Harmonizing Model-Based Standards for Shipbuilding

MBE Summit

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Presenters:

Ryan Bounds HII-Newport News Shipbuilding

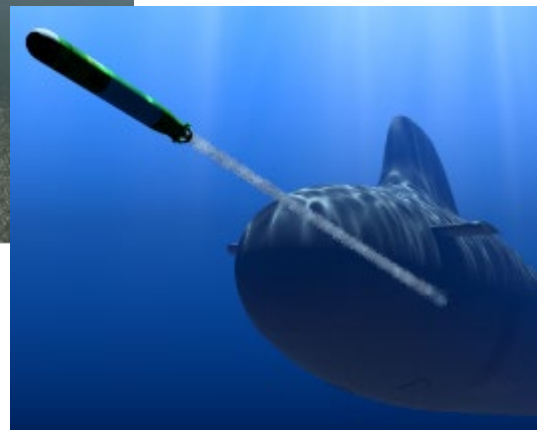
Bio

Ryan Bounds, Design Engineer
Model-Based Engineering

- AAS in Mechanical Engineering Technology
- BA in History from Texas A&M University
- Model-Based Definition lead developing the model-based standards strategy for NNS's digital evolution
- 10+ years in shipbuilding
  - Manufacturing
  - Instructor (GD&T Evangelist & MBD practices)
  - Design Engineering
  - Manufacturing Engineering
  - Model-Based Engineering
- GDPT-2009 Senior Level

Presentation Topics

- HII-Newport News Shipbuilding (NNS) Overview
- Problem Description and Objective
- Lines of Effort
- Discussion/Conclusion



HII SHIPBUILDING DIVISIONS

Providing Advanced Digital Products

NEWPORT NEWS SHIPBUILDING

***Ford*-Class**
Aircraft Carrier Programs

Submarine Programs
New Construction

Aircraft Carrier Refuelings (RCOH) & Inactivation

Submarine Onsite and CVN Offsite Fleet Support Programs

Engineering and Planning Yard Programs

Kenneth A. Kesselring Site Operations

INGALLS SHIPBUILDING

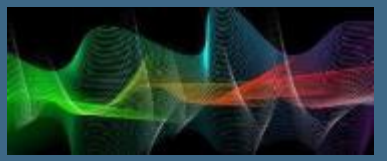
***America*-class**
Large Deck Amphibious Assault Ships

***San Antonio*-class**
Amphibious Transport Dock Ships

***Arleigh Burke*-class**
Aegis Guided Missile Destroyers

***Legend*-class**
National Security Cutters

MISSION TECHNOLOGIES



Cyber & Electronic Warfare

Live, Virtual, Constructive Solutions

Fleet Sustainment

Nuclear & Environmental Services

Intelligence, Surveillance & Reconnaissance

Unmanned Systems

About Newport News Shipbuilding

- **Sole designer, builder and refueler** of U.S. Navy aircraft carriers
- **One of only two U.S. shipyards** capable of designing and building nuclear-powered submarines
- **Designs, builds, maintains and inactivates** the most advanced ships in the world using expertise in nuclear propulsion, naval design and manufacturing
- **Largest industrial employer** in Virginia

***Ford*-Class**
Aircraft Carrier Programs

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Submarine Onsite and **CVN Offsite Fleet** Support Programs

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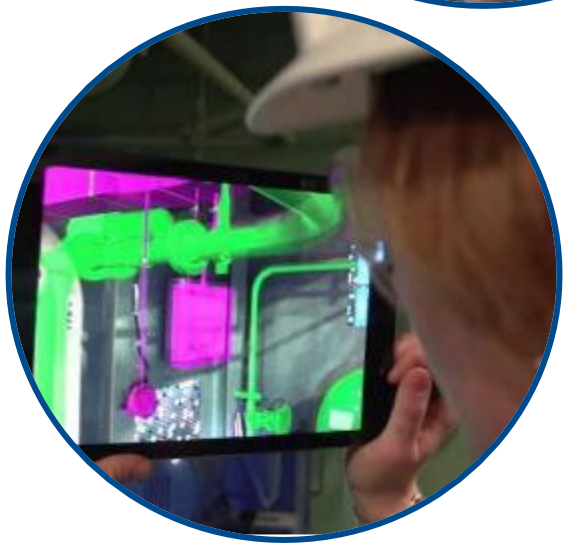
Kenneth A. Kesselring
Site Operations

Why Go Digital?
Manufacturing Demands

"Manufacturing Need for Technology Efficiency at Scale"—Matt Needy (NNS VP, ShipTech 2024)

Standards Contribution

- Repeatable solutions
- 1st time quality/accuracy
- Data exchange and efficiency
- Outsourcing interoperability (6 million man-hours per year)
- Digital thread sustainment (Navy)
- MBSE Requirements management
  - Traceability
  - Certification
  - Early validation
- Drawingless Products
- Clear end-user interpretation/understanding



Problem Description and Objective

Current standards that address digital needs are limited and legacy data-based.

Define and perform work for activities that will ensure efficient data development, management, and exchange for engineering and manufacturing operation activities for a new digitally designed Naval program.

Model-Based Standards

VISION

Define standards that support the way ships are designed, built, and maintained.

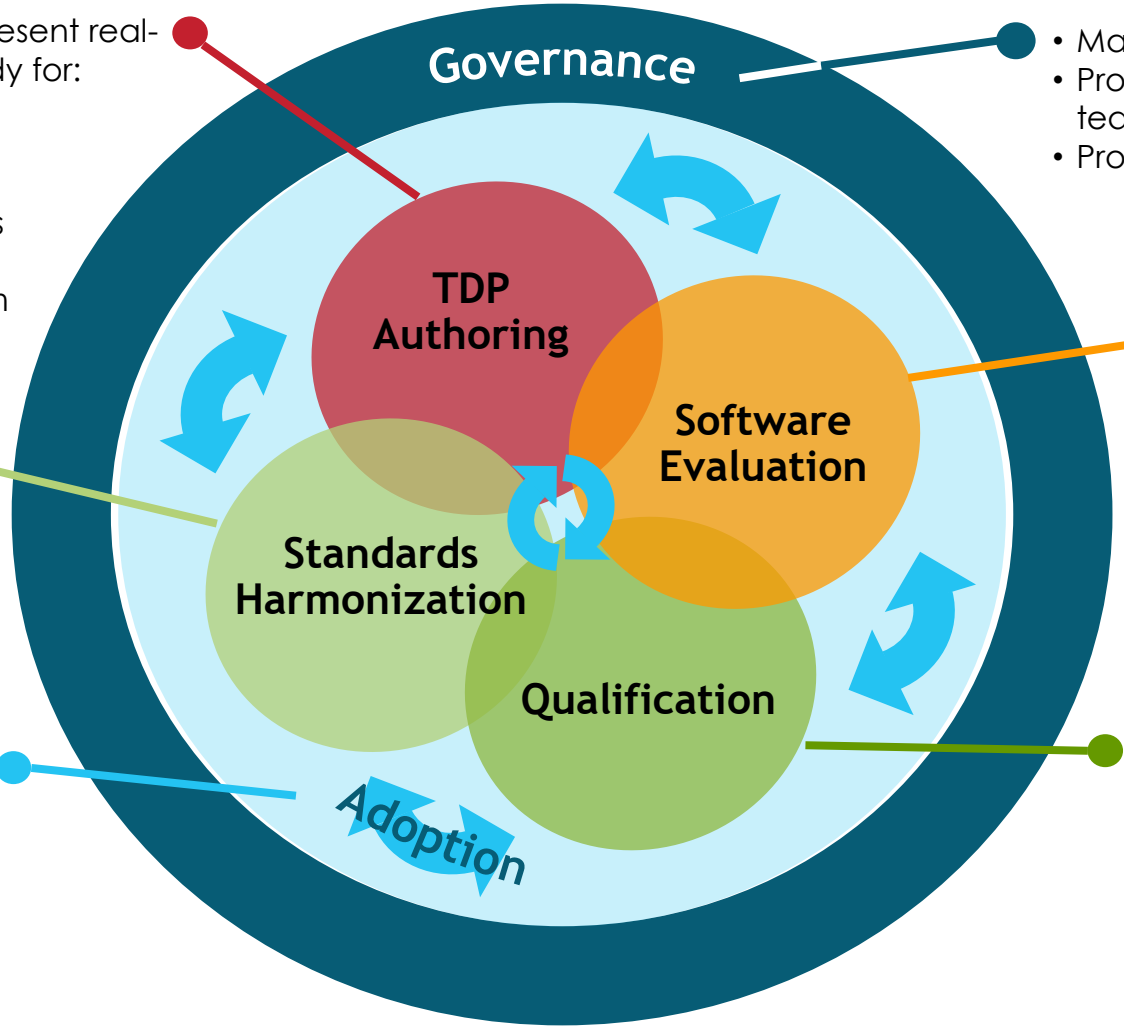
Shipbuilding Model-Based Standards must support:

- Assembly configurations for design & build
- Data exchange between partners and customers
- Integration between internal PLM and ERP Systems
- Integration with external Systems (Navy)
- Automation of derivative products for build / test & inspect pro
- Advanced simulation & predictive models (Digital Twins)
- Data that will persist for the lifecycle (30-50 years)

Work Performed in Collaboration with Action Engineering

Lines of Effort

- Author 3D Technical Data that represent real-world designs and are digitally ready for:
  - Manufacturing
  - Quality
  - Sustainment
- Produce native and neutral formats to be tested against the Standards and Tools by the Qualification Team



- Maintains Mission and Vision
- Provides operating guardrails for teams to work within
- Provides guidance when teams stall

- Review existing standards
- Identify gaps
- Write new standards
- Continuously manage standards, iterate and update over time

- Evaluate software tools for: Interoperability, Data Exchange, Security
- Review software tools: Available, Emerging, Posit future state technology needs

- People-focused use of 3D Technical Data including:
  - OCM guidance & expertise
  - Workforce transformation
  - Workforce communications
  - Workforce training
- Facilitation guidance to teams

- Evaluate 3D Technical Data Examples for digital-readiness using:
  - Software Tools
  - Standards
  - Examples
- Report results

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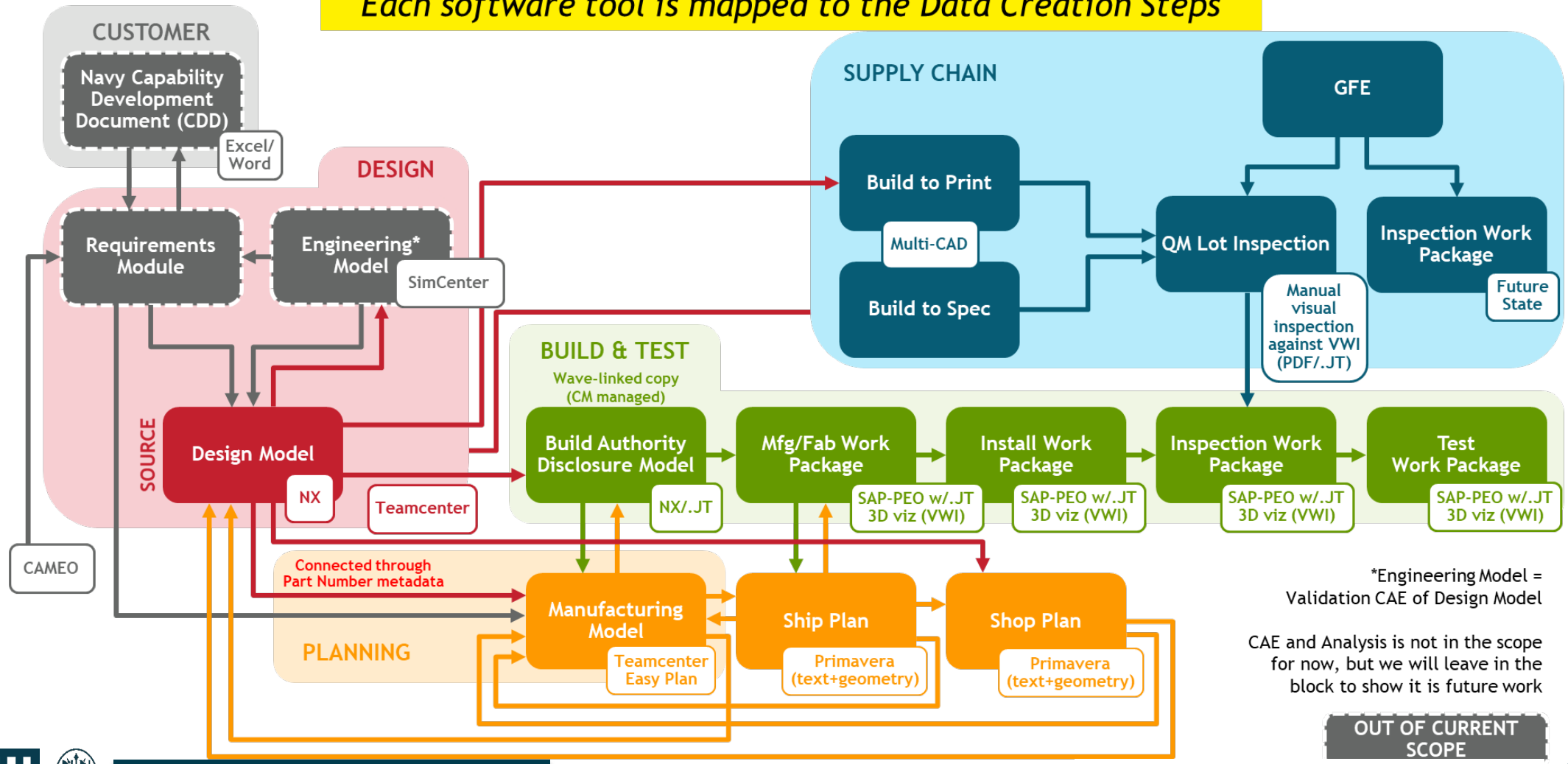
HII-NNS Planned Digital Environment

Each software tool is mapped to the Data Creation Steps



Use Cases

Design

1. Design Review
   a. Part
   b. Assembly
   c. System*
2. Engineering Changes
   a. Part
   b. Assembly
   c. System*

Planning

1. Ship Plan
   a. Part
   b. Assembly
   c. System*
   d. Modules**
2. Shop Plan
   a. Part
   b. Assembly
   c. System*
3. Manufacturing Model
   a. Part
   b. Assembly
   c. System*

Build & Test

1. Fab Work Package – Part and Components
2. Install Work Package – Assembly
3. Inspection Work Package
   a. Part
   b. Assembly
   c. System*
4. Test Work Package

Supply Chain

1. Build to Print
2. Build to Spec
3. Inspection Work Package
4. Receipt Inspection

*System: Refers to a specific functional area (e.g., structural, electrical, piping)
**Modules: Refers to a strategic boundary within the ship that includes many systems

This list is not exhaustive. New use cases will arise as the project develops.

Standards

Design

- ASME Y14
- LOTAR
- QIF (Quality Information Framework)
- ISO 10303 (STEP & PLCS)
- SAE EIA-649-1 (Configuration Management)
- MIL-HDBK61A (Configuration Managem ent)

Planning

Build & Test

Supply Chain

- NAVSEA 9090-700E (SCLIS)
- S-Series

- MTConnect
- ASME, ASTM (Process Standards)
- ISO 16949 (IATF AIAG Quality Management System)
- ASME Y14, B46, B89
- SAE AS9000, AS9102
- QIF (Quality Information Framework)

- ISO 14306, 14739-1 (3D Viewables)
- SAE EIA-649-1 (Configuration Management)
- MIL-HDBK-61A (Configuration Management)
- ISO 10303 (STEP)

- MIL-STD 881F (Work Breakdown Structure)
- MIL-STD 31000B
- DoDI 5000.97
- MIL-HDBK-539
- Dev/Sec/Ops?

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Cohorts

Supply chain vendors have personas in each cohort that match the HII-NNS personas

Authors

Authors 3D Data

Creates standardized Data and Refers to Standards

- Repair Officer/Lead, USN
- Design Engineers
- Quality Engineers
- Manufacturing Engineers
- Tooling and Fixturing
- CAD Administrator

Analysts

Reads and Manipulates 3D Data

Uses Standardized Data and Refer to Standards

- Specialist, USN
- Quality Assurance, USN
- CNC Programmers
- CMM Programmers
- Machinists
- Procurement Specialist

Consumers

Reads 2D Drawings Today, Needs to Read and use 3D data

Uses Standardized Data

- Supply, USN
- Operator, USN
- Inspectors
- Assembly Teams
- Technical Writer
- Area Planner

Command

Needs to Know the Value of 3D Data

Refers to Standards

- Command, USN
- Executives
- Management
- Sales
- Document Control
- Supply Chain Manager

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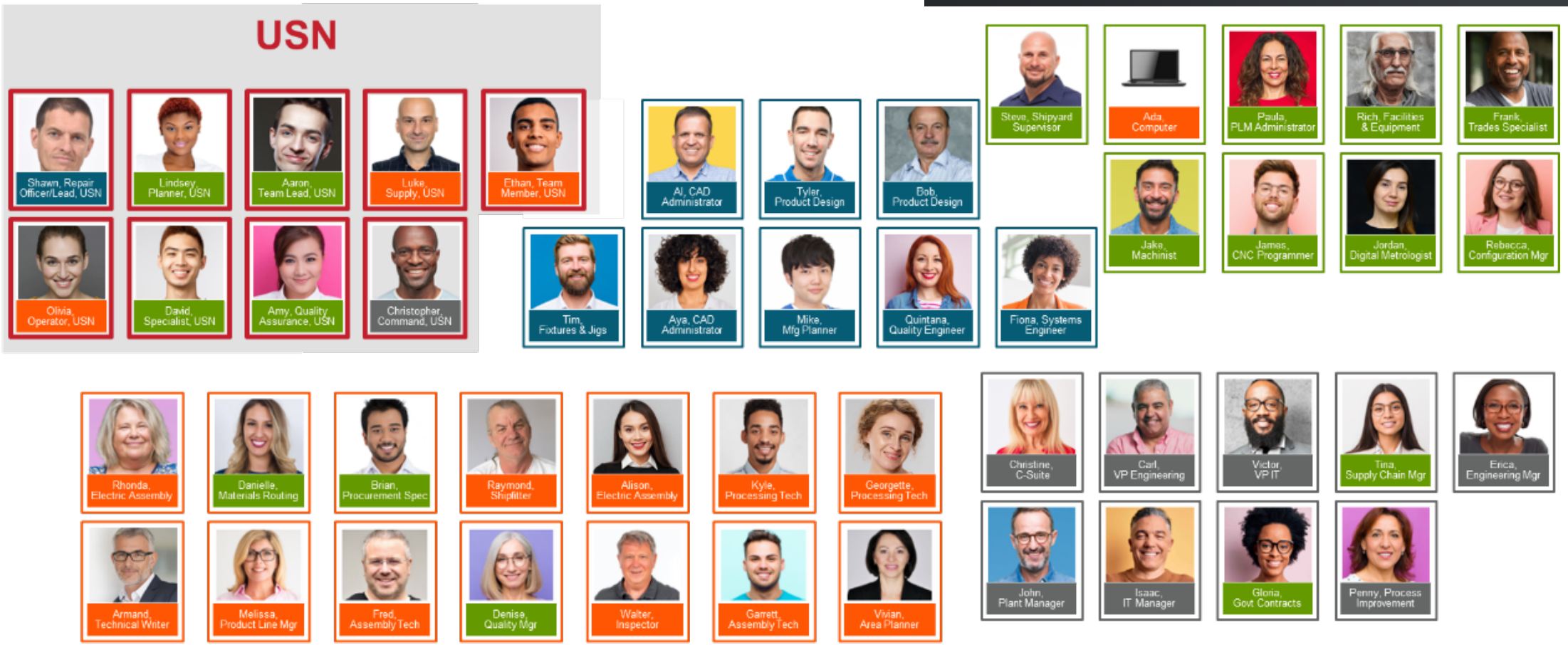
Personas



Create Standardized Data and Refer to Standards

Use Standardized Data and Refer to Standards

Use Standardized Data

Refer to Standards

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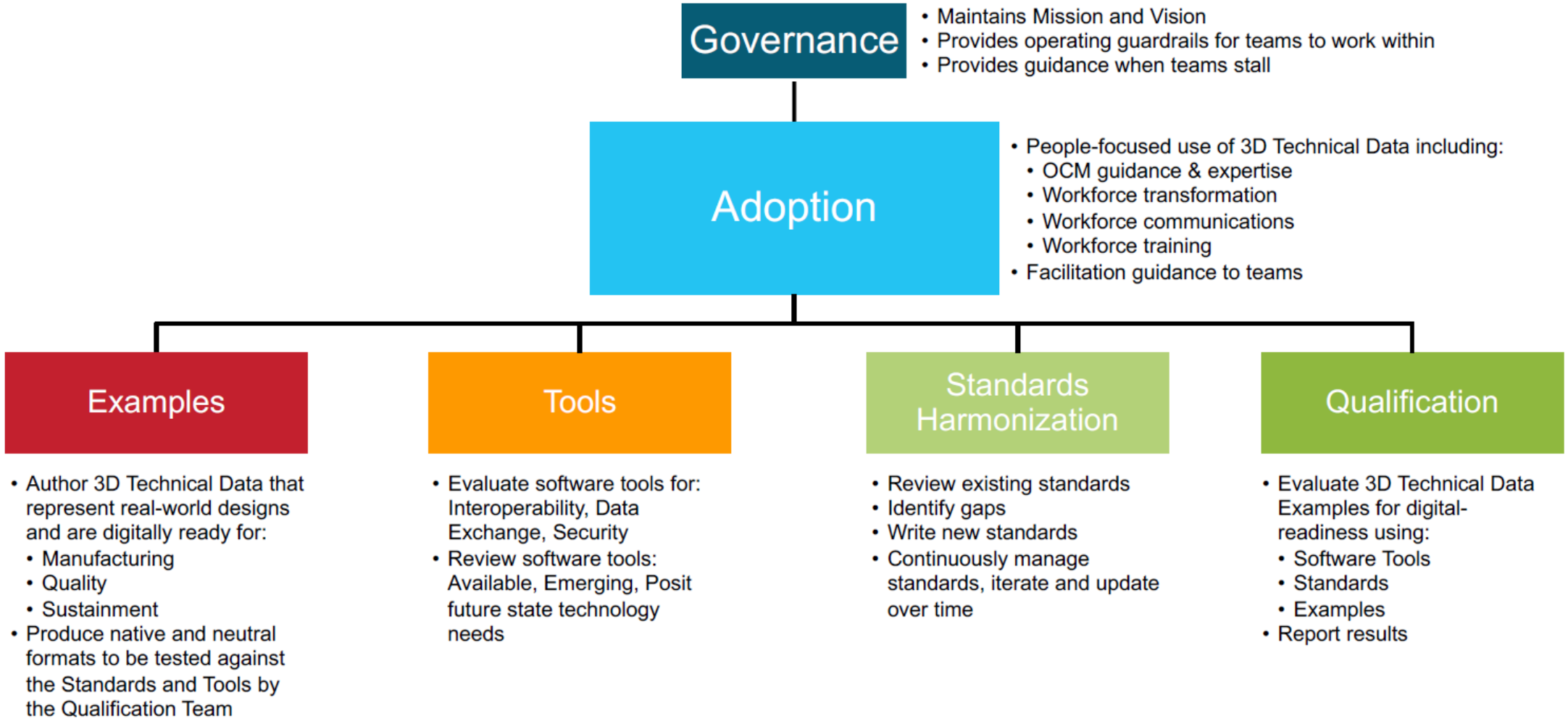
Develop & Implement a Standards Strategy

Team being Established Currently



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Thank You for your Attention…

Discussion