



Research Question: How can Humans and AI Form Effective Engineering Teams?

INCOSE Augmented Intelligence for Systems Engineering

International Council on Systems Engineering (INCOSE) Challenge Team, Chartered 2018

Purpose: Effectively pair human and machine intelligence to improve systems engineering

The goal of the Augmented Intelligence for Systems Engineering challenge team is to further the understanding of how computational approaches, such as artificial intelligence, machine learning, and data science, can collaborate with human systems engineers to measurably improve the system engineering effort. The challenge team will seek out approaches that enhance human capabilities in systems engineering.

What is Augmented Intelligence for SE?

A complement, not a replacement, to human intelligence

Helping humans become faster and smarter at the tasks they're performing

$$\begin{aligned} \text{AuI} &= \text{Human} + \text{AI} \\ &> \text{Human} \\ &> \text{AI} \end{aligned}$$

Team:

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- Mr. Troy Peterson, SSI
- Mr. Mark Petrotta, SSI
- Dr. Donna Rhodes, MIT
- Mr. Bill Schindel, ICTT System Sciences

Cited:

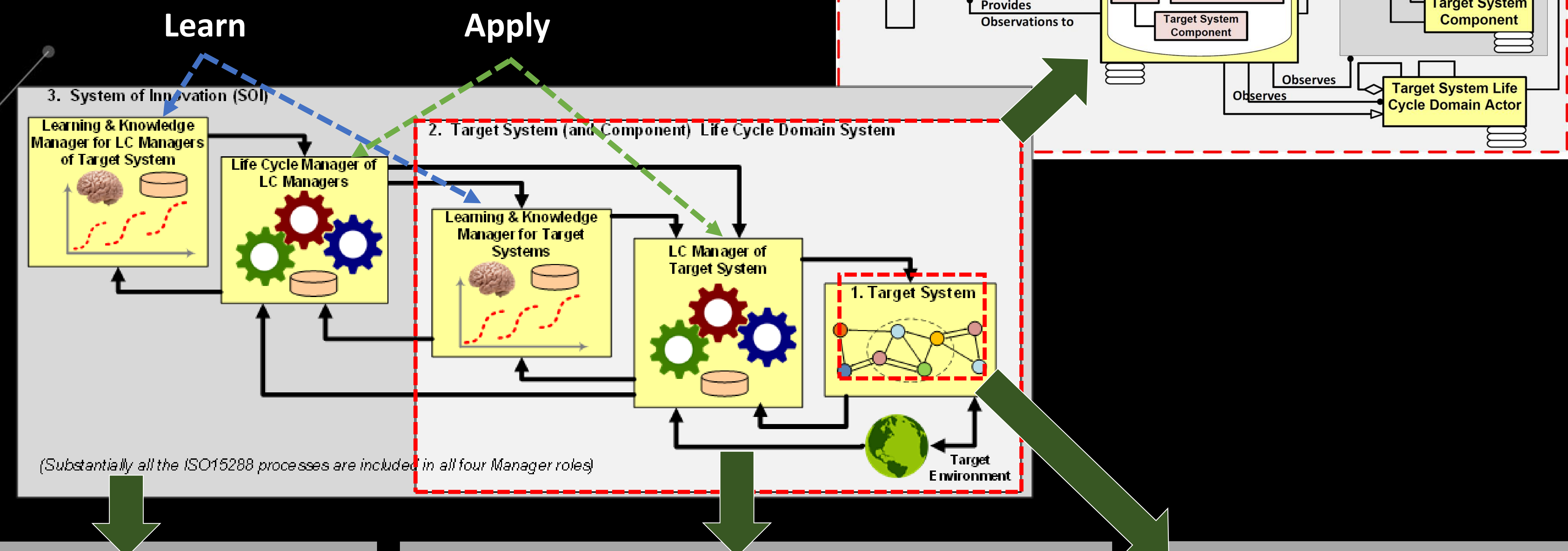
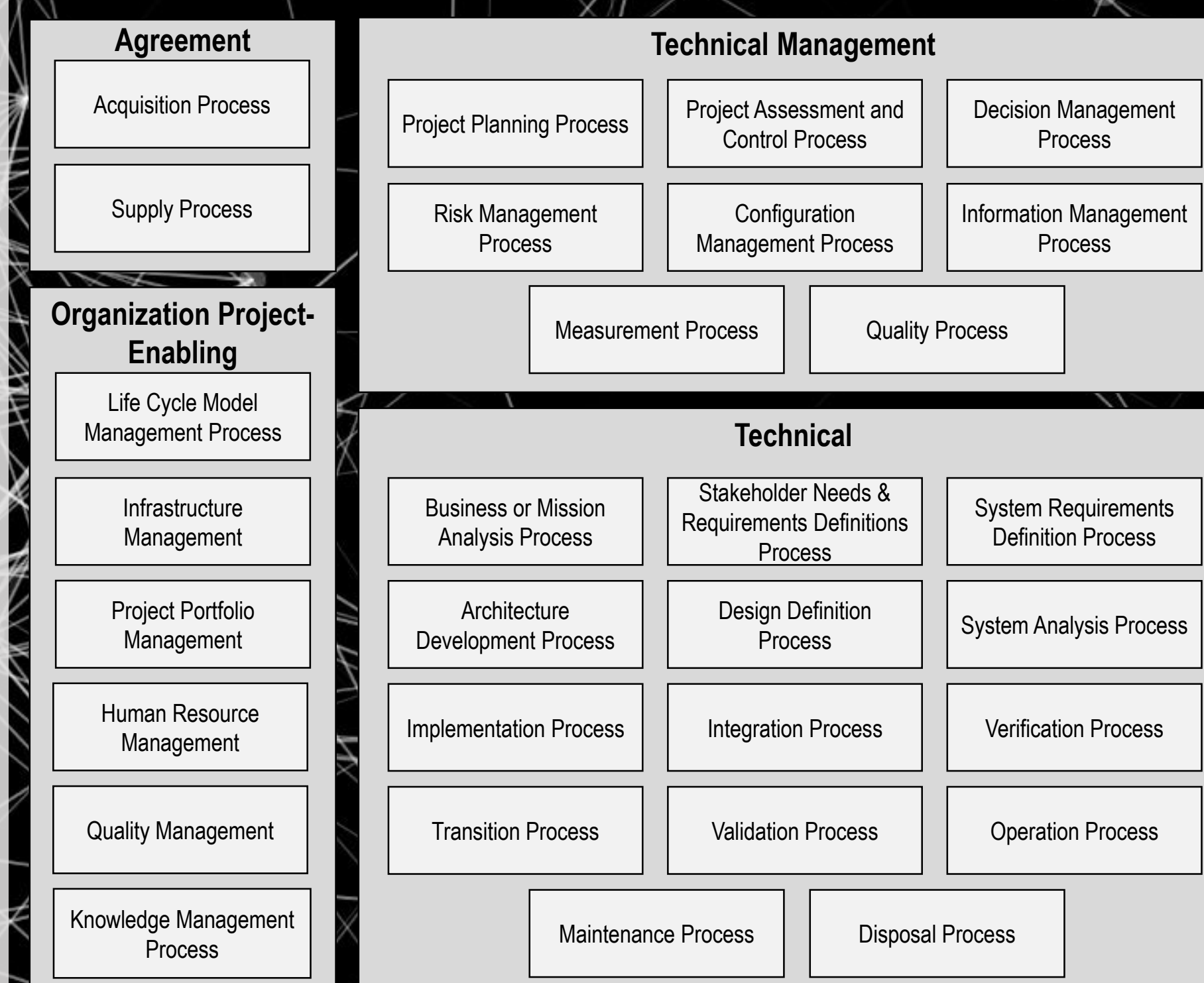
- (1) Schindel and Dove, "Introduction to the ASELCM Pattern", in Proc. of INCOSE 2016 International Symposium, Edinburg, UK, July, 2016.
- (2) Why is Human-Model Interactivity Important to the Future of Model-Centric Engineering?, . . . NASA/JPL Symposium & Workshop on Model-Based Systems Engineering, Dr. Donna H. Rhodes

Conceptual Model: AI Augmentation

Framework to analyze the nature, capabilities, relationships of three systems for Human/Computer Interaction

- How do humans interact with models and model-generated information?
- How do humans interact with each other using models?
- What cognitive challenges exist for model-informed decision-making?
- What are essential human roles in model-centric environments?
- How can interactivity of humans and models be made more effective?

The ISO/IEC 15288 is a systems engineering standard covering processes and lifecycle stages



System 3: AI as a co-manager for cross-domain efficiency, effectiveness and innovation for System 2

Trust Relationship: AI will enhance understanding and discovery to better communicate, collaborate, and share critical information about engineering processes in timely manner.

System 2: AI as a collaborator in the system lifecycle processes for System 1

Trust Relationship: Models & AI will provide unbiased insights into patterns expressed by data, and assist the engineering team in applying learned patterns, in a manner that improves the technical and operational aspects of systems engineering.

System 1: AI embedded in target system / target environment

Trust Relationship: AI will perform reliably and predictably under anticipated conditions, and will gracefully degrade when unable to perform tasks.

Open Questions: How to maintain trust relationships in a Digital Engineering environment with Model to Model interactions? Must "through-person" be human? How does conceptual model change if not?

Through Person Trust
User without technical insight into model may rely on "through person" as basis for trusting

Conceptual Model for "Through-Person" Trust:

