TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

Integrated System Engineering Framework (ISEF)

NDIA SE Annual Conference

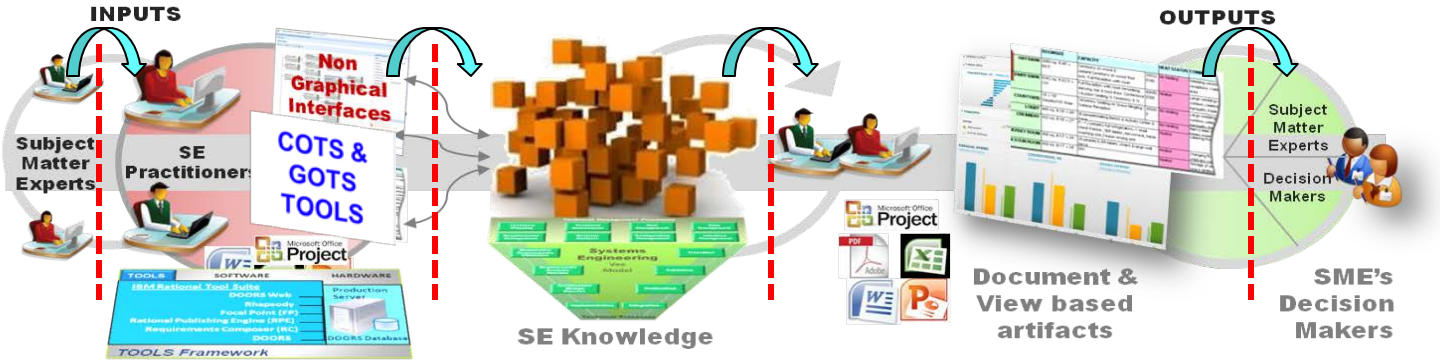
Presented by: Dr. Edward Umpfenbach, Technical Lead, PM ISEF
29 Oct 2014

Current Operating Framework

ODASD

Reference: – Engineered Resilient Systems (ERS) S&T priority Description & Roadmap, Dr, Robert Neches, ERS PSC Lead, Advanced Engineering Initiatives, ODASD SE, 31 October 2011

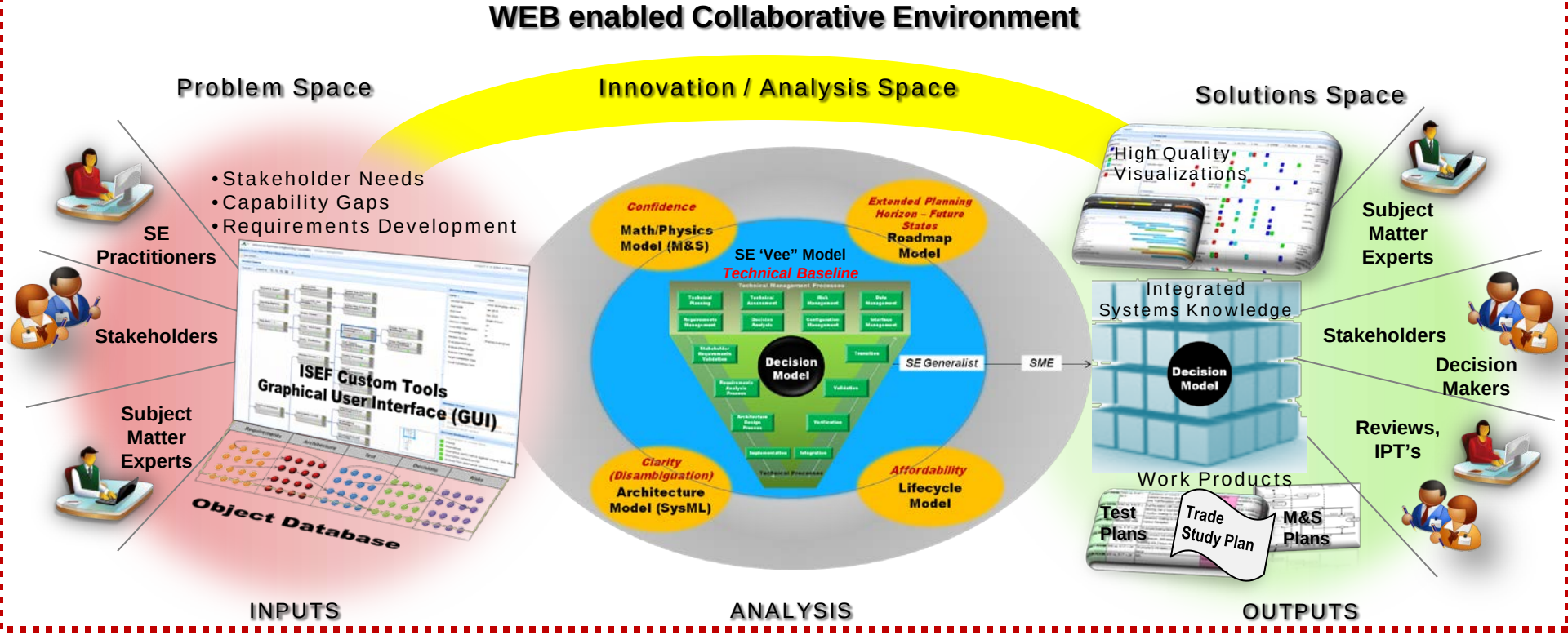
Graphical Representation of Current Operating Environment



- 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

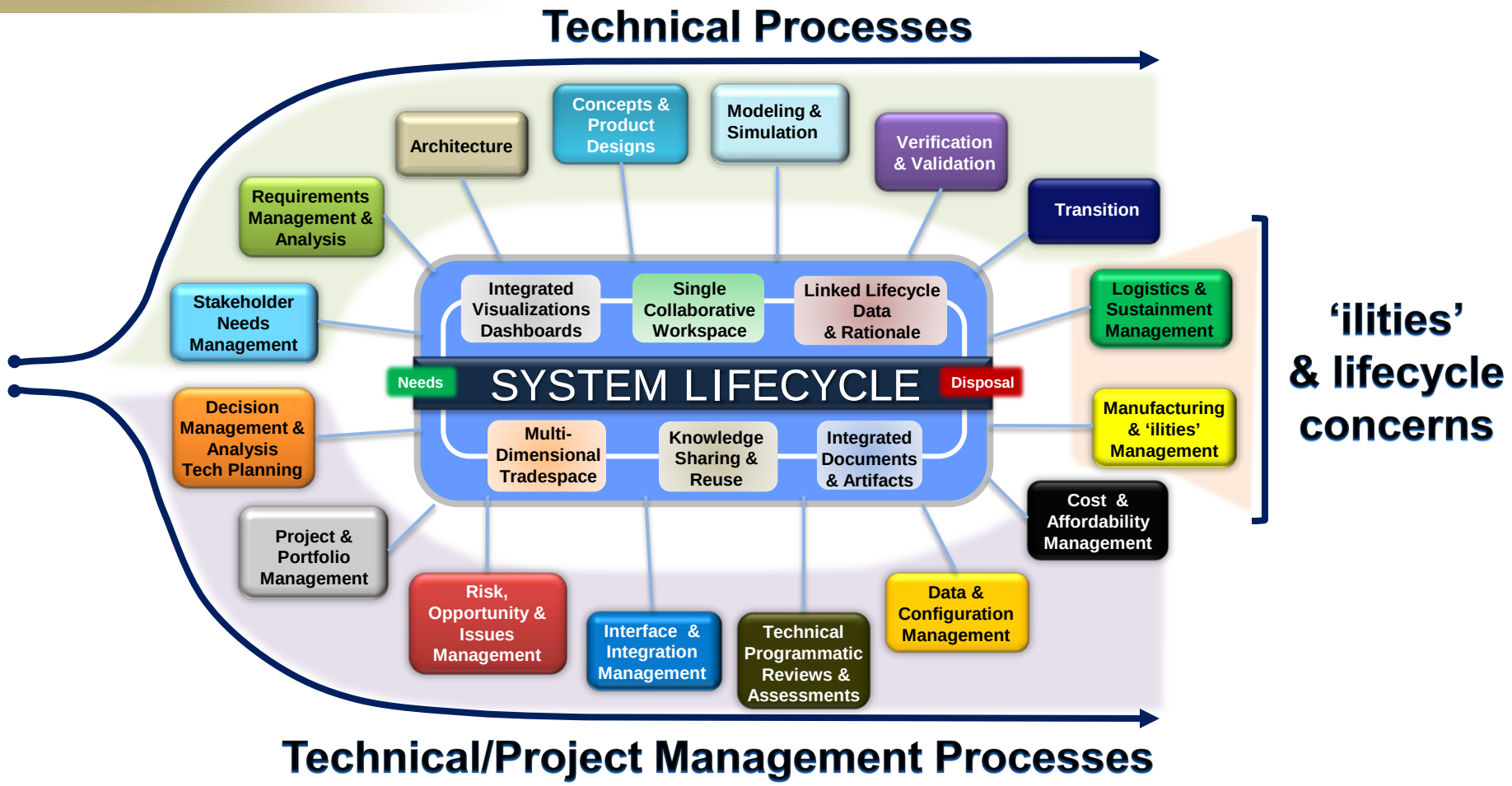
Integrated Systems Engineering Framework (ISEF)



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

Framework to Improve SE Effectiveness

Framework Concept



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 Knowledge Architecture

U.S. ARMY RDECOM

CREATE CAPTURE Knowledge

Stakeholder Needs Analysis

Decision Breakdown Structure (DBS)

Requirements

Decision Analysis

Criteria

Alternatives

Consequences

Decision

Performance

Architecture Models

$y = F(x)$

Math/Physics/Lifecycle Models

ACTION PUBLISH EXPLOIT Knowledge

Visualizations

Dashboard/Metrics

WYSWYG/Reports

Plans/Artifacts

WBS/IMS

Strategy Roadmaps

MANAGE Knowledge

SYSTEM LIFECYCLE

SNR SRR SFR PDR CDR TRR

REUSE Knowledge

Decisions Requirements Patterns Criteria Architecture

Legacy Data Seeding Traceability

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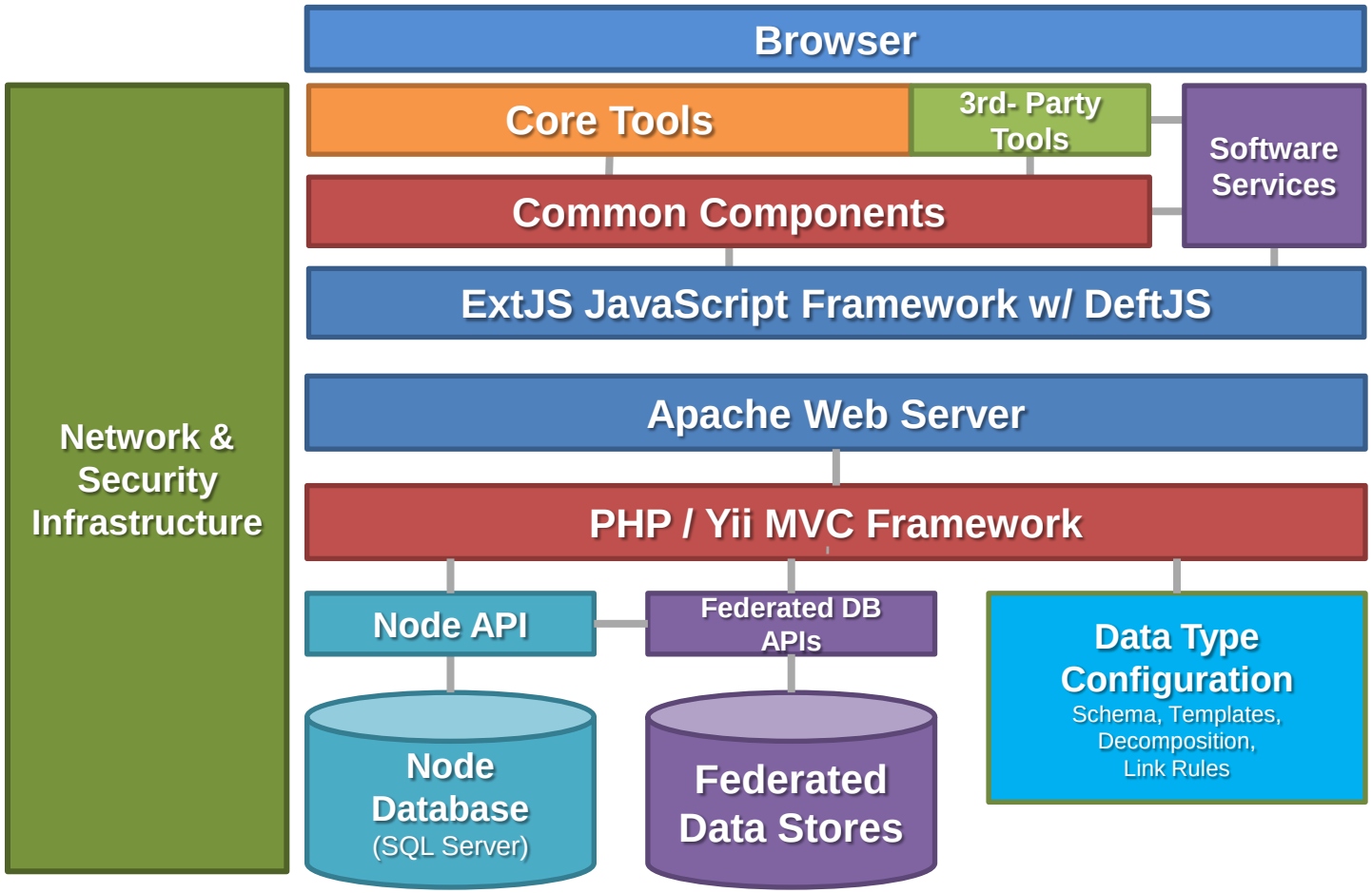
ISEF Software Architecture



Stakeholder Needs Analysis (SNA) Tools

Stakeholder Needs Analysis

Capability:

Stakeholder Needs Analysis from multiple sources

Gap Filled:

Rapid, integrated single point collaborative stakeholder needs capture and analysis framework

Tools:

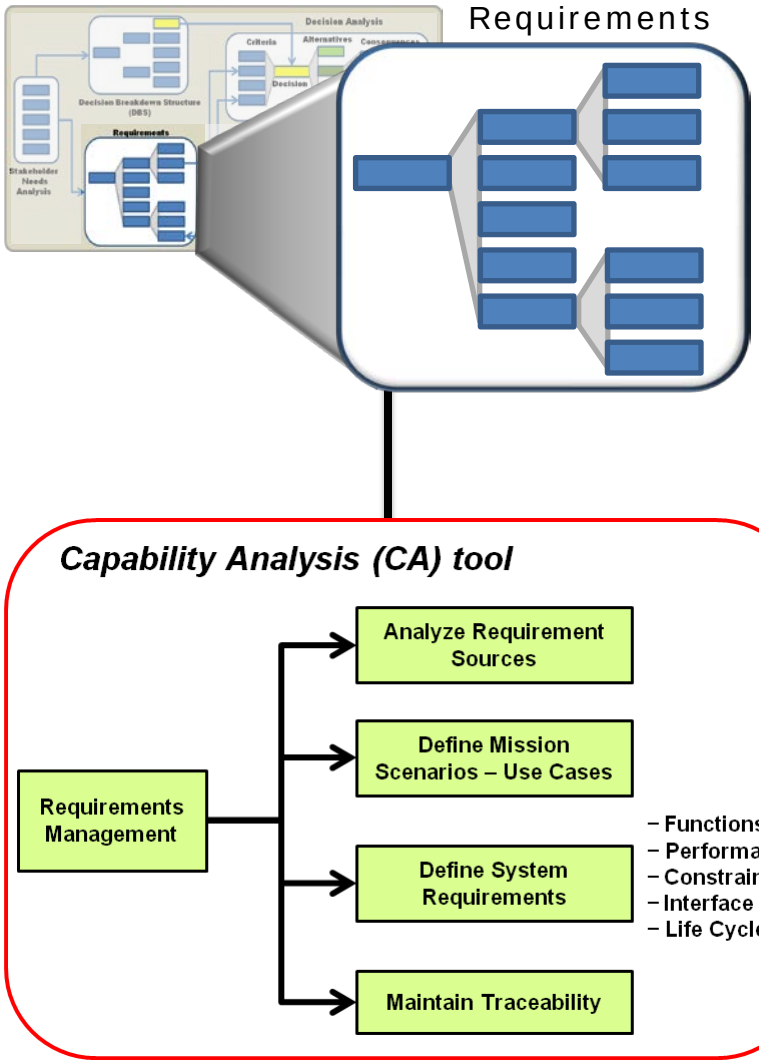
- Lessons Learned
- Stakeholder Needs
- CNA Gaps
- Source Document Parsing w/ hierarchy and attributes

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:

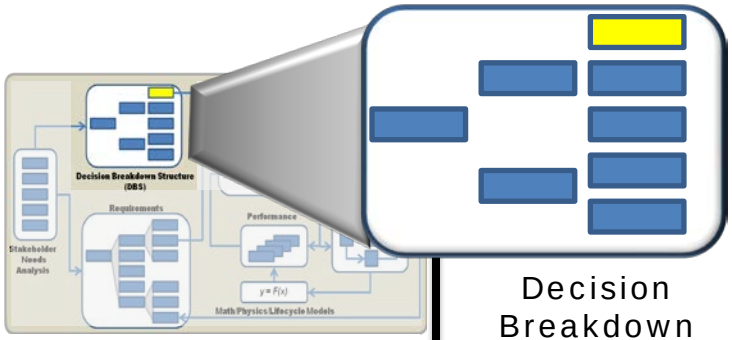
Consistent pattern based decomposition across platforms/systems

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)

Decision Management (DM) tool

- Plan Decisions
- Make Decisions
- Manage Consequences
- Manage Decisions over Time
- Maintain Traceability

→ Decision Management

Capability:

Decision-centric knowledge creation

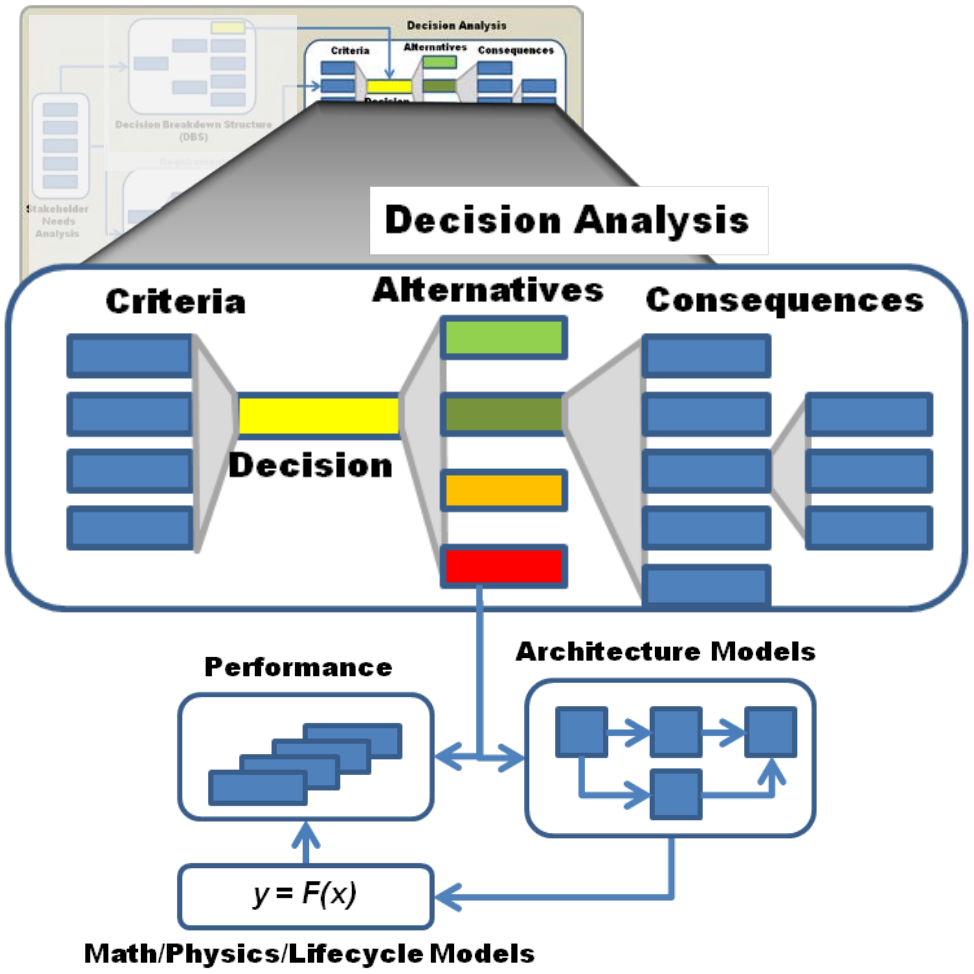
Gap Filled:

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

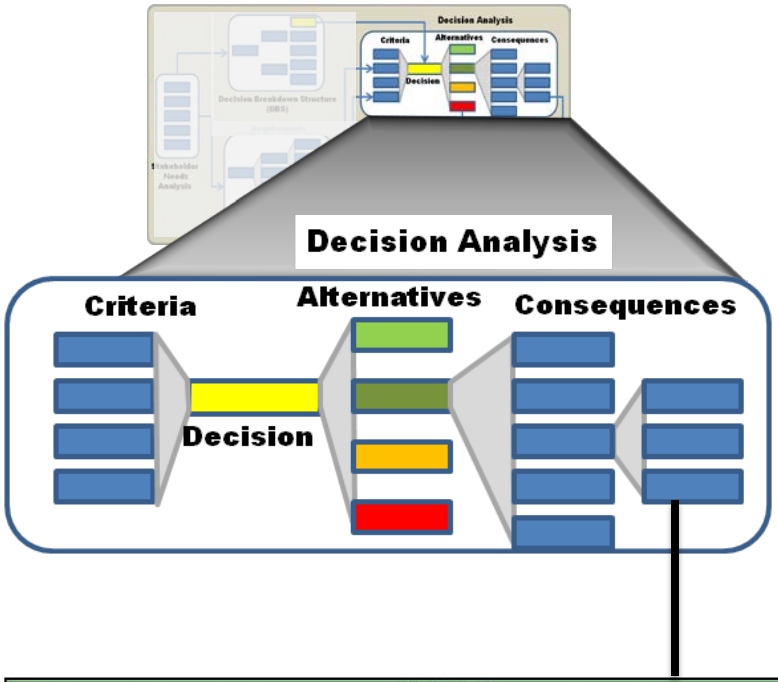
Gap Filled:

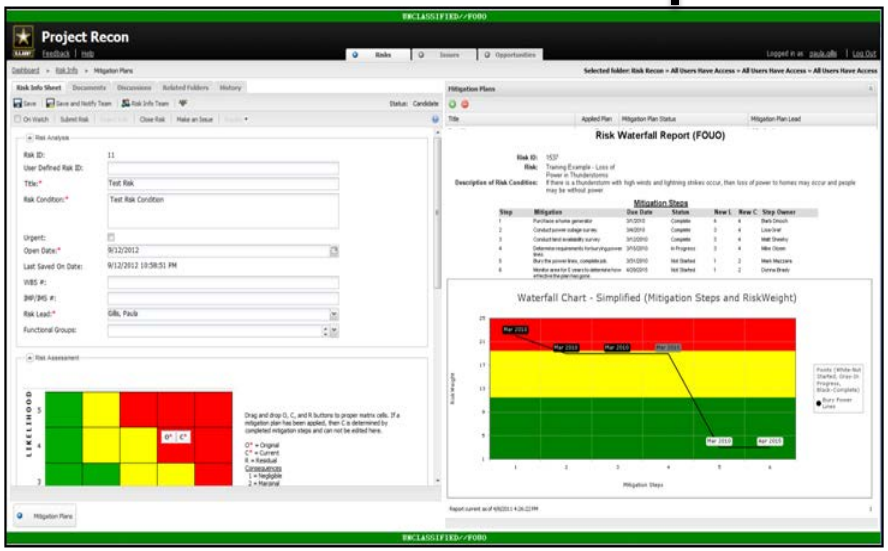
Visualize and facilitate rich derivation traceability between requirements-decisions and plans.

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.

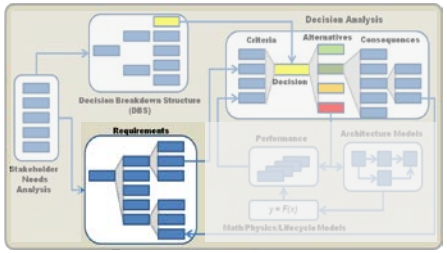
Issue Recon: Risk-to-issue traceability, issue identification, prioritization and corrective action.

Impact:

Reduced programmatic risk and increased collaboration on issues/opportunities

Most widely adopted ISEF tool

Compliance Evaluation (CE) Tool



Requirements

Capability:

Requirements Compliance

Gap Filled:

Highly visual and collaborative requirements compliance management

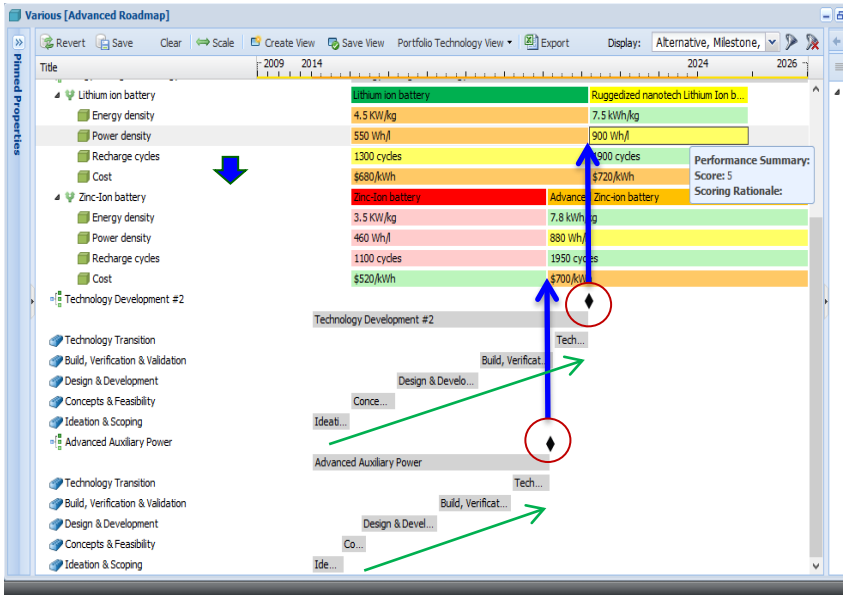
Impact:

Roll-up of system compliance against operational capability requirements

Reduced processing effort to visualize contractor compliance status

Canvas 1: PD linked to CDD																								
PD ID	PD Tier	Section 3 - Requirement	I	T	A	C	Section 4 - Verification	CPD ID	CPD Tier	CPD Requirement	CPD Impact (PD or CPD Action)	All, Some or None	Team A				Team B				Team C			
													Vendor Assessment		Government Assessment		Vendor Assessment		Government Assessment		Vendor Assessment		Government Assessment	
													VL	Comment	VL	Comment	VL	Comment	VL	Comment	VL	Comment	VL	Comment
PD-1	1	[PD REQUIREMENT]		X			Testing shall be conducted.	CDD-1 CDD-4	1	[CDD REQUIREMENT] [CDD REQUIREMENT]	*Monitor (Will NC affect all varients).*	Some	PV	Comment	NC	Comment	PV	Comment			NC	Comment		
PD-2	2	[PD REQUIREMENT]		X			Testing shall be conducted.	CDD-2 CDD-3 CDD-4	3	[CDD REQUIREMENT] [CDD REQUIREMENT] [CDD REQUIREMENT]	*No Impact*	None	VT	Comment			VT	Comment			VT	Comment		
PD-3	3	[PD REQUIREMENT]			X		Analysis shall be performed.	CDD-4	2	[CDD REQUIREMENT]	*No Impact*	None	VA	Comment			PV	Comment			VA	Comment		

Roadmapping Tool



Capability/ Technology

Technical Performance (State Change)

Project Cost & Schedule Milestones

Capability:

Lay S&T Projects, S&T Technology States, and Program of Record Milestones out over time to identify capability gaps

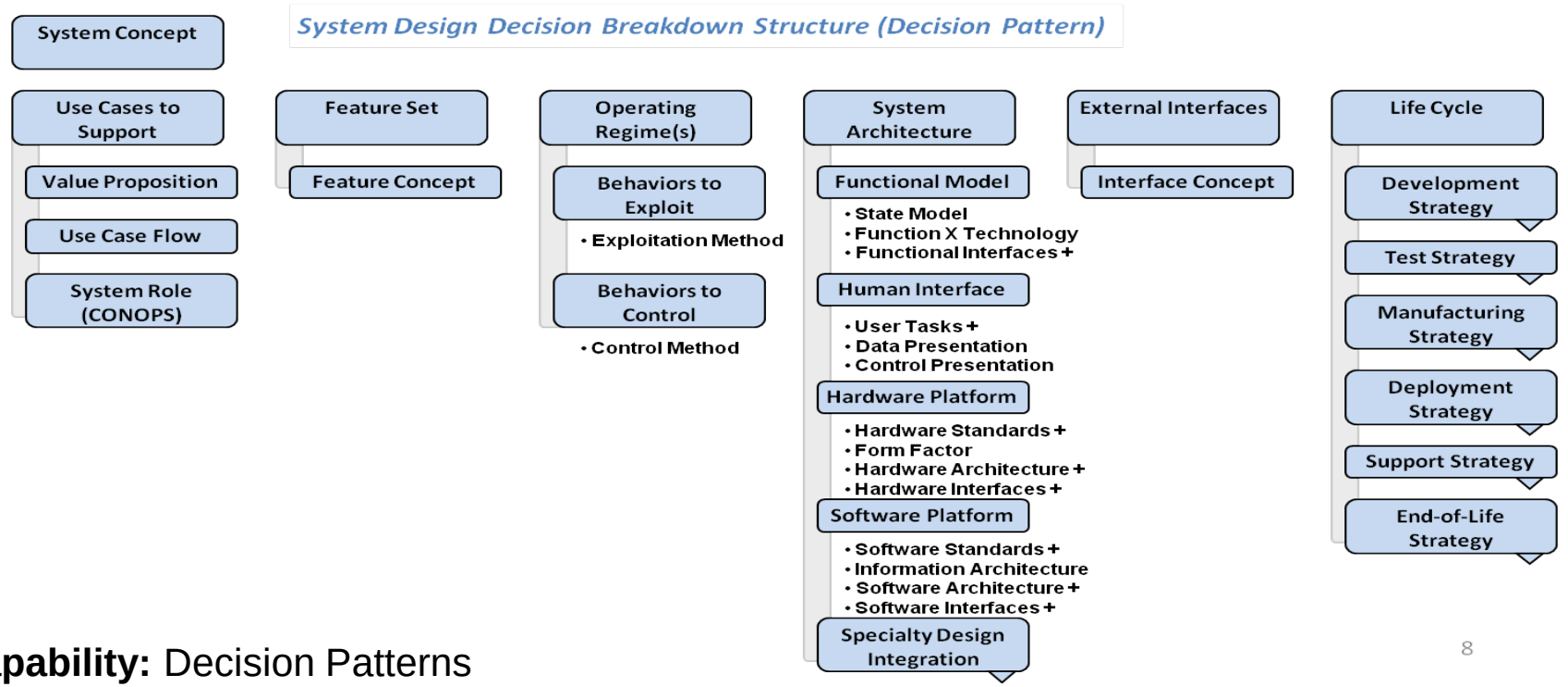
Gap Filled:

Communicate technology status and transition plan across agencies

Impact:

Increased visibility to leadership PMs about S&T projects to fill capability gaps

Decision Patterns (Knowledge Reuse)



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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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