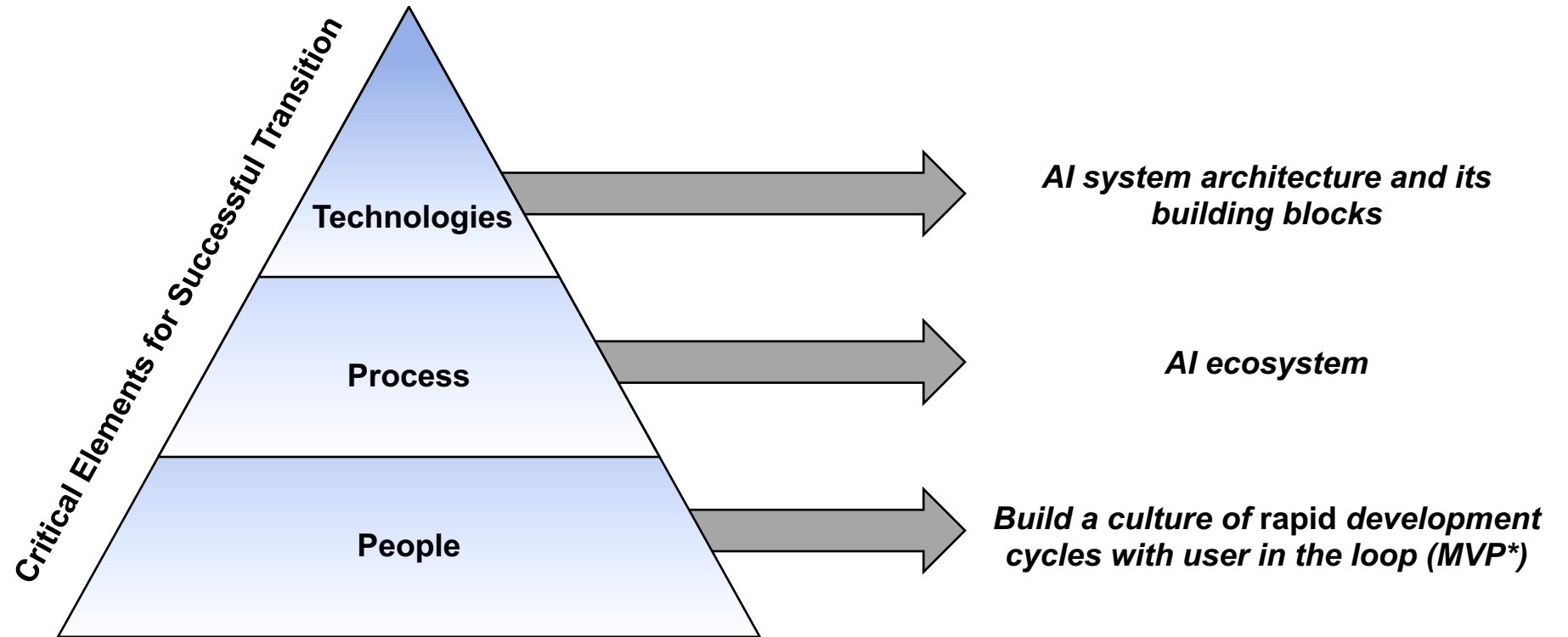
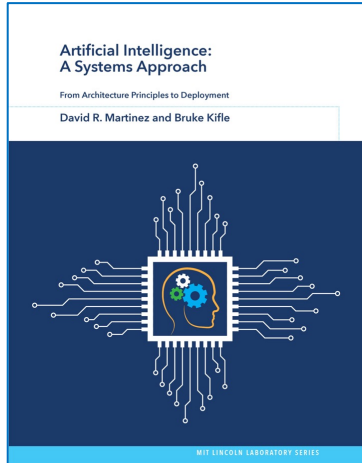




AI Systems Engineering Approach and Implications on the Workforce

Transitioning AI Capabilities to Users



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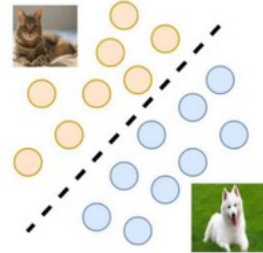
Different Machine Learning Types

Making Room for the Current Revolution



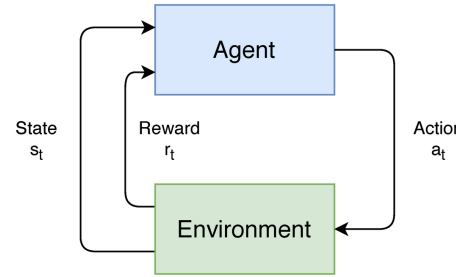
Analytic AI

Unsupervised Learning



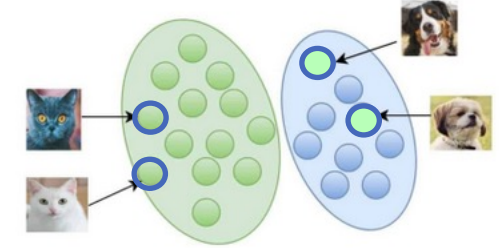
Discriminative AI

Supervised Learning



Interactive AI

Reinforcement Learning



Generative AI

Self-supervised Learning
+ unsupervised learning
+ supervised learning
+ reinforcement learning

Representative Techniques

- Clustering
- Dimension Reduction

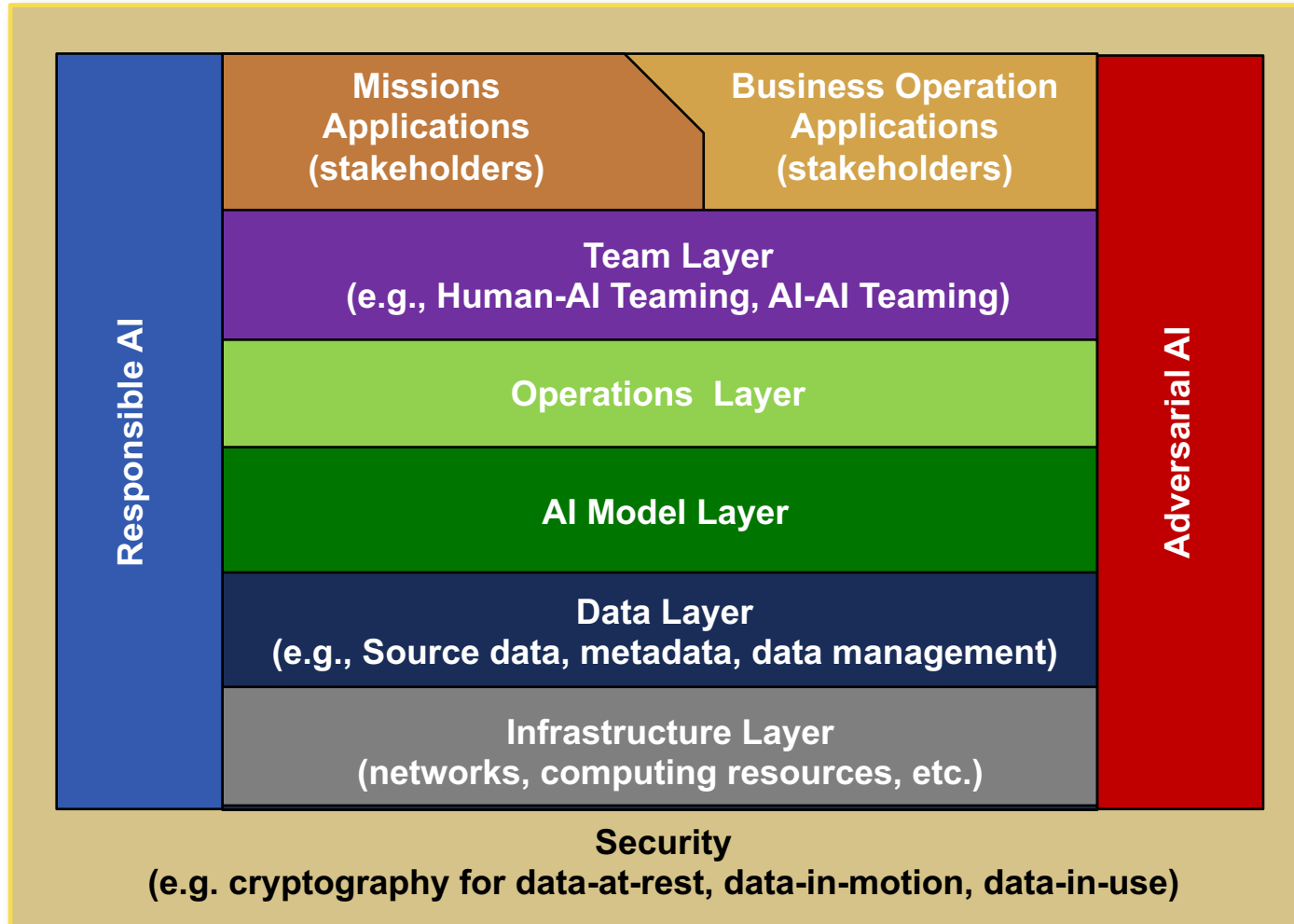
- Classification
- Regression

- Decision making
- Skill acquisition

- Language generation
- Imagery generation
- Base for other AI types



Technology Stack GenAI Stack (Simplified Version of AI System Architecture)

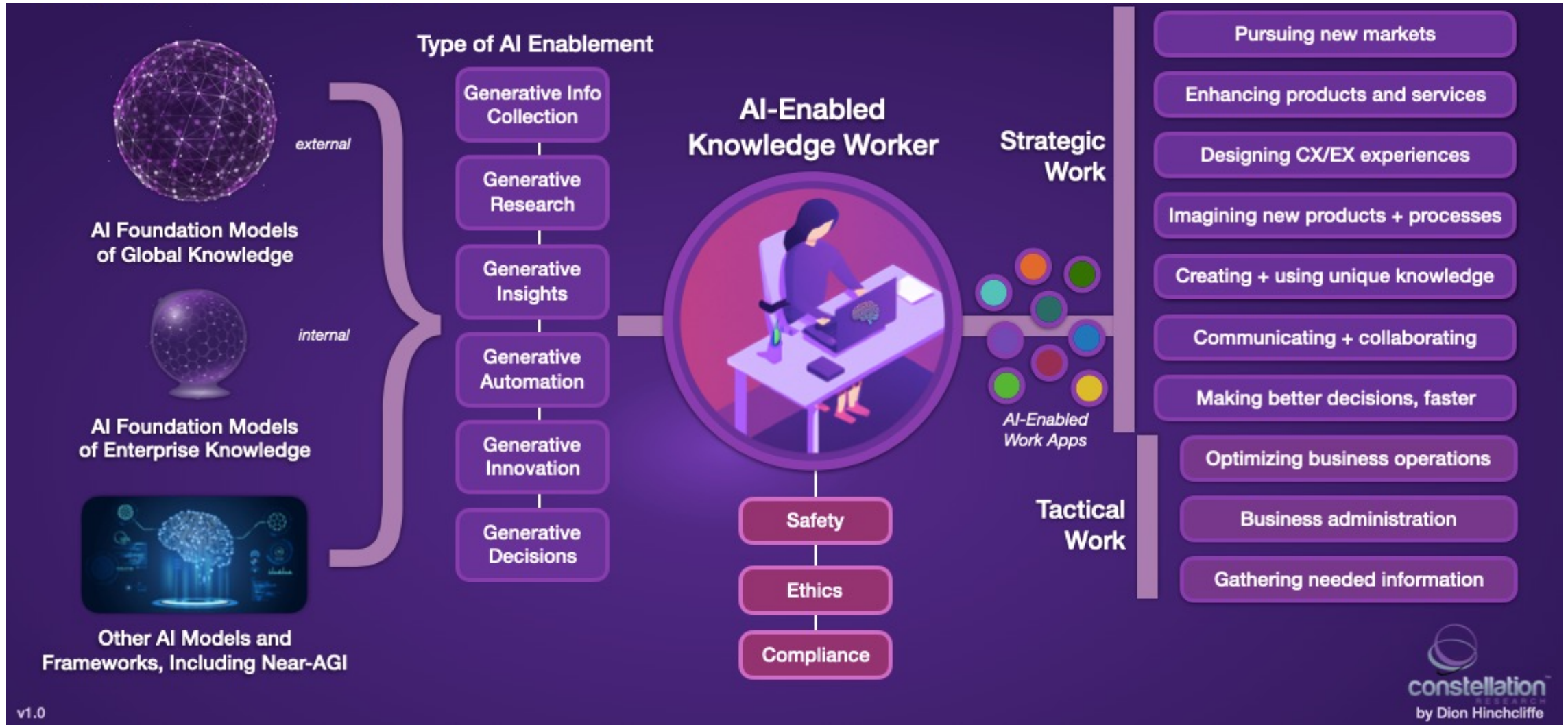


Workforce Skills Needed

- Leadership at the AI governance level
- AI systems engineer
- Data scientists
- Data engineers
- Machine learning scientists
- Machine learning engineers
- Responsible and security engineers
- Implementers and IT subject matter experts



Generative AI and the Knowledge Worker





Systems Thinker Skills

(As Identified in the INCOSE Handbook*)

Essential skills of a systems thinker

- Seeks to understand the big picture
- Observes how elements within the system change over time, generating patterns and trends
- Recognizes that a systems' structure (elements and their interactions) generates behavior
- Identifies the circular nature of complex cause-and-effect relationships
- Surfaces and tests assumptions
- Changes perspective to increase understanding
- Considers an issue fully and resists the urge to come to a quick conclusion
- Considers how mental models affect current reality and the future
- Uses understanding of system structure to identify possible leverage actions
- Considers both short- and long-term consequences of actions
- Finds where unintended consequences emerge
- Recognizes the impact of time delays when exploring cause-and-effect relationships
- Checks results and changes actions if needed: "successive approximation"





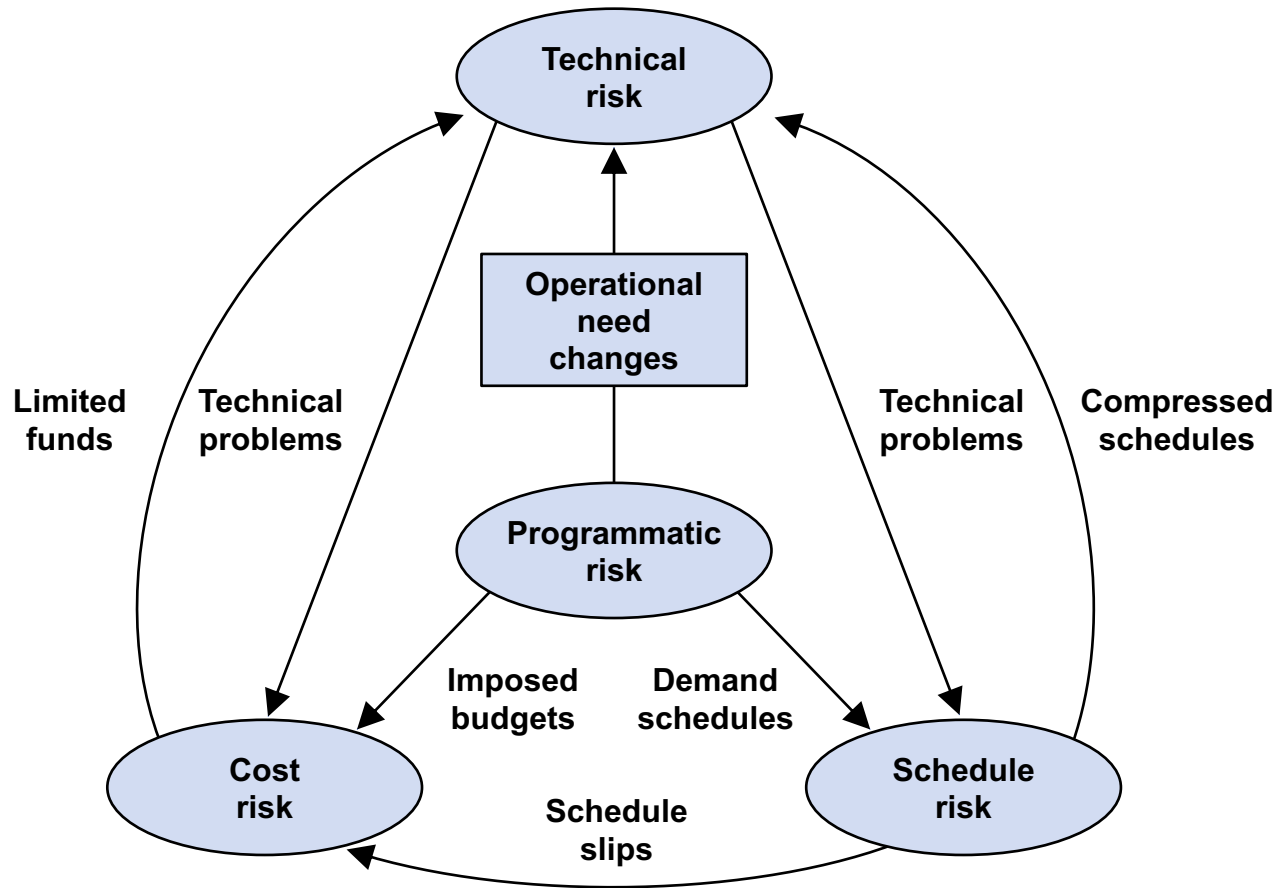
AI Sociotechnical Systems: Harms

Individual	Collective/Organizational	Societal
Physical Safety	Financial performance	National security
Privacy	Equity and fair treatment	Economic stability
Digital Safety	Access to consequential services	Political stability
Financial health	Reputational integrity	Infrastructure/ integrity
Equity and fair treatment		

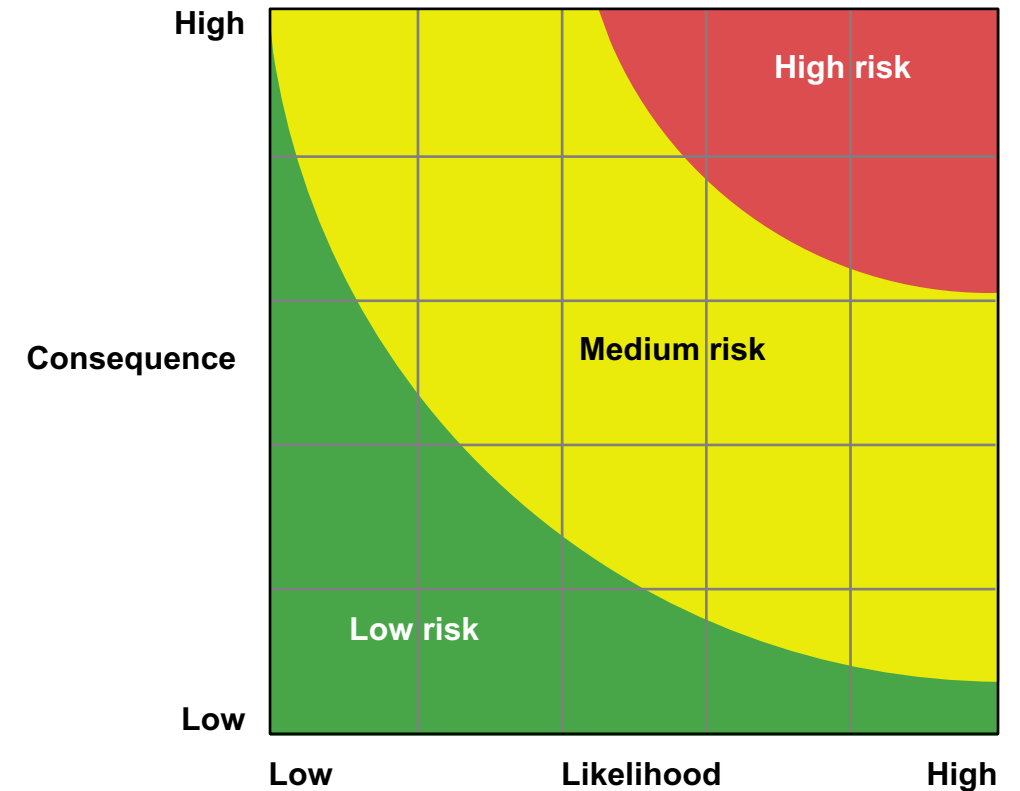


An Example of Applying System Engineering Principles to AI - Risk Management -

Risk Categories



Risk Levels





Recommendations

Systems Engineering and AI	Workforce Implications
<ul style="list-style-type: none">• Must start by having a well-defined system needs (business acumen)• GenAI can help in organizing system specifications• AI developments should include system architects/engineers, in addition to machine learning developers, and AI integrators• GenAI can increase productivity during the system integration, verification and validation. The How: creating simulated/emulated data and summarizing performance results	<ul style="list-style-type: none">• Educate the workforce on systems engineering principles• Users at the mission level must understand and be educated on the capabilities afforded from both traditional AI and GenAI• Business operations and decision makers will be more productive when using GenAI. Examples: HR, Finances, Contracting, Reporting, etc....• Digital natives will expect AI tools in their work environment• AI system engineers will be in high demand to best transition products/services from development to production

Better understanding of the System Engineering discipline is needed to successfully deploy AI capabilities within the triad of People-Process-Technologies