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

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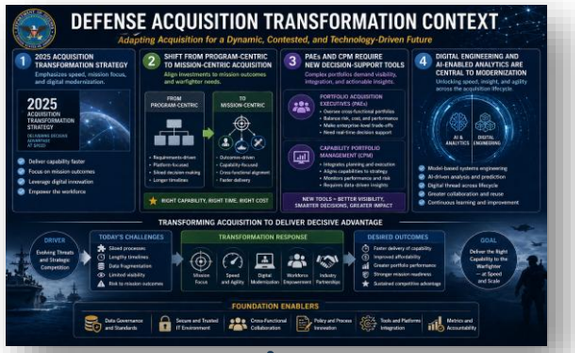
OLD DOMINION UNIVERSITY

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.



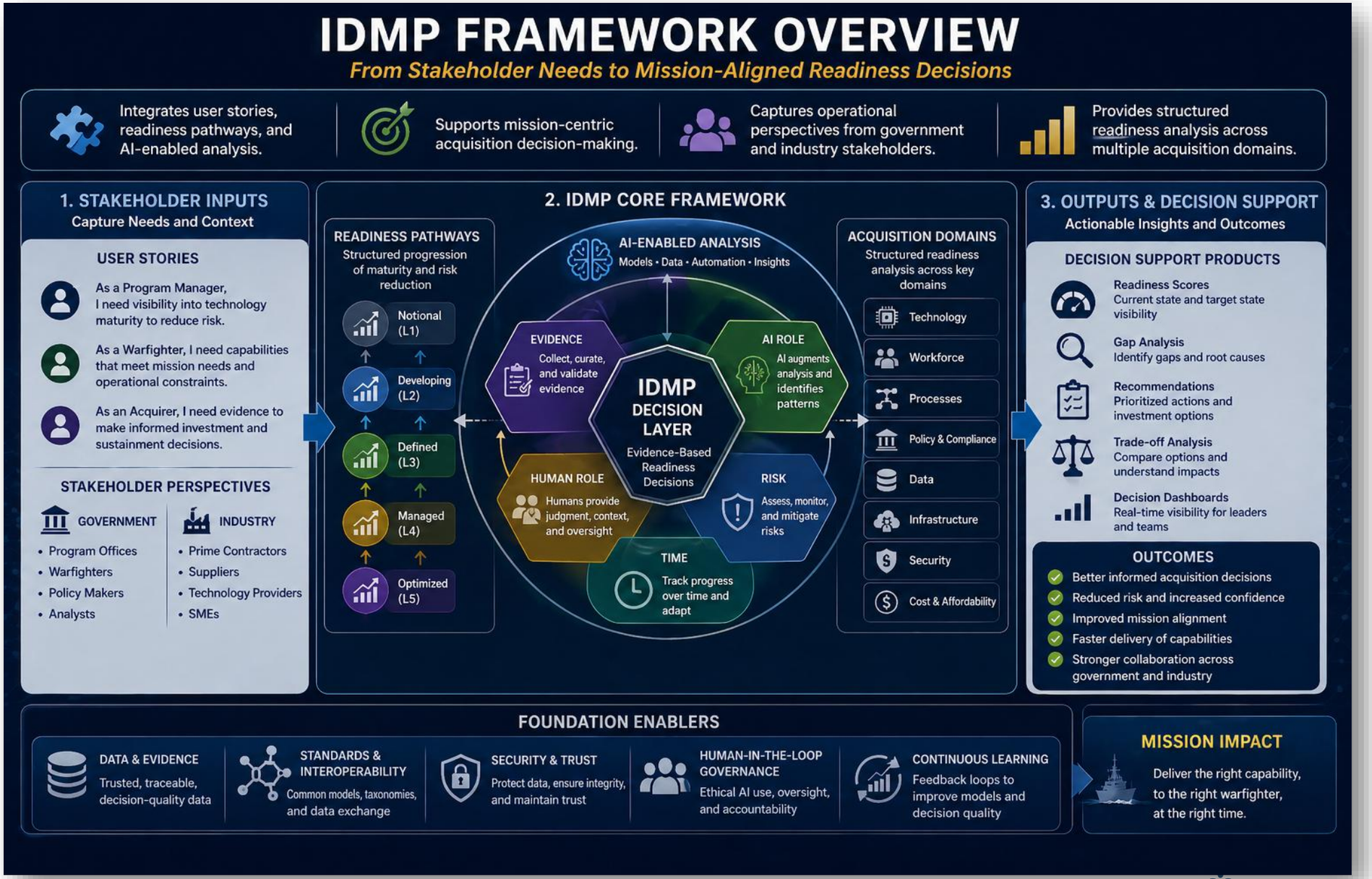
Research Problem

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

Leaders lack integrated visibility into mission readiness impacts.

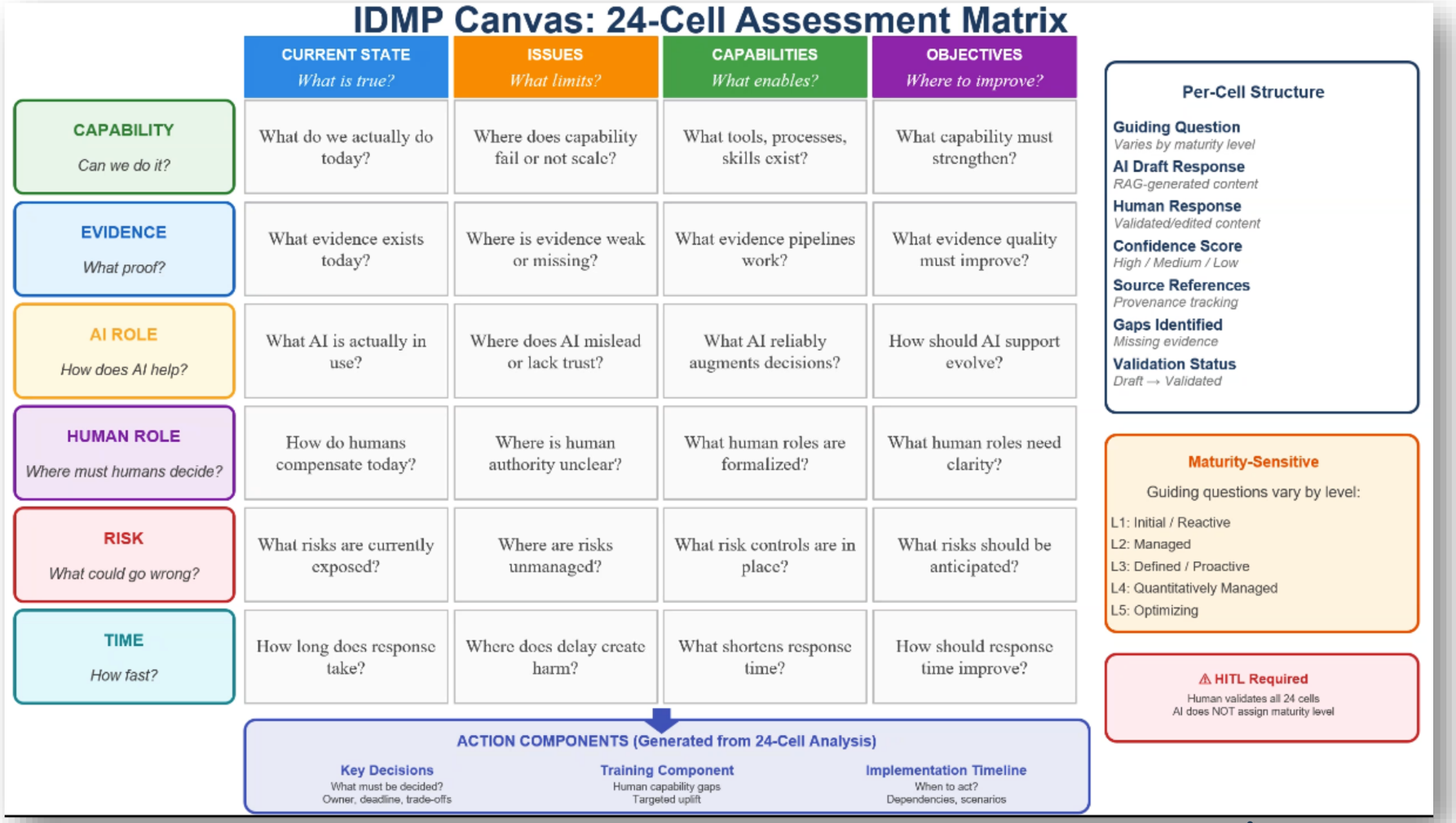
Decision transparency and mission traceability remain limited.

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
Program Offices
Warfighters
Policy Makers
Analysts
INDUSTRY
Prime Contractors
Suppliers
Technology Providers
SMEs
2. IDMP CORE FRAMEWORK
READINESS PATHWAYS
Structured progression of maturity and risk reduction
Notional (L1)
Developing (L2)
Defined (L3)
Managed (L4)
Optimized (L5)
AI-ENABLED ANALYSIS
Models • Data • Automation • Insights
EVIDENCE
Collect, curate, and validate evidence
AI ROLE
AI augments analysis and identifies patterns
IDMP DECISION LAYER
Evidence-Based Readiness Decisions
HUMAN ROLE
Humans provide judgment, context, and oversight
RISK
Assess, monitor, and mitigate risks
TIME
Track progress over time and adapt
ACQUISITION DOMAINS
Structured readiness analysis across key domains
Technology
Workforce
Processes
Policy & Compliance
Data
Infrastructure
Security
Cost & Affordability
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.

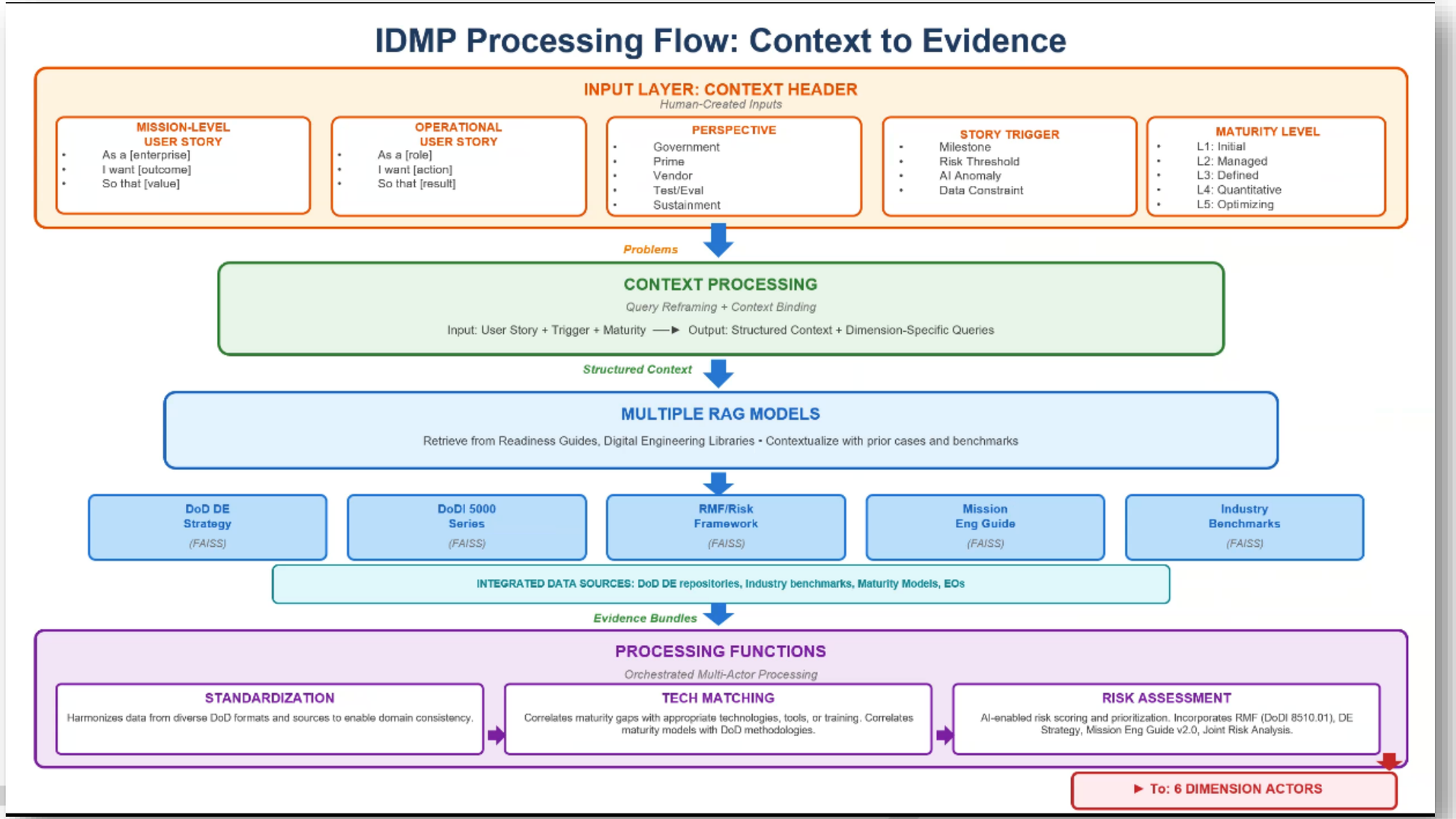
The IDMP Readiness Canvas

- 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.

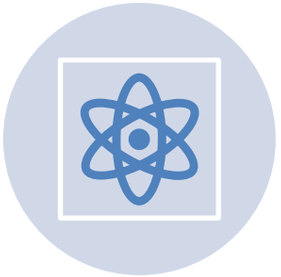
AI/ML analysis for clustering, pattern recognition, and readiness classification.

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].

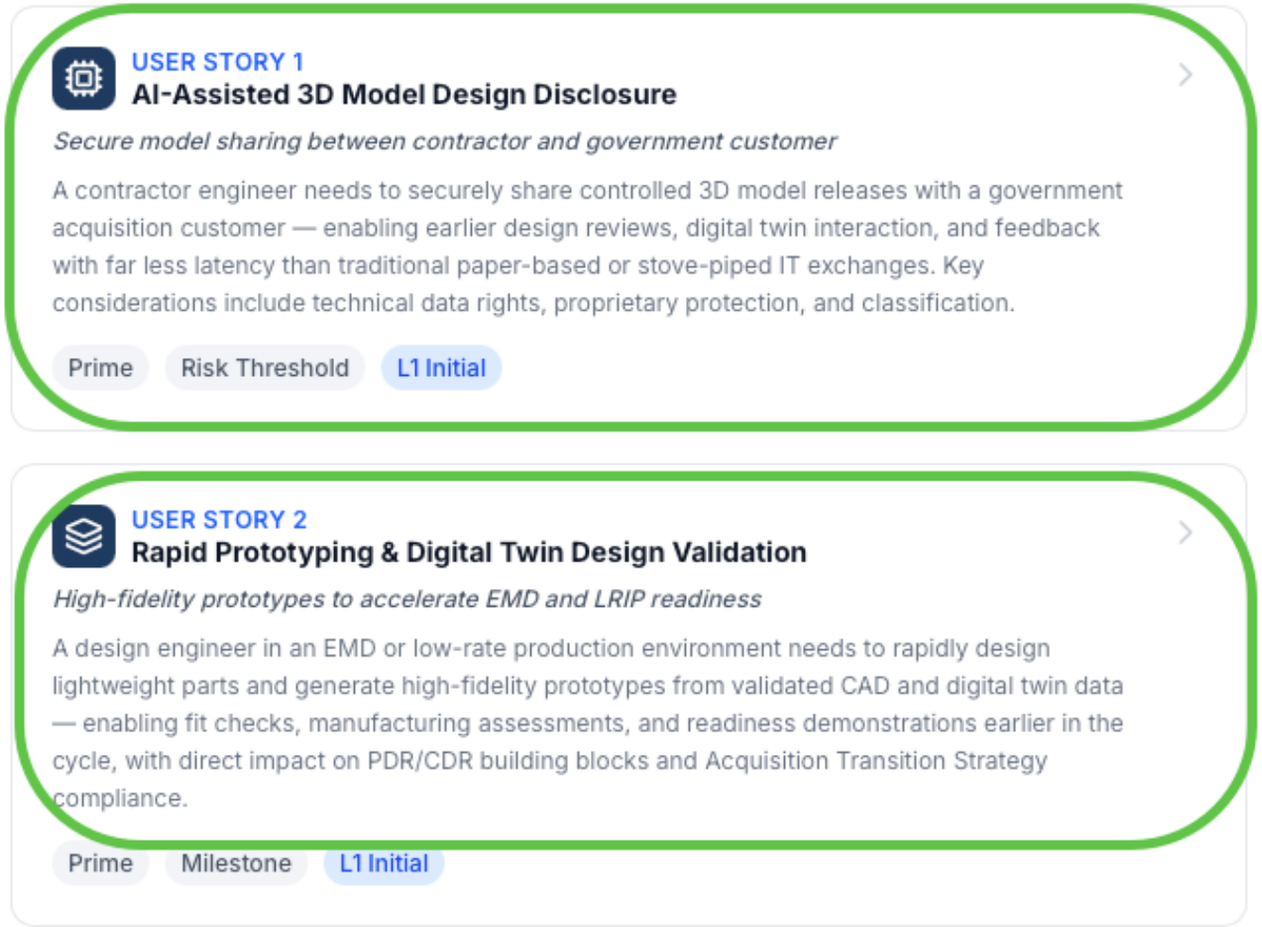


Supports mission engineering, readiness assessment, and portfolio prioritization.

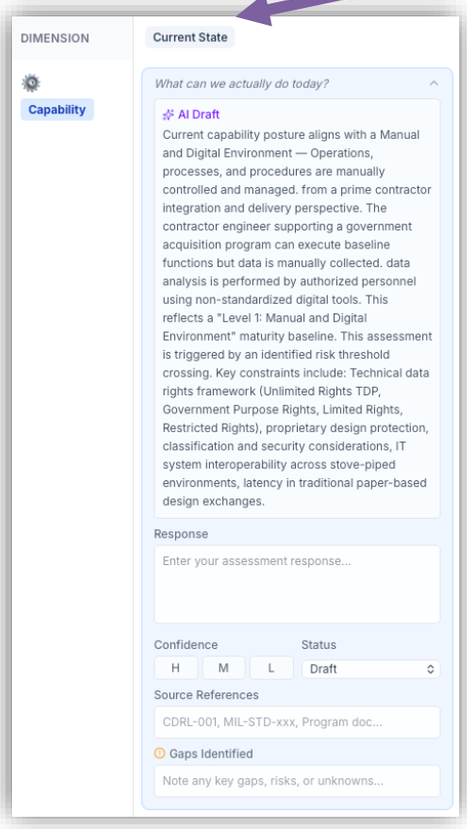
Transforms qualitative stakeholder input into analyzable acquisition data.

Operational User Stories Developed

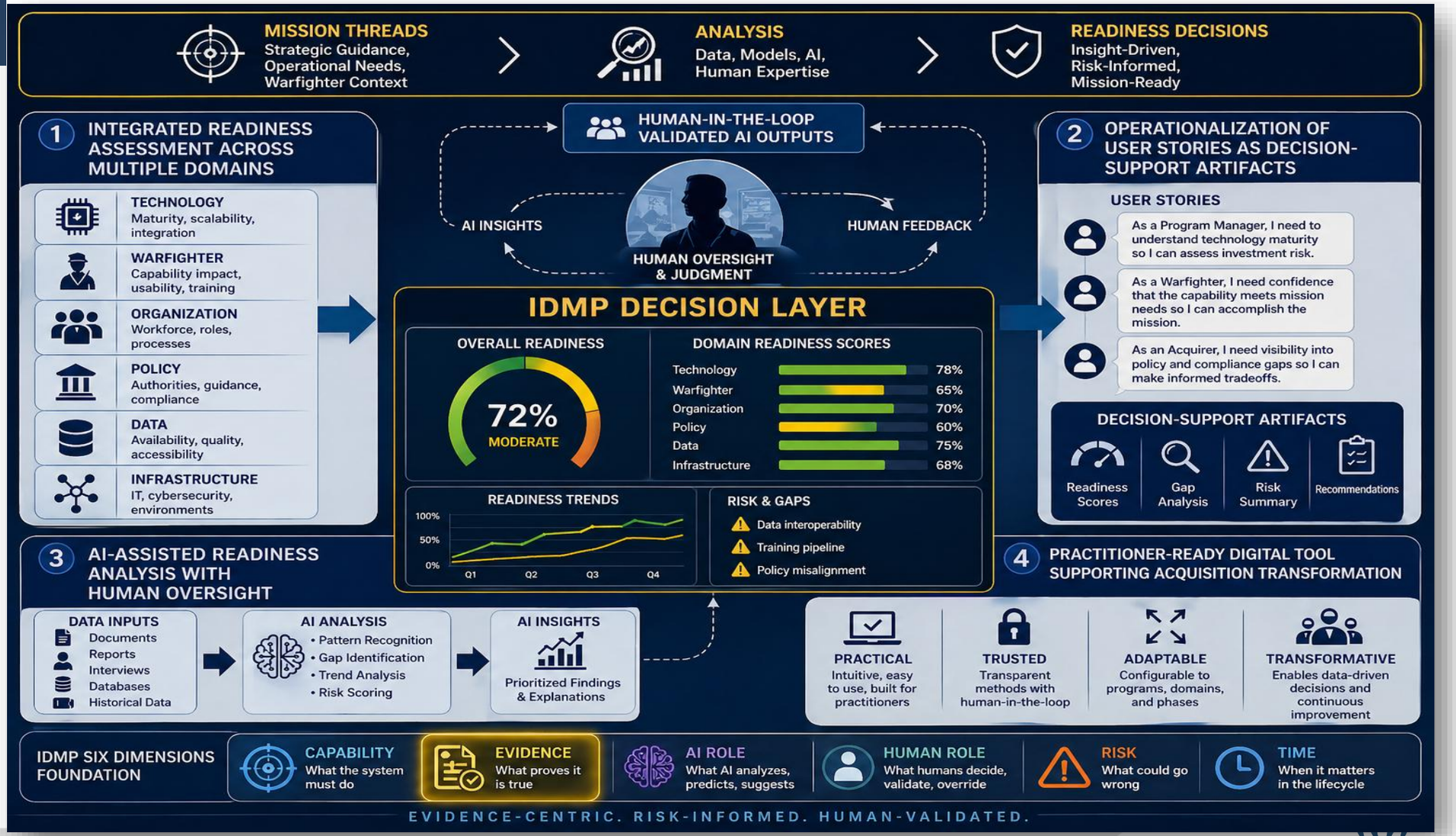
- Both stories reveal implicit mission engineering concerns.
- Highlights need for cross-domain readiness integration.



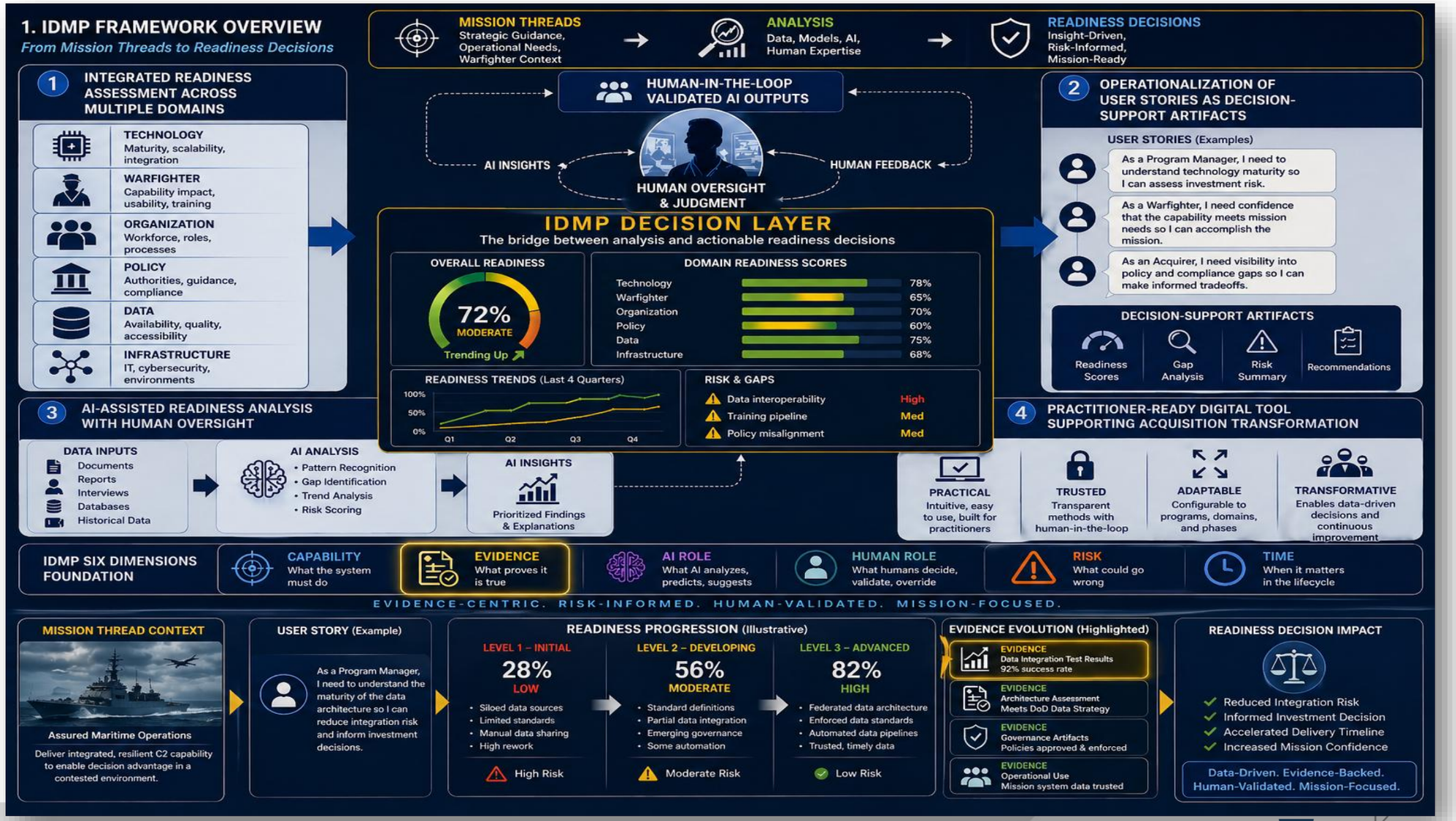
Readiness Canvas Development



Key Contributions



What This Looks Like in Practice



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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

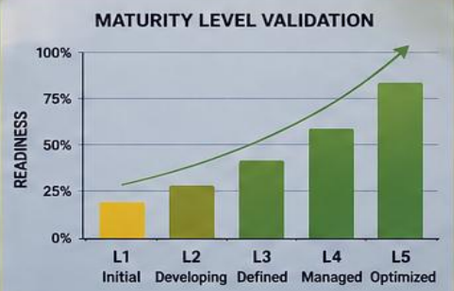
RESEARCH FOCUS

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

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

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.

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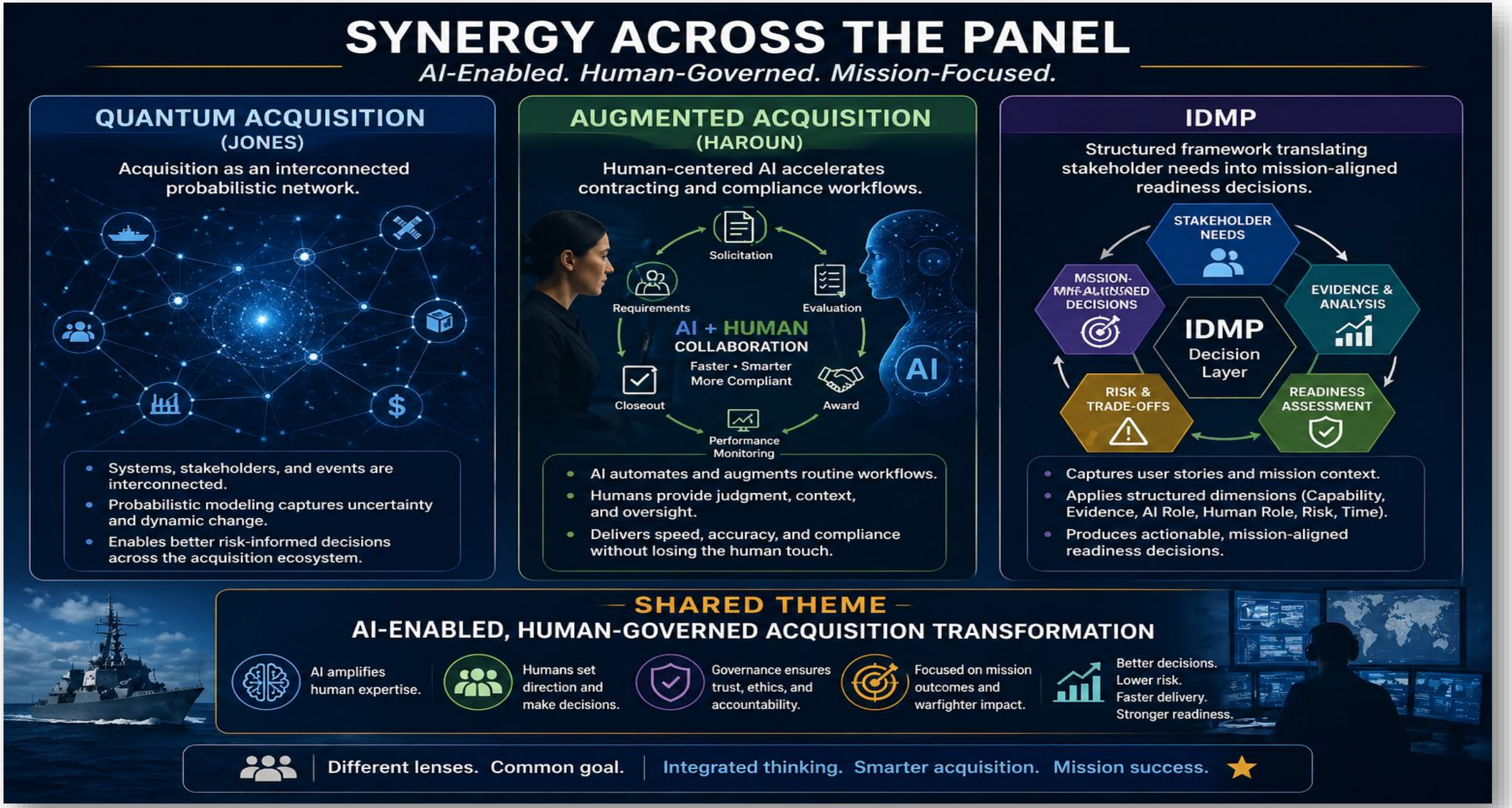
Different Approaches – but…

Together, we form the architecture of next generation acquisition.



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Thank You!

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