AFRL

IMPLEMENTING THE DIGITAL TRANSFORMATION TRIFECTA IN AIR FORCE RESEARCH LAB'S 711 HUMAN PERFORMANCE WING WITH THE DIGITAL FUSION CELL TO MAKE IT SIMPLE

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Agenda

- 711 HPW 2023 Strategic Plan (Goal 1)

- DoD Digital Engineering Vision, Definition and Goals

- 711 HPW Digital Engineering / Transformation Vision

- 711 HPW Digital Engineering / Transformation Challenges

- Our Digital Transformation Trifecta Approach

- Applying Systems Thinking

- Applying Systems Engineering

- Applying Digital Engineering

- Trifecta in Action: Digital Fusion Cell

- Trifecta in Action: CRAFT Use Case Example

- Summary

711 HPW 2023 Strategic Plan (Goal 1)

Goal 1: Operate efficiently and effectively as one Wing with one voice.

The Wing is a complex organization. *We are part of AFRL, and we have a functional alignment to support the Air Force Surgeon General as well as the larger Military Health System.* We embrace a rich legacy, but we are firmly focused on the future. *We are organized into two mission units, but there is a distinct and powerful synergy to be gained by operating as One Wing.* In order to fully exploit the Wing's expertise and capabilities , *Goal 1 is focused on developing and implementing a Wing Operating Model, Digital Engineering Ecosystem and Continuous Learning Practices to ensure we operate as efficient and effective as possible.*

- **Objective 1.1:** Design, develop, and implement a Wing Operating Model
- **Objective 1.2:** Implement digital engineering for improved mission execution
- **Objective 1.3:** Foster continuous learning and improving practices

DoD Digital Engineering Vision, Definition and Goals

Vision: DoD vision for digital engineering is to _modernize how the Department designs, develops, delivers, operates and sustains systems_

Definition: DoD defines digital engineering as an _integrated digital approach_ that uses the _authoritative sources of system data and models_ as a continuum across disciplines to _support lifecycle activities_ from concept through disposal.

Goals:

1. Formalize the development, integration, and use of models to inform enterprise and program decision making

2. Provide an enduring, authoritative source of truth

3. Incorporate technological innovation to improve the engineering practice

4. Establish a supporting infrastructure and environment

5. Transform the culture and workforce to adopt and support digital engineering

711 HPW Digital Engineering / Transformation Vision

Goal: Create a seamless, safe and secure, cost-effective digital engineering, data management and analytics ecosystem to support the workforce in performing research and analysis and support leadership with making business decisions

- **Expectation 1.2.1:** Develop an ecosystem to sustain digital engineering.
- **Expectation 1.2.2:** Implement digital business operations to improve access to data, tools, and processes.
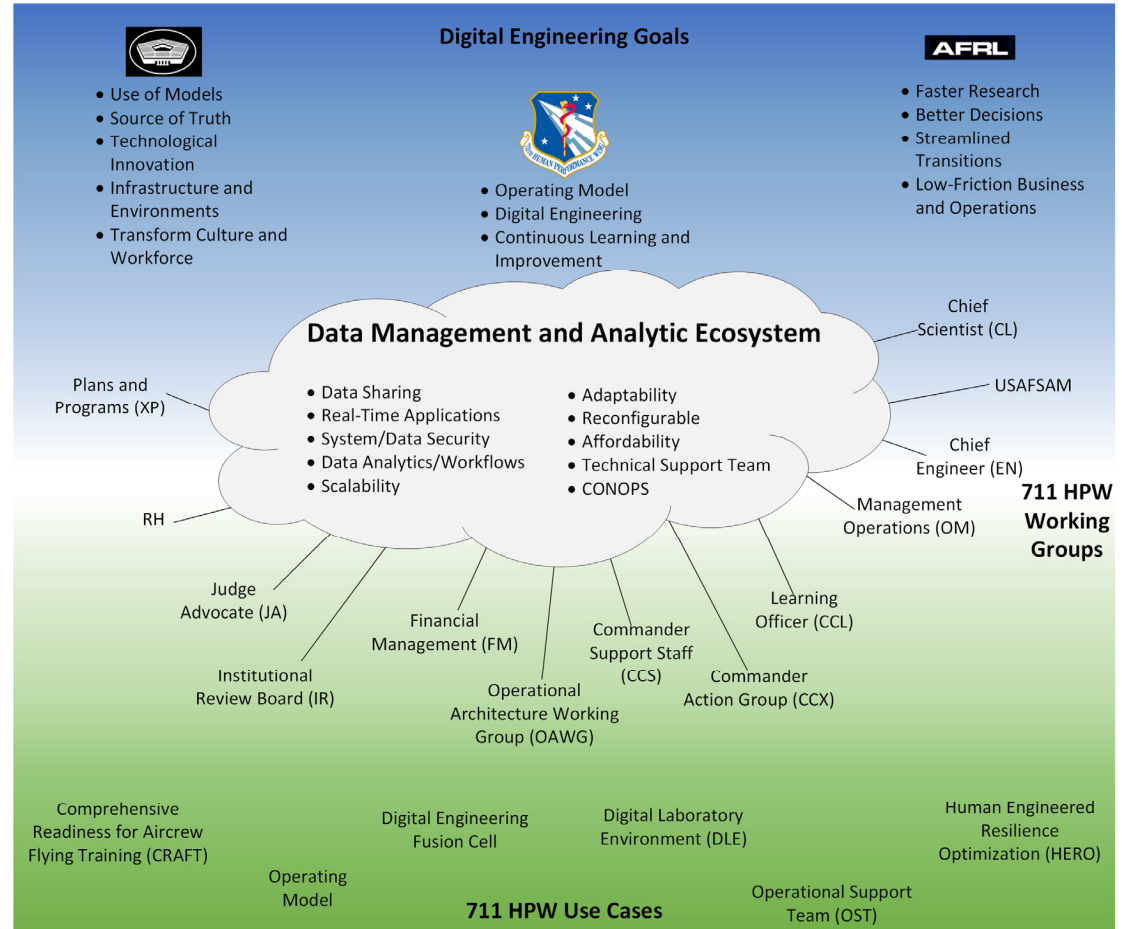
711 HPW Digital Engineering/Transformation Challenges

- Tailored systems engineering practices early in the acquisition cycle
- Robust program management practices early in the acquisition cycle
- Data sharing across the enterprise
- Data storage and retrieval
- Data analytics to enable informed decision making
- Data security
- Data/Information visualization
- Improved business operations (research, education, consultation)
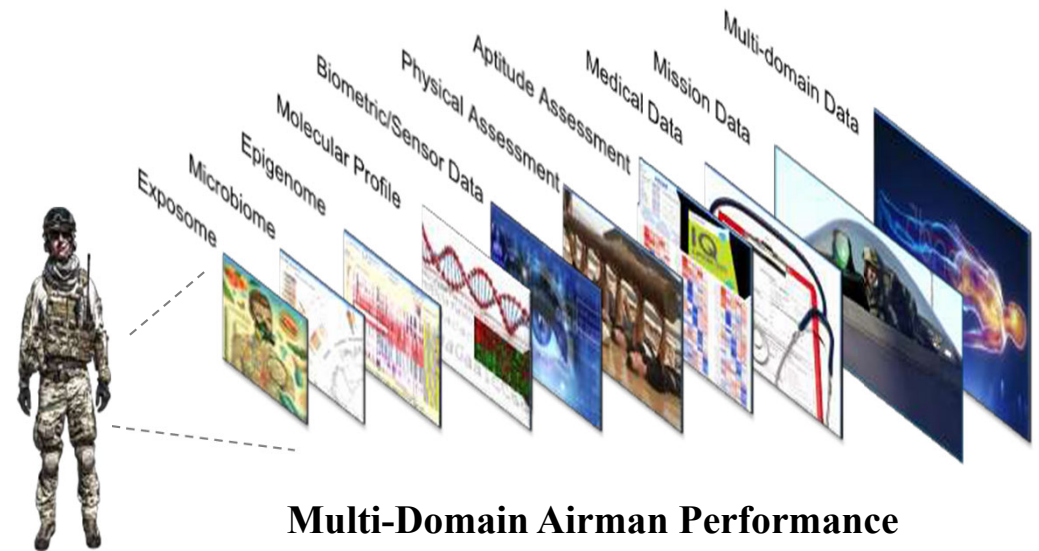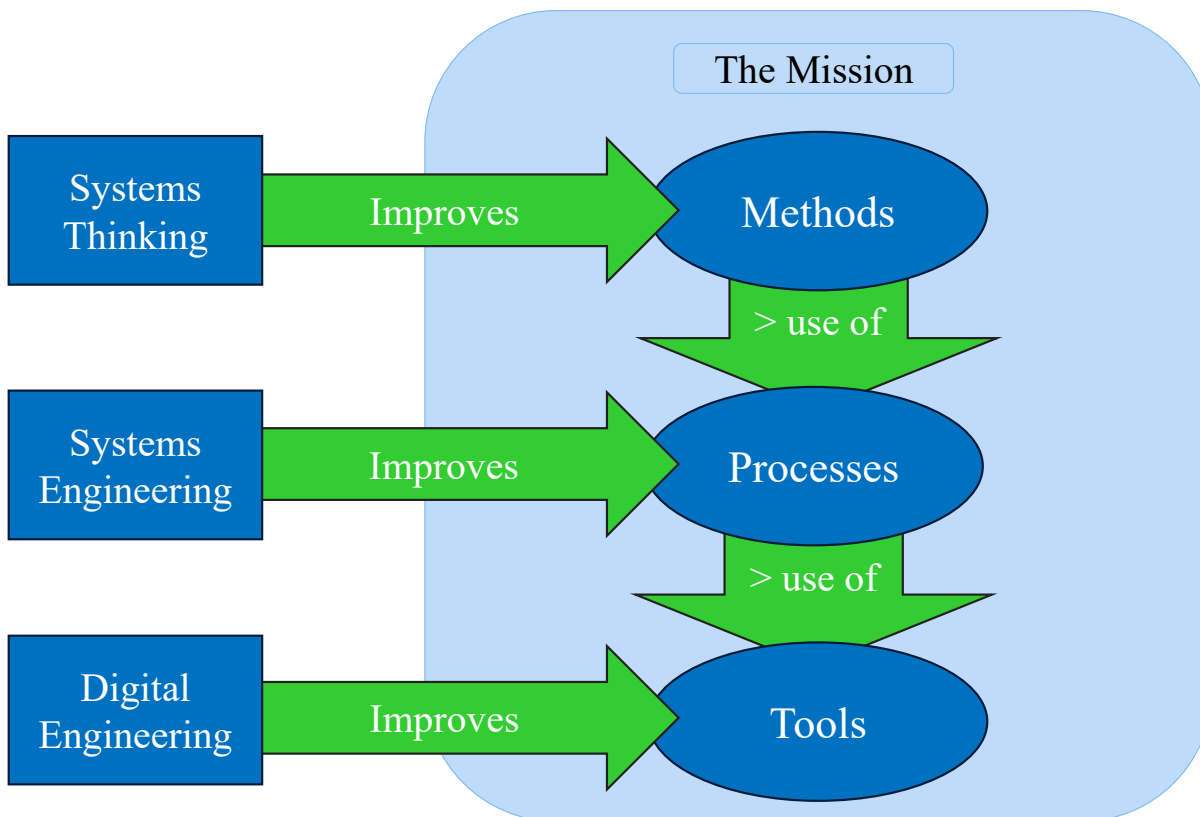
Multi-Domain Airman Performance

DIGITAL TRANSFORMATION TRIFECTA

Our Digital Transformation Trifecta Approach

Digital Transformation Trifecta = Systems Thinking x (Systems Engineering + Digital Engineering)

The Mission

Systems Thinking → Improves → Methods

> use of

Systems Engineering → Improves → Processes

> use of

Digital Engineering → Improves → Tools

✓ **Systems Thinking**
  - Understanding the Key Problems

✓ **Systems Engineering**
  - Wisdom on Solving Problems

✓ **Digital Engineering**
  - Solving the Problems Together

Our Approach
  - Digital Transformation Trifecta

Entity Who Applies Our Approach
  - Digital Fusion Cell

Our Initial Customers
  - AFRL 711 HPW Use Cases

Applying Systems Thinking

"A problem well defined is a problem half-solved." - John Dewey

Formal Systems Thinking approach to understand the problem:

- Making **Distinctions**
- Organizing **Systems**
- Recognizing **Relationships**
- Taking **Perspectives**

Figure 2. INCOSE ASELCM Level 0 Reference Model—Systems 1, 2, and 3.

Our DTT Approach leverages **Systems Thinking**:

- Throughout the Entire Life Cycle
- To Better Define The Problem
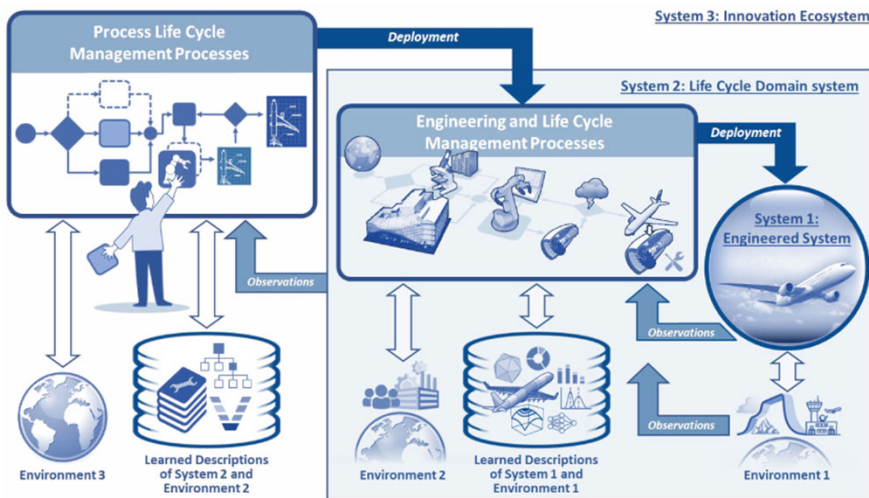- As A Critical Input to the Systems Engineering Process

- ✓ **Mind Mapping**
  - Understand the Current State and Pain Points
- ✓ **Sketching**
  - Getting Ideas Out of Your Head
- ✓ **Systems Thinking Approaches (DSRP, VMCL, etc…)**
  - Structuring Your Framework for Implementation

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Applying Systems Engineering

Guiding the Workflow Across All Stakeholders Including Non-Systems Engineers

Our Challenge with **Systems Engineering**:

- **Welcome** stakeholders without a background in it

- **Make it Easy** to use by default

- Help Everyone See **The Big Picture and Their Role In It**
  - Enterprise Architecture with Archimate Language

- Provide a **Method** to Guide Systems Modeling
  - Arcadia Method

Our DTT Approach leverages **Systems Engineering**:

- To Make Sure That Mission Processes are Clearly Defined

- To Make Sure That Mission Processes are Complete

- To Account for the Entire Life Cycle
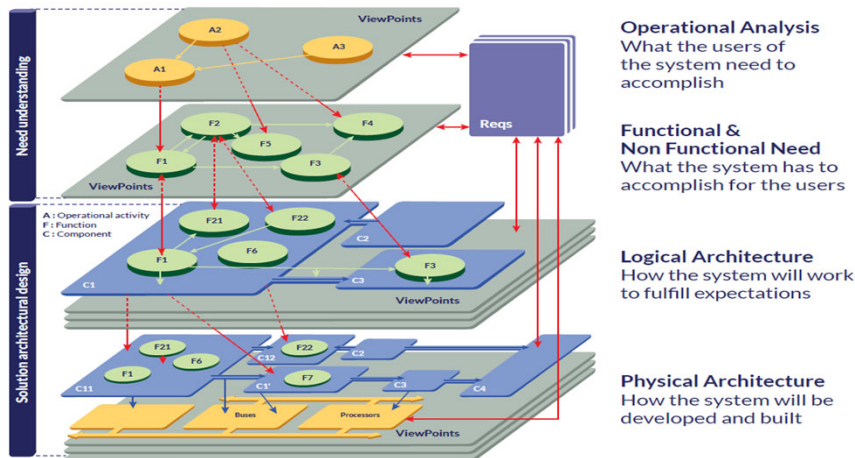
✓ **Defining and Implementing Processes**
  - Assessing Gaps In Current State vs. Best Practices

✓ **Utilizing Standards**
  - ISO/IEC/IEEE 15288, 42010, DODAF, TOGAF, etc…

✓ **Putting Methods and Processes Into Practice**
  - Improving Workflow for PMs and All Stakeholders

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Applying Digital Engineering

Facilitating Growth of the Digital Engineering Capability

The Five Goals of **Digital Engineering** are addressed:

- Transitioning Stakeholder Workflows into **Models**
- Establishing **Source of Truth** with Digital Ecosystem
- Leading **Innovation** for the Wing and Developing Capability
- Best Practices for the **Infrastructure and Environment**
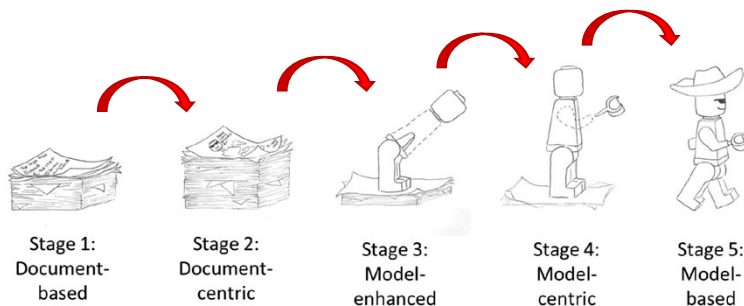- Transforming **Culture and Workforce** and Growing Capability

Figure 2.10 – The evolution of MBSE (Holt & Perry 2020)

Digital Maturity

Our DTT Approach leverages **Digital Engineering**:

- After Determining the Right Problems to Solve
- After Aligning Methods and Processes to the Right Problems
- To Provide The Right Tools To Address Your Unique Problems

✓ **Enterprise Architecture**
  - Understanding The Big Picture and Your Role In It

✓ **Systems Modeling**
  - Using MBSE as the Standard for Systems Engineering

✓ **Digital Ecosystem Usability for Program Management**
  - Improving Efficiency with Real-time Stakeholder Collaboration

✓ **Digital Mindset Development**
  - Converting PMs into Advocates for Digital Transformation
  - Tool Agnostic Learning of Concepts
  - "Doing Digital Engineering" on Day One
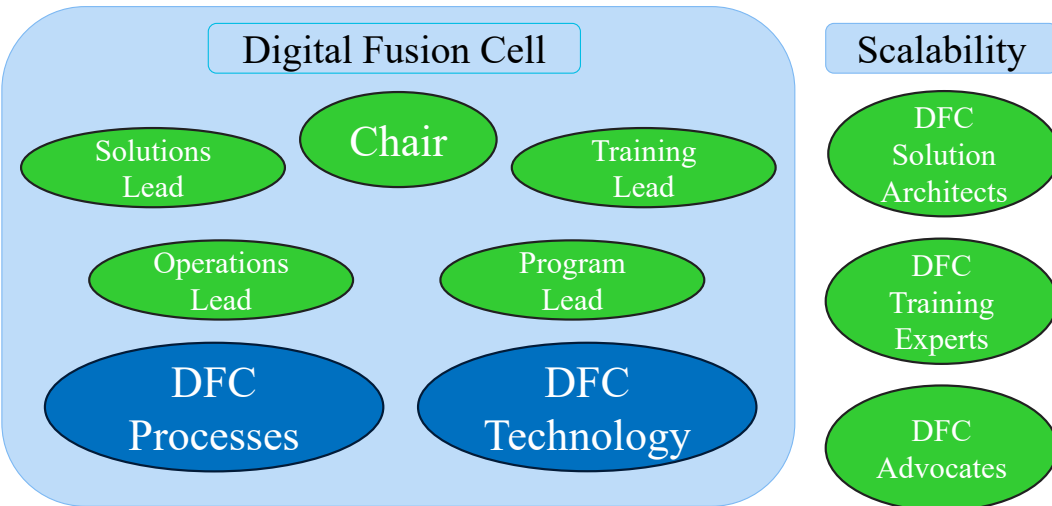
Trifecta in Action: Digital Fusion Cell

Team of Subject Matter Experts for Enabling Digital Transformation

Our Digital Fusion Cell who applies our DTT Approach:

- Is a **New Team** of **Subject Matter Experts**
- Consists of **People**, **Processes**, and **Technology**
- Integrates **Best Practices** into the AFRL 711 HPW
- Provides **Solutions** to Use Cases and Interested Parties
- Provides **Training** to Use Cases and Interested Parties

The DFC enables **Digital Transformation**:

- Serving as an **Advisory Board** to the Chief Engineer's Office
- Developing **New Domain Experts** and **Sharing Knowledge**
- Incorporating **Continuous Learning and Improvement**
- Seeks to **Lead the Digital Transformation Effort** in 711 and Beyond
  - Currently Piloting our Concept with Use Cases
    - AFRL Digital Ecosystem
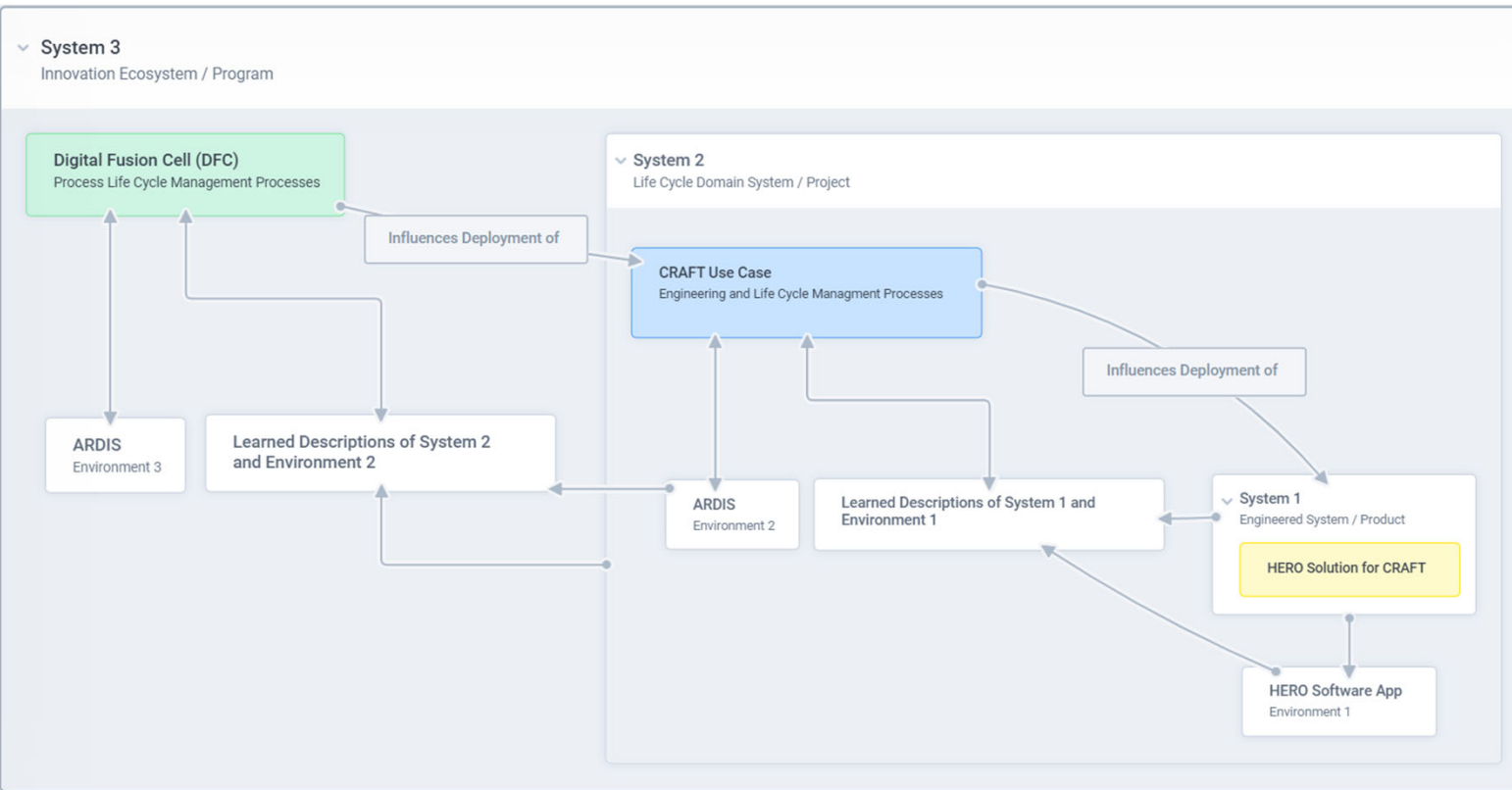   - CRAFT
    - OST
    - Digital Thread
    - HRDE

✓ **Consultation and Mind Mapping**
  - CRAFT, OST, Digital Thread, HRDE

✓ **Enterprise Architecture**
  - AFRL Digital Ecosystem, Digital Fusion Cell

✓ **Systems Modeling**
  - HERO Solution for CRAFT and OST Use Cases

Digital Fusion Cell

- Solutions Lead
- Chair
- Training Lead
- Operations Lead
- Program Lead
- DFC Processes
- DFC Technology

Scalability

- DFC Solution Architects
- DFC Training Experts
- DFC Advocates

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Trifecta in Action: CRAFT Use Case Example

The CRAFT Use Case:

- Comprehensive Readiness for Aircrew Flying Training

- Goal is **Better Pilots Faster**

- Will Incorporate Human Engineered Resilience Optimization (**HERO**) as a Solution

We are Reducing Pain Points by:

- Transitioning Stakeholder Workflows into **Models**, Establishing **Source of Truth**, and Integrating **Best Practices**
    - DFC MBSE Enterprise Architecture
    - CRAFT Use Case MBSE System Architecture
    - HERO Solution MBSE System Architecture

- Fostering **Innovation**
    - Stakeholder Training of Concepts and Tools
    - Value Stream Mapping of Processes

- Transforming **Culture and Workforce** and Growing Capability
    - Usability of Digital Engineering Environment Leads to Greater Use

Summary

- Implemented Our Digital Transformation Trifecta (DTT) to Address Pain Points of AFRL 711 HPW
- Created the Entity of the Digital Fusion Cell (DFC) to Apply Our DTT Approach
- DFC Applies Our DTT Approach of Systems Thinking, Systems Engineering, and Digital Engineering
- We Piloted the Concept of the DFC with the CRAFT Use Case and Others
- We Will Continue to Scale the Digital Fusion Cell to Meet the Needs of AFRL 711 HPW and Beyond

QUESTIONS