



AI-Infused Integrated Digital Maturity Pathway (IDMP) User-Story Framework for Defense Acquisition Transformation

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Defense Acquisition Transformation Context

- 2025 Acquisition Transformation Strategy emphasizes speed, mission focus, and digital modernization.
- Shift from program-centric to mission-centric acquisition.
- Portfolio Acquisition Executives (PAEs) and Capability Portfolio Management (CPM) require new decision-support tools.
- Digital engineering and AI-enabled analytics are increasingly central to acquisition modernization.



Research Problem



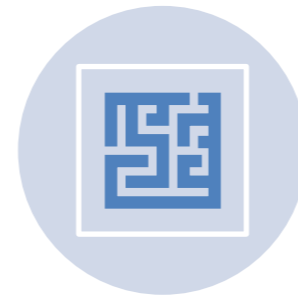
Current readiness models operate largely in silos (TRL, MRL, IRL, HRL).



Leaders lack integrated visibility into mission readiness impacts.



Decision transparency and mission traceability remain limited.



Need for a repeatable framework integrating user needs, readiness, and AI-enabled analysis.

IDMP FRAMEWORK OVERVIEW

From Stakeholder Needs to Mission-Aligned Readiness Decisions



Integrates user stories, readiness pathways, and AI-enabled analysis.



Supports mission-centric acquisition decision-making.



Captures operational perspectives from government and industry stakeholders.



Provides structured readiness analysis across multiple acquisition domains.

1. STAKEHOLDER INPUTS Capture Needs and Context

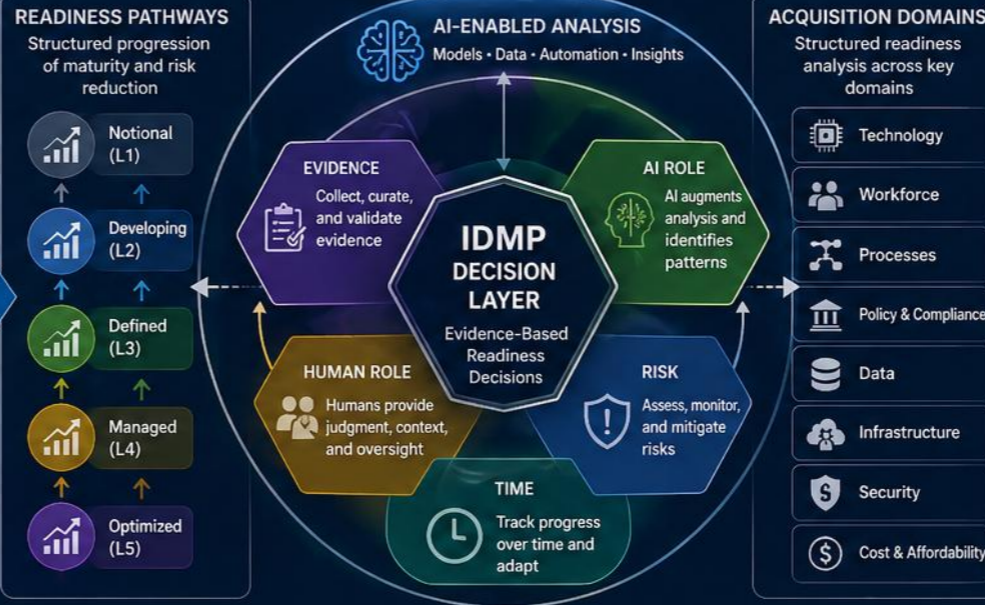
USER STORIES

- As a Program Manager, I need visibility into technology maturity to reduce risk.
- As a Warfighter, I need capabilities that meet mission needs and operational constraints.
- As an Acquirer, I need evidence to make informed investment and sustainment decisions.

STAKEHOLDER PERSPECTIVES

- | | |
|---|--|
| GOVERNMENT | INDUSTRY |
| <ul style="list-style-type: none"> • Program Offices • Warfighters • Policy Makers • Analysts | <ul style="list-style-type: none"> • Prime Contractors • Suppliers • Technology Providers • SMEs |

2. IDMP CORE FRAMEWORK



3. OUTPUTS & DECISION SUPPORT Actionable Insights and Outcomes

DECISION SUPPORT PRODUCTS

- Readiness Scores**
Current state and target state visibility
- Gap Analysis**
Identify gaps and root causes
- Recommendations**
Prioritized actions and investment options
- Trade-off Analysis**
Compare options and understand impacts
- Decision Dashboards**
Real-time visibility for leaders and teams

OUTCOMES

- Better informed acquisition decisions
- Reduced risk and increased confidence
- Improved mission alignment
- Faster delivery of capabilities
- Stronger collaboration across government and industry

FOUNDATION ENABLERS



DATA & EVIDENCE
Trusted, traceable, decision-quality data



STANDARDS & INTEROPERABILITY
Common models, taxonomies, and data exchange



SECURITY & TRUST
Protect data, ensure integrity, and maintain trust



HUMAN-IN-THE-LOOP GOVERNANCE
Ethical AI use, oversight, and accountability



CONTINUOUS LEARNING
Feedback loops to improve models and decision quality

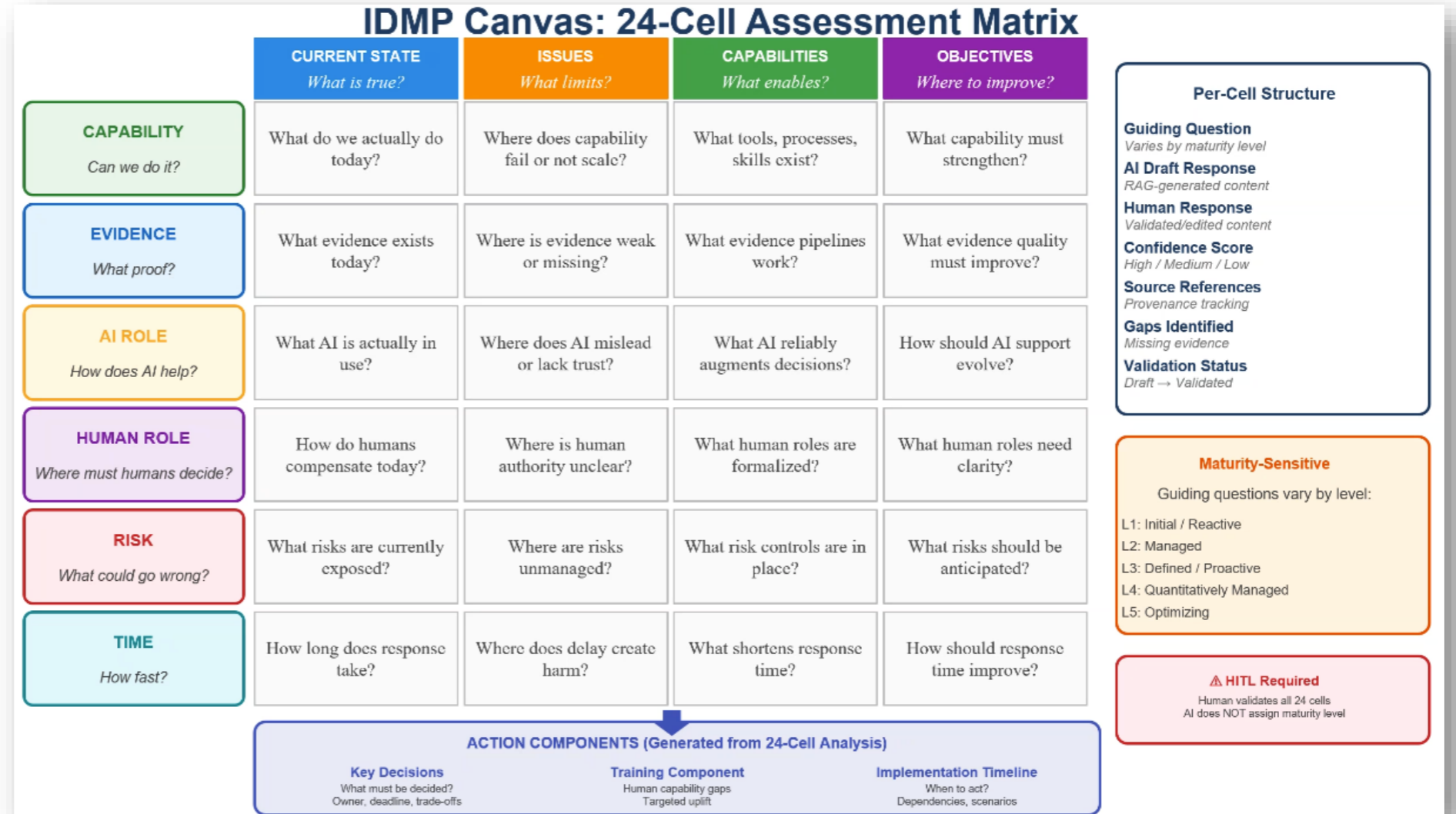
MISSION IMPACT

Deliver the right capability, to the right warfighter, at the right time.



The IDMP Readiness Canvas

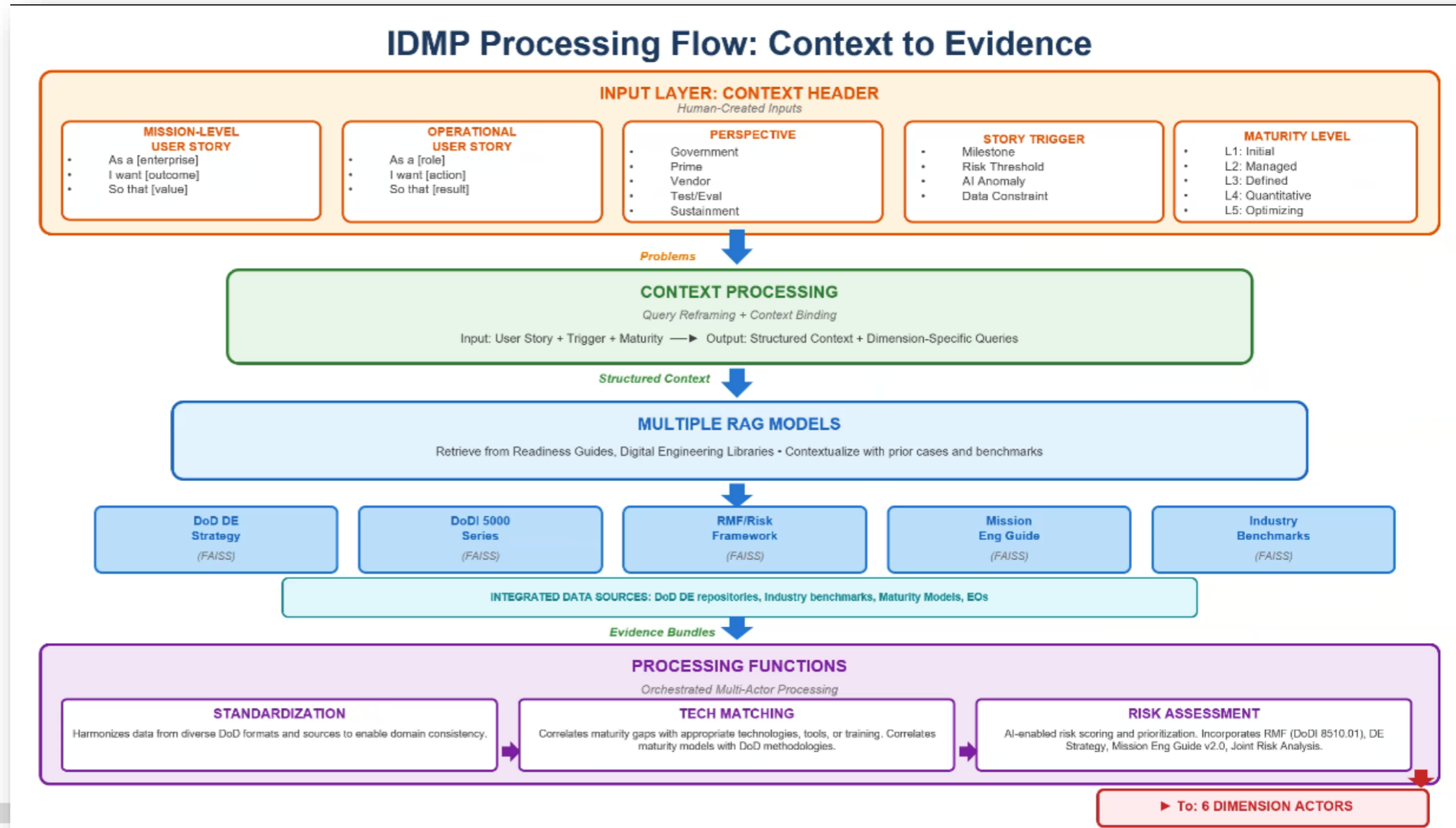
- 24-cell readiness matrix.
- Six readiness dimensions: Capability, Evidence, AI Role, Human Role, Risk, and Time.
- Four analytical elements: Current State, Issues, Capabilities, Objectives.
- Provides structured, traceable readiness assessments.





AI Processing Pipeline

- Context-driven AI analysis using Retrieval-Augmented Generation (RAG).
- Integrates authoritative acquisition and mission engineering references.
- Supports standardization, technology matching, and risk assessment.
- Continuous learning with human-in-the-loop oversight.



Research Methodology



R&E stakeholder workshops
and structured elicitation
sessions.



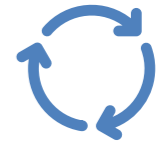
Operational user story
development and maturity
mapping.



Supplementary stakeholder
survey.



AI/ML analysis for clustering,
pattern recognition, and
readiness classification.



Human-in-the-loop validation
throughout the process.

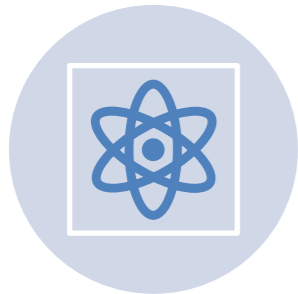
User Stories as Decision Artifacts



User stories capture stakeholder needs in operational language.



Format: As a [role], I need [capability], so that [mission outcome].



Supports mission engineering, readiness assessment, and portfolio prioritization.



Transforms qualitative stakeholder input into analyzable acquisition data.

Operational User Stories Developed

- Both stories reveal implicit mission engineering concerns.
- Highlights need for cross-domain readiness integration.



USER STORY 1

AI-Assisted 3D Model Design Disclosure

Secure model sharing between contractor and government customer

A contractor engineer needs to securely share controlled 3D model releases with a government acquisition customer — enabling earlier design reviews, digital twin interaction, and feedback with far less latency than traditional paper-based or stove-piped IT exchanges. Key considerations include technical data rights, proprietary protection, and classification.

Prime

Risk Threshold

L1 Initial



USER STORY 2

Rapid Prototyping & Digital Twin Design Validation

High-fidelity prototypes to accelerate EMD and LRIP readiness

A design engineer in an EMD or low-rate production environment needs to rapidly design lightweight parts and generate high-fidelity prototypes from validated CAD and digital twin data — enabling fit checks, manufacturing assessments, and readiness demonstrations earlier in the cycle, with direct impact on PDR/CDR building blocks and Acquisition Transition Strategy compliance.

Prime

Milestone

L1 Initial

Readiness Canvas Development

Readiness Canvas
6 dimensions × 4 elements = 24 cells

24/24 completed 0 validated

DIMENSION	Current State	Issues	Capabilities	Objectives
Capability	<p>What can we actually do today?</p> <p>Current capability posture aligns with a Manual and Digital Environment — Operations, processes, and procedures are manually controlled and managed...</p>	<p>Where does capability fail, break, or not scale?</p> <p>Capability gaps stem directly from operating in a Manual and Digital Environment: operations, processes, and procedures are manually...</p>	<p>What tools, processes, skills, or resources enable execution?</p> <p>Existing enablers reflect a Level 1 posture where decision making is accomplished by authorized personnel using a mix of manual...</p>	<p>What capability must be strengthened or matured?</p> <p>Advancing capability requires maturing from a Manual and Digital Environment toward the next level, where Operations, processes, and procedures will be manually controlled and...</p>
Evidence	<p>What evidence exists today?</p> <p>Evidence collection reflects a Level 1 (Manual and Digital Environment) posture: Data is manually collected. Data analysis is performed by authorize...</p>	<p>Where is evidence weak, missing, outdated, or unreliable?</p> <p>Evidence gaps arise because data is manually collected. data analysis is performed by authorized personnel using non-standardized...</p>	<p>What evidence pipelines, measures, or artifacts are available?</p> <p>Available evidence pipelines operate at Level 1 level: Data is manually collected. Data analysis is performed by authorized personnel using...</p>	<p>What evidence quality or traceability must improve?</p> <p>Improve evidence maturity to support AI-assisted 3D model design disclosure capabilities that allow me to securely share controlled model releases with my acquisition customer and...</p>
AI Role	<p>What AI is currently being used, if any?</p> <p>AI utilization at Level 1 (Manual and Digital Environment) is bounded by the prevailing decision-making posture: Decision making is accomplished...</p>	<p>Where does AI mislead, underperform, or lack trust?</p> <p>AI limitations at this maturity level follow directly from the Manual and Digital Environment: decision making is accomplished by authorized personnel...</p>	<p>What AI functions reliably augment analysis or decisions?</p> <p>Functional AI support is scoped to what the current environment enables: Decision making is accomplished by authorized personnel...</p>	<p>How should AI support evolve to improve readiness and decision quality?</p> <p>AI role maturity should advance in step with the overall environment. The target is to move beyond "decision making is accomplished by authorized personnel using a mix of...</p>
Human Role	<p>How are humans currently compensating, deciding, or overseeing?</p> <p>Human involvement at Level 1 (Manual and Digital Environment) is characterized as: Decision making is accomplished by authorized personnel using a...</p>	<p>Where is human authority unclear, overloaded, or inconsistent?</p> <p>Human authority and accountability at this maturity level can create bottlenecks: decision making is accomplished by authorized personnel...</p>	<p>What human expertise, review processes, or decision roles are formalized?</p> <p>Formalized human expertise operates within the Level 1 framework: Decision making is accomplished by authorized personnel using...</p>	<p>What human roles need clarification, support, or strengthening?</p> <p>Clarify and evolve human roles to ensure AI-assisted 3D model design disclosure capabilities that allow me to securely share controlled model releases with my acquisitio...</p>
Risk	<p>What risks are currently exposed?</p> <p>Risk posture at Level 1 (Manual and Digital Environment) is shaped by interface and communication maturity: Interfaces for data,...</p>	<p>Where are risks unmanaged, underestimated, or poorly tracked?</p> <p>Risk gaps emerge from the Manual and Digital Environment environment: interfaces for data, communications, and operations are manually...</p>	<p>What controls, mitigations, or oversight mechanisms are in place?</p> <p>Risk management mechanisms reflect Level 1 maturity: Operations, processes, and procedures are manually controlled and...</p>	<p>What risks should be reduced, monitored, or anticipated earlier?</p> <p>Advance risk management to enable earlier identification and faster response for AI-assisted 3D model design disclosure capabilities that allow me to securely share controlled mode...</p>
Time	<p>How long does response, action, or decision-making currently take?</p> <p>Decision and response cycle times at Level 1 (Manual and Digital Environment) are governed by communication posture: Communication is a mix o...</p>	<p>Where do delays create harm, rework, or lost opportunity?</p> <p>Time delays arise from the Manual and Digital Environment posture: communication is a mix of manual and digitized processes, requiring...</p>	<p>What currently shortens cycle time or improves responsiveness?</p> <p>Existing mechanisms that affect cycle time reflect Level 1 capabilities: Communication is a mix of manual and digitized processes,...</p>	<p>How should response time, decision speed, or implementation pace improve?</p> <p>Improve decision speed and implementation pace to support AI-assisted 3D model design disclosure capabilities that allow me to securely share controlled model releases with my...</p>

DIMENSION

Current State

What can we actually do today?

AI Draft

Current capability posture aligns with a Manual and Digital Environment — Operations, processes, and procedures are manually controlled and managed. from a prime contractor integration and delivery perspective. The contractor engineer supporting a government acquisition program can execute baseline functions but data is manually collected. data analysis is performed by authorized personnel using non-standardized digital tools. This reflects a "Level 1: Manual and Digital Environment" maturity baseline. This assessment is triggered by an identified risk threshold crossing. Key constraints include: Technical data rights framework (Unlimited Rights TDP, Government Purpose Rights, Limited Rights, Restricted Rights), proprietary design protection, classification and security considerations, IT system interoperability across stove-piped environments, latency in traditional paper-based design exchanges.

Response

Enter your assessment response...

Confidence Status

H M L Draft

Source References

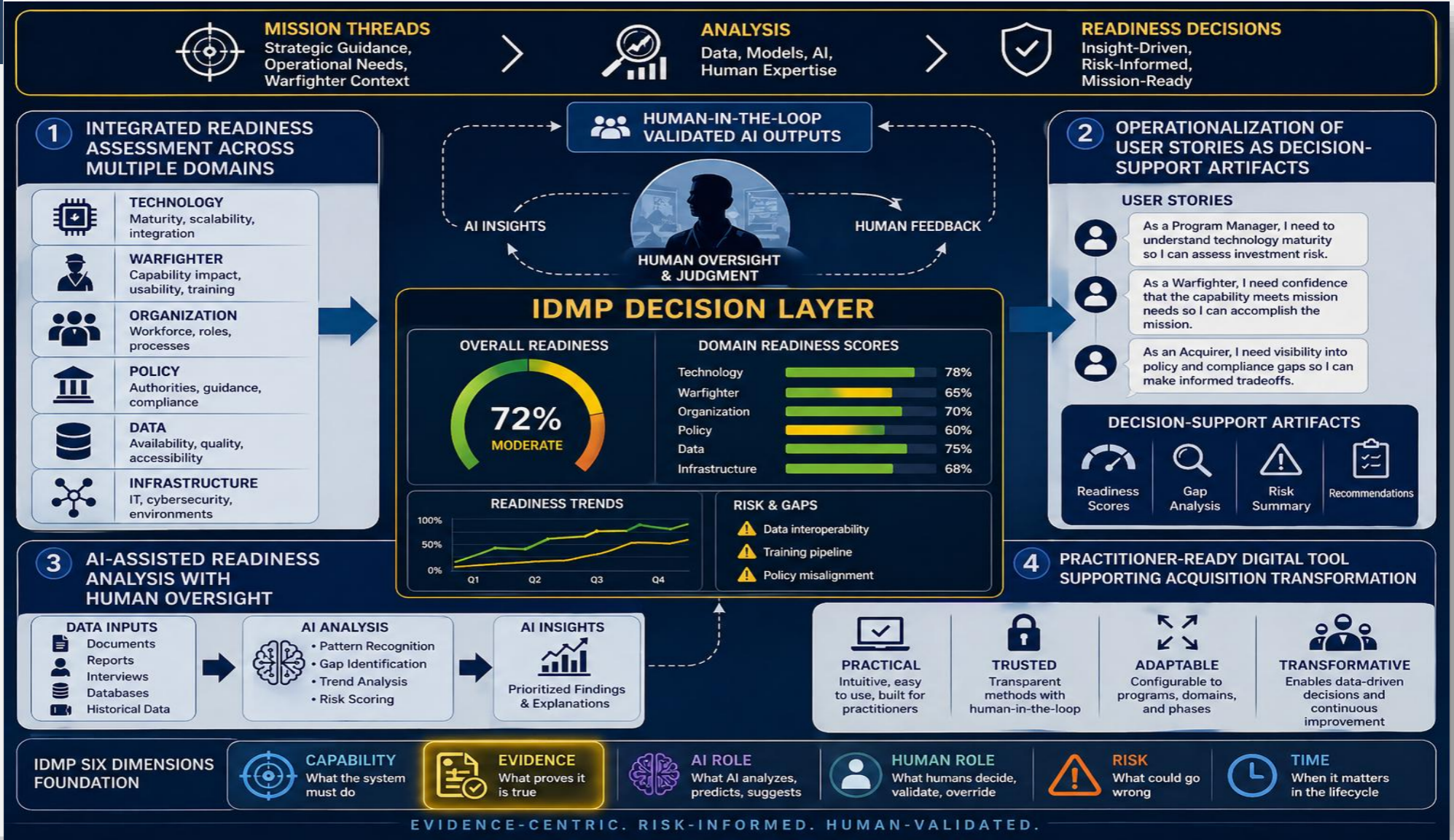
CDRL-001, MIL-STD-xxx, Program doc...

Gaps Identified

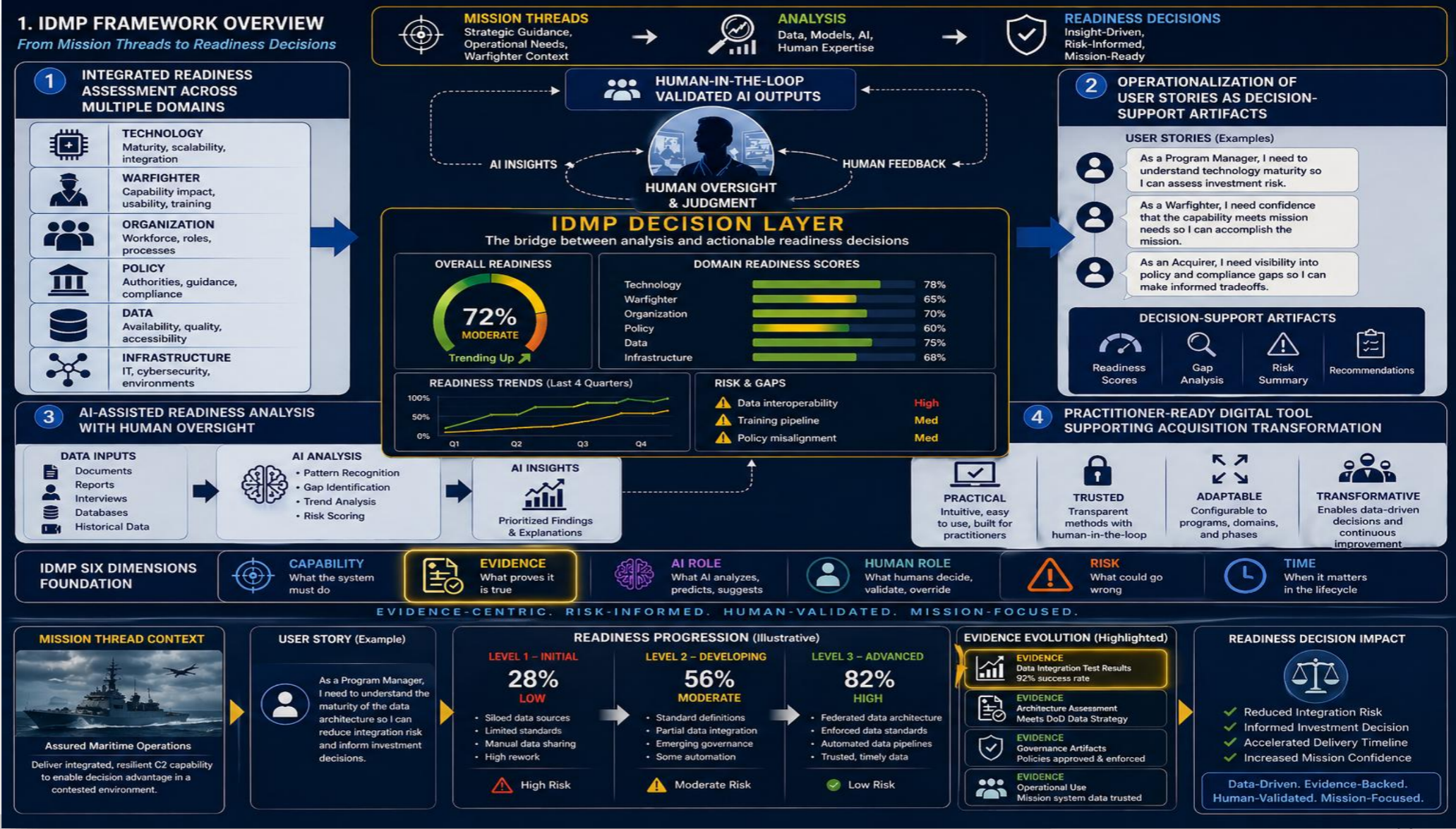
Note any key gaps, risks, or unknowns...



Key Contributions



What This Looks Like in Practice



FUTURE RESEARCH

Advancing IDMP and AI-Enabled Acquisition Decision Support



VISION: Enable data-driven, human-governed acquisition decisions that deliver mission advantage at speed and scale.



1 EXPAND STAKEHOLDER PARTICIPATION ACROSS ACQUISITION COMMUNITIES



RESEARCH FOCUS

Broaden engagement to capture diverse perspectives, validate utility, and drive adoption across the acquisition ecosystem.

OUTCOMES

- Greater representation
- Stronger buy-in
- More relevant outputs

2 VALIDATE MATURITY LEVELS AND READINESS METRICS EMPIRICALLY



RESEARCH FOCUS

Collect empirical data to test, refine, and validate maturity models and readiness metrics across programs and domains.

OUTCOMES

- Evidence-based validation
- Reliable metrics
- Improved model confidence

3 ENHANCE PREDICTIVE ANALYTICS AND AUTOMATED STORY QUALITY ASSESSMENT



- Predict Outcomes & Risks
- Detect Gaps & Dependencies
- Assess Completeness, Clarity, Consistency
- Recommend Improvements

RESEARCH FOCUS

Improve AI/ML models to predict outcomes, identify risks, and automatically assess and strengthen user stories.

OUTCOMES

- Higher story quality
- Better risk prediction
- Faster, smarter decisions

4 EVALUATE OPERATIONAL EFFECTIVENESS IN PORTFOLIO-LEVEL ACQUISITION DECISIONS



DECISION INSIGHTS

- Resource Allocation
- Risk Trade-offs
- Investment Prioritization
- Mission Impact

RESEARCH FOCUS

Assess how IDMP-informed insights drive better portfolio decisions, resource allocation, and mission outcomes.

OUTCOMES

- Improved portfolio performance
- Better resource stewardship
- Stronger mission outcomes

CROSS-CUTTING ENABLERS

- Human-in-the-Loop Governance
- Data & Evidence Integrity
- Ethics & Responsible AI
- Security & Trust
- Standards & Interoperability

ULTIMATE GOAL



Continuously improve IDMP as a trusted, evidence-based foundation for AI-enabled, human-driven acquisition transformation.


Different Approaches – but... Together, we form the architecture of next generation acquisition.

SYNERGY ACROSS THE PANEL

AI-Enabled. Human-Governed. Mission-Focused.

QUANTUM ACQUISITION (JONES)


Acquisition as an interconnected probabilistic network.



- Systems, stakeholders, and events are interconnected.
- Probabilistic modeling captures uncertainty and dynamic change.
- Enables better risk-informed decisions across the acquisition ecosystem.

AUGMENTED ACQUISITION (HAROUN)

Human-centered AI accelerates contracting and compliance workflows.




AI + HUMAN COLLABORATION
Faster • Smarter
More Compliant

- AI automates and augments routine workflows.
- Humans provide judgment, context, and oversight.
- Delivers speed, accuracy, and compliance without losing the human touch.

IDMP

Structured framework translating stakeholder needs into mission-aligned readiness decisions.



IDMP Decision Layer

- Captures user stories and mission context.
- Applies structured dimensions (Capability, Evidence, AI Role, Human Role, Risk, Time).
- Produces actionable, mission-aligned readiness decisions.

— SHARED THEME —

AI-ENABLED, HUMAN-GOVERNED ACQUISITION TRANSFORMATION



-  AI amplifies human expertise.
-  Humans set direction and make decisions.
-  Governance ensures trust, ethics, and accountability.
-  Focused on mission outcomes and warfighter impact.
-  Better decisions. Lower risk. Faster delivery. Stronger readiness.

 Different lenses. Common goal. |  Integrated thinking. Smarter acquisition. |  Mission success. ★



Thank You!

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