cross-domain collaboration:** As an HSI Practitioner, I need to identify similar technical activities across HSI Domains so that I can leverage HSI analyses efficiently. |

Developed use cases to identify needs, support prioritization, and facilitate design

# HSIF: Static version

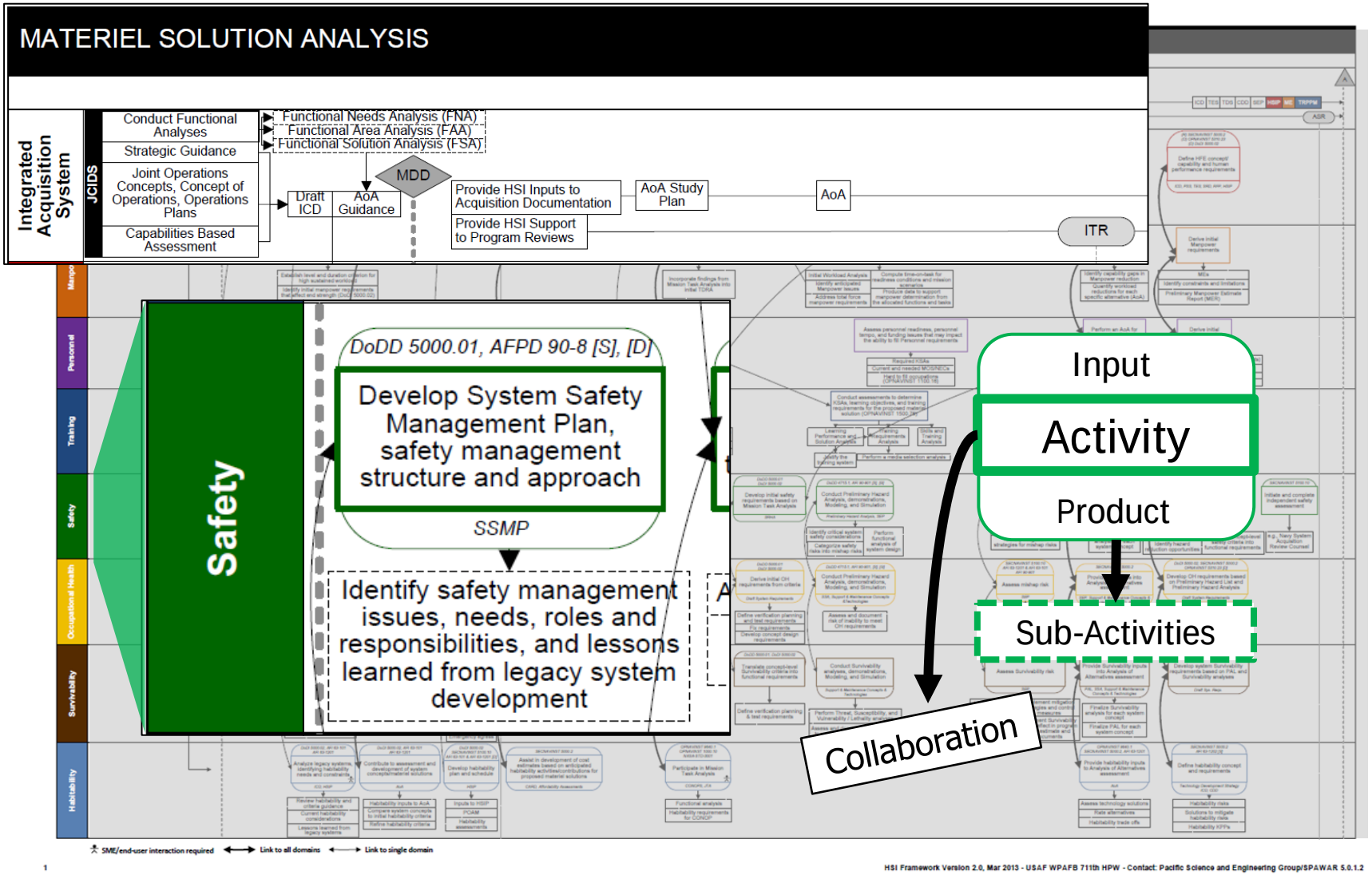
| Habitability | Survivability | Occupational Health | Safety | Training | Personnel | Manpower | Human Factors Engineering | Integrated Acquisition System |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | JCIDS |




Static HSIF

- Developed and maintained in Visio
- One page for each Acquisition Phase
- Each row represents an HSI Domain

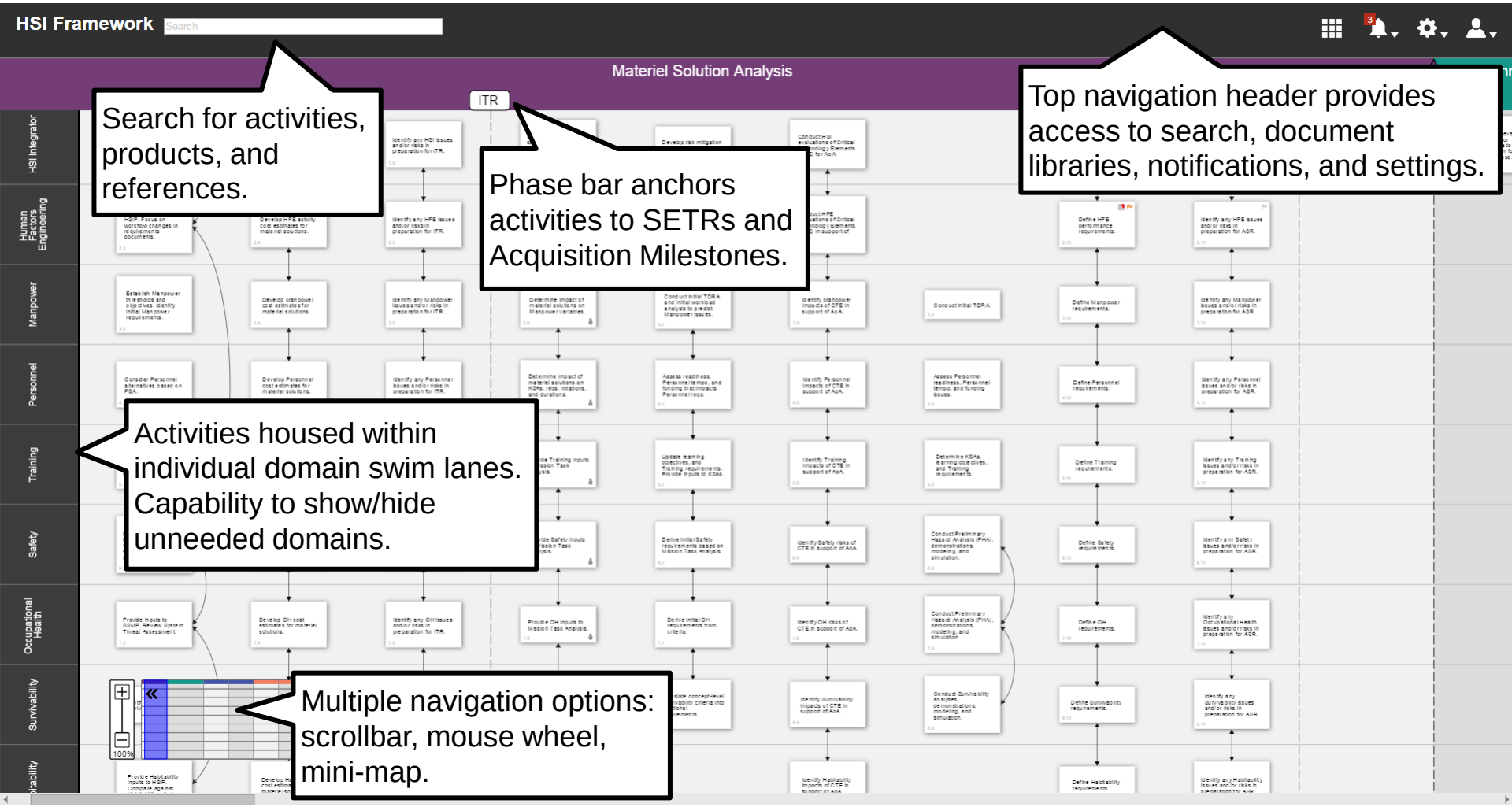
# HSIF: Static version (cont.)



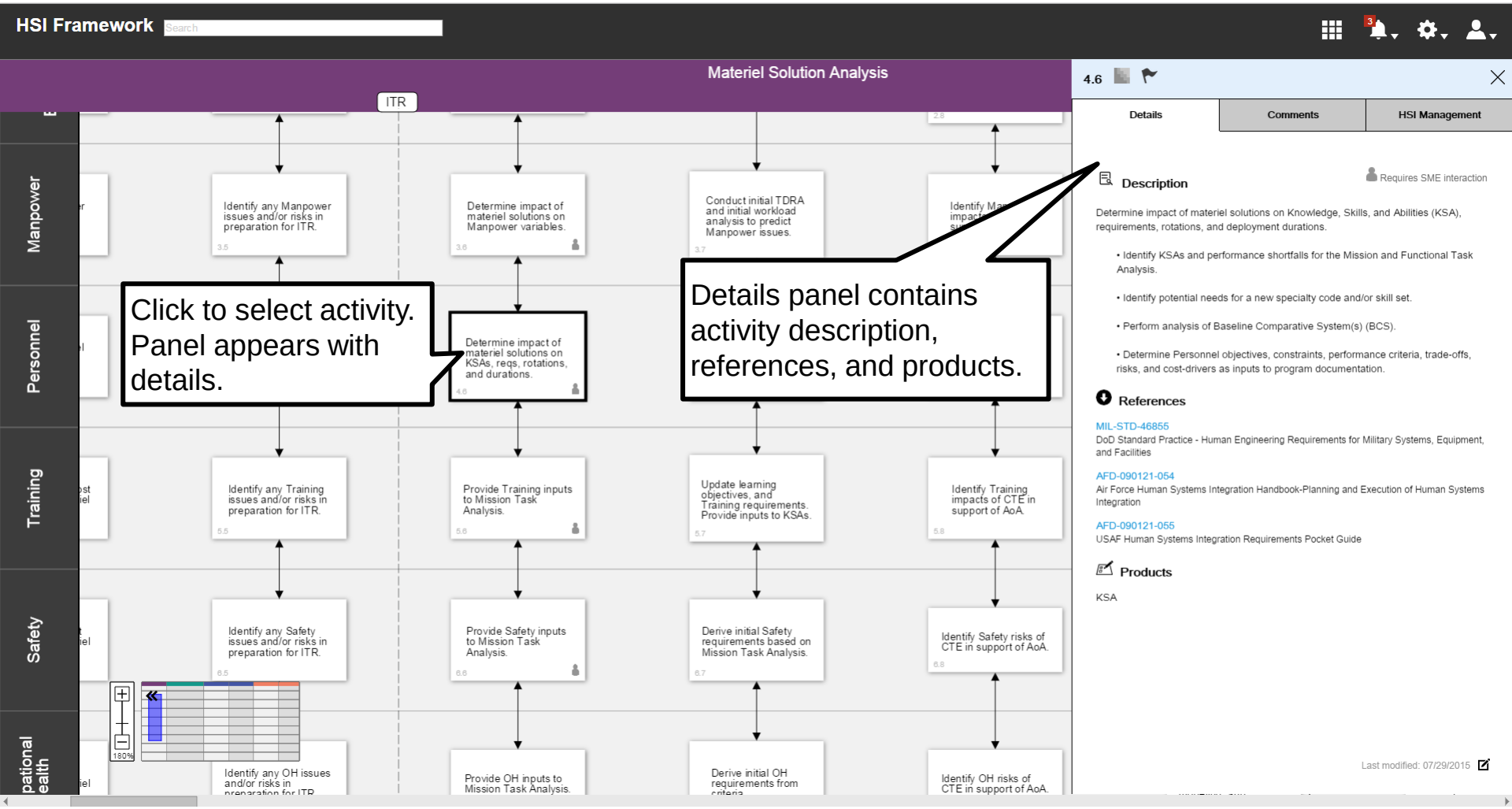
# HSIF Objectives

1. **Develop an interactive HSIF application**
   - Mitigate limitations of static visualization: Clutter, accessibility, configuration management, expansion
   - Add interactive features: Navigation, information access, product search, reference search, Quick Reference Guide
   - Serves as a resource for the acquisition community: AFHSIO, PEOs, SPAWAR, Program Management Offices, Defense Acquisition University
2. Define and scope activities: HSI Integrator Role
3. Vet and adjudicate HSIF design and content
4. Develop training materials

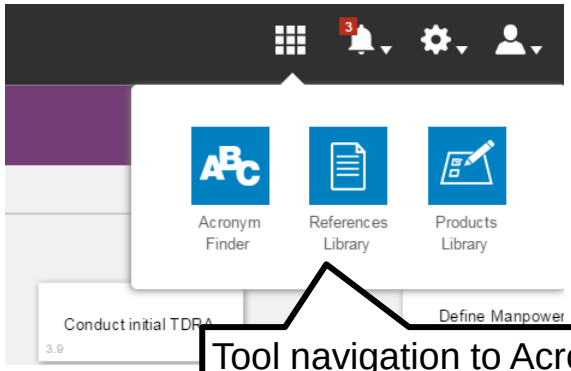
# HSIF: Overview



# HSIF: Details Panel

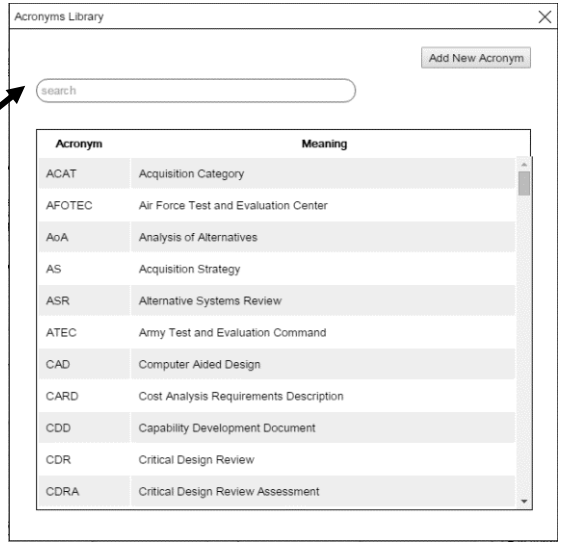


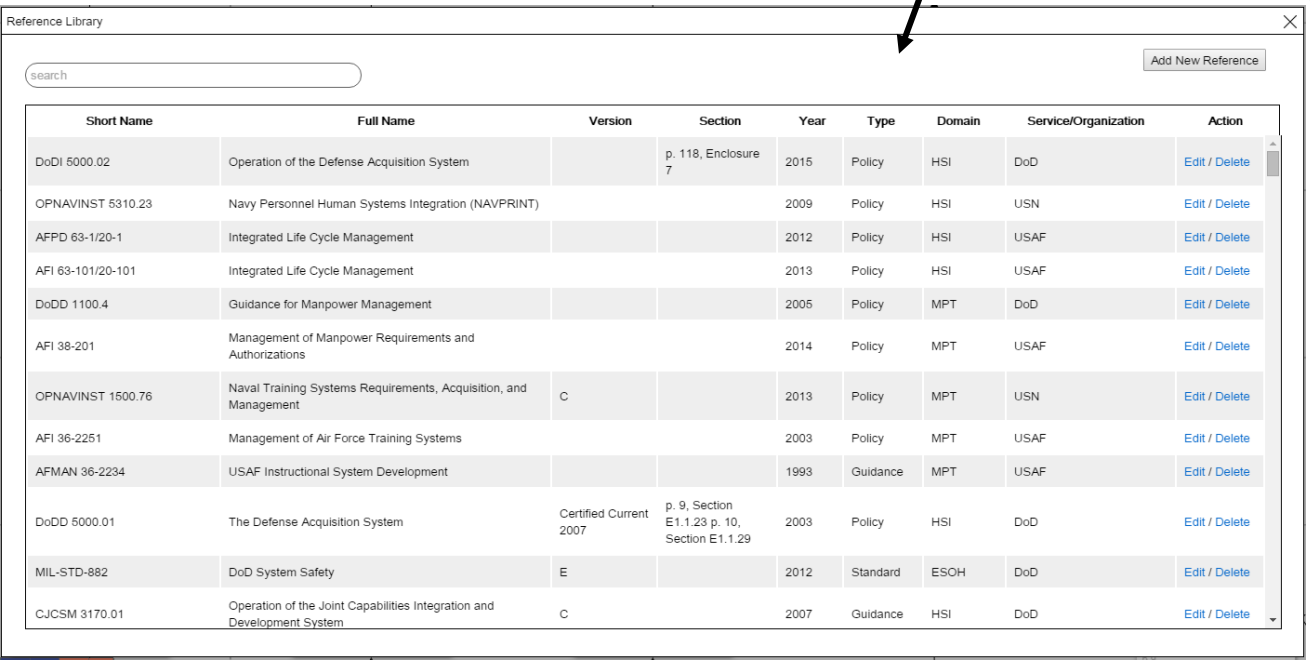
# HSIF: Document Libraries

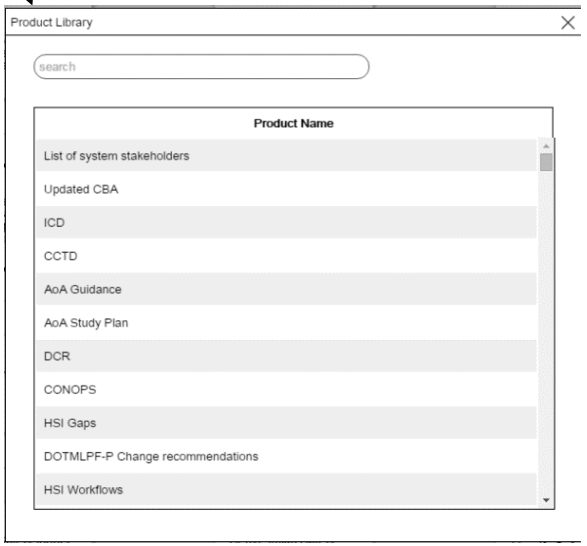



Tool navigation to Acronym Finder, References Library, Products Library

Reference and Product metadata supports searchable tables



# HSIF Objectives (cont.)

1. Develop an interactive HSIF application
2. **Define and scope activities: HSI Integrator Role**
   - Identify core HSI Integrator Role functions
     - Conduct HSI planning and trade studies
     - Exercise leadership on collaborations between HSI Domains
     - Serve as an interface between HSI and Systems Engineering, especially during SETR and Acquisition Milestone reviews
   - Derive HSI Integrator Role content from core functions, as an additional row in the HSIF visualization
   - Adapt and edit existing HSIF structure and content, re-establish collaborations
3. Vet and adjudicate HSIF design and content
4. Develop training materials

# A New Role: The HSI Integrator

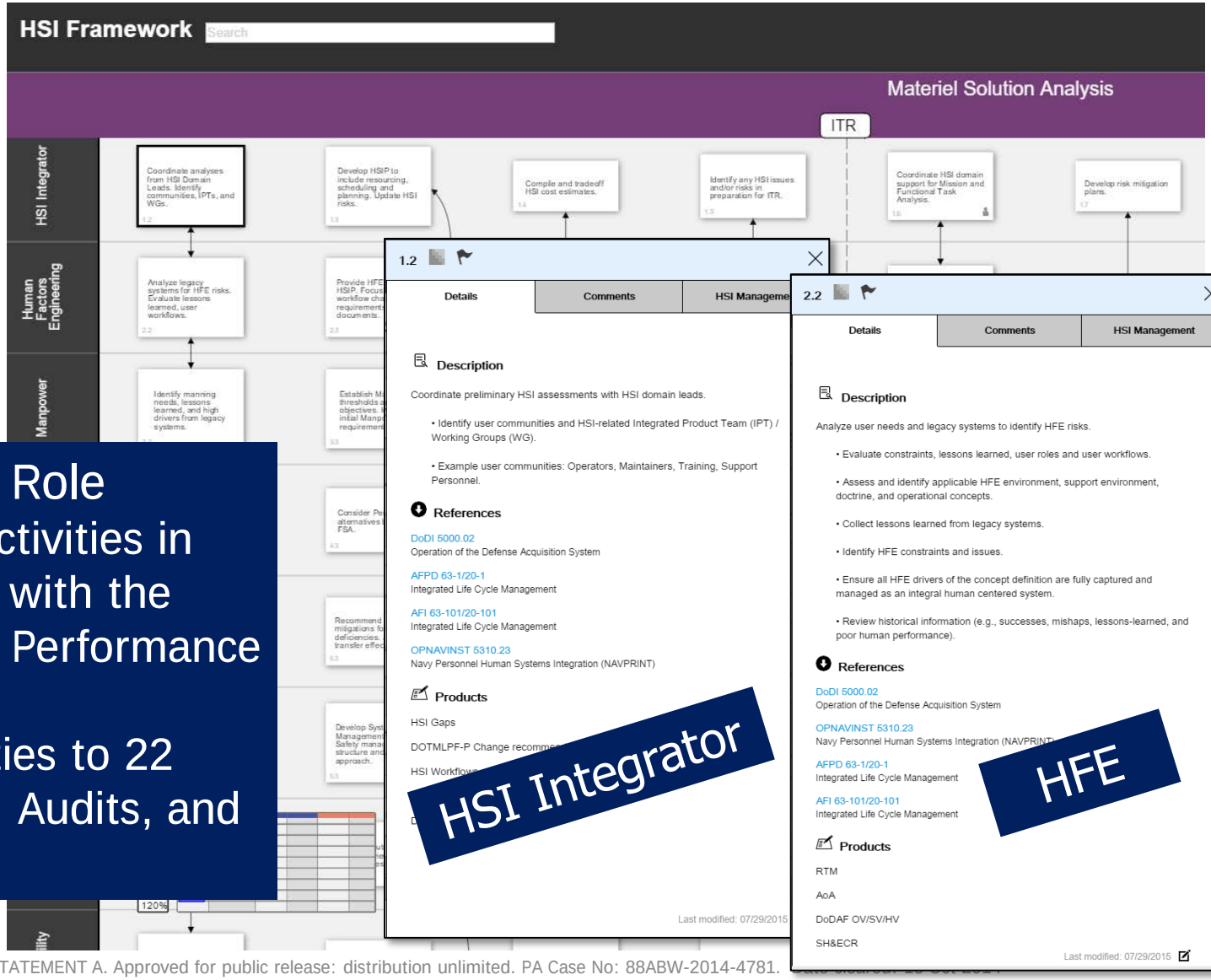
- Among HSI domains, responsibility and tasks to facilitate coordination and trade-offs remain unknown
- The HSI Integrator Role and related activities were developed to serve as an interface to coordinate between the HSI Domains
- HSI would benefit from a mechanism or role similar to a Chief Engineer to:
  - provide SoS/FoS oversight
  - facilitate trade-offs among domains
  - communicate HSI risk within an organization
  - Identify HSI trends across programs
- The HSIF defines these coordinating activities to facilitate the consistent application and effectiveness of HSI

# Use Case: HSI Integrator

| Role | User Stories |
|---|---|
| HSI Integrator | **As an HSI Integrator,** I need to identify collaboration points so that I can engage HSI Domain leads timely and accurately.<br><br>• **HSI Planning:** As an HSI Integrator, I need to provide guidance to a program on developing a Human Systems Integration Plan (HSIP), so that HSI tasking is planned and scoped to support program needs.<br><br>• **HSI Requirements:** As an HSI Integrator, I need to identify requirements-related activities, so that I can ensure timely and effective technical support for a SETR. |

# HSI Integrator Role: Collaboration w/ HFE

HSI Integrator activities




## HSI Integrator Role

- Defined 59 activities in collaboration with the 711th Human Performance Wing
- Linked activities to 22 SETR events, Audits, and Milestones

# HSIF Objectives (cont.)

1. Develop an interactive HSIF application
2. Define and scope activities: HSI Integrator Role
3. **Vet and adjudicate HSIF design and content**
   - Develop criteria for integrating HSI content
     - Suitable for HSI practitioners
     - Supports a range of Acquisition programs
     - Clear relationship to SE/Acq/HSI products
     - Practitioner-friendly: Handbooks, Guidance, Data Templates
   - Conducted 10 Working Groups
   - Adjudicated 342 comments from 5 review sessions
4. **Develop training materials**
   - Created a HSIF Quick Reference Guide
   - Training Brief

# Recap of HSIF Benefits

- For HSI Practitioners and System Engineers
  - Provides explicit technical guidance for HSI Domains that is both policy-driven and product-focused
  - Leverages HSI best practices across services, organizations
  - Facilitates and communicates HSI planning among stakeholders
- For Program Managers
  - Provides a list of potential HSI-related activities that can be tailored to manage program technical risks
  - Makes HSI tasks and products explicit to system stakeholders
- For those serving as the HSI Integrator Role
  - Serves as a coordinating mechanism between HSI domains
  - Improved technical alignment to System Engineering Technical Review (SETR) events and Acquisition Milestones

# HSIF Next Steps

- Vet HSIF application with HSI practitioners
- Define rules for HSI domain collaboration
- Develop pre-MDD content
  - Include Capability Planning & Analysis (CP&A), Concept Development (CD), AoA, ICD activities
- Development
  - Generate reports
  - Improve search capability: index all content, documents, provide faceted search results
  - Save, retrieve, and share selected activities (e.g., different models)
  - Import/Export activities
  - Refine document and document repositories
  - Incorporate pre-MDD and Environment content

# HSIF Vision

- Achieve full HSI representation: From all DoD Services and government agencies
- Achieve continuous content improvement: Design and content feedback from working groups
- Integrate with DoD-wide HSI Standards
- Expand collaboration capability for use as a knowledge management tool
- Adapt to emergent Acquisition Models (DoDI 5000.02)
- Define HSI, Systems Engineering, and Acquisition product traceability
- Integrate with HSI tool integration: Shared COI tool suite (ROI, MBSE)

# Questions?

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