

Biomedical Digital Twin – TEAMING Sessions

NASEM Definition of a Digital Twin

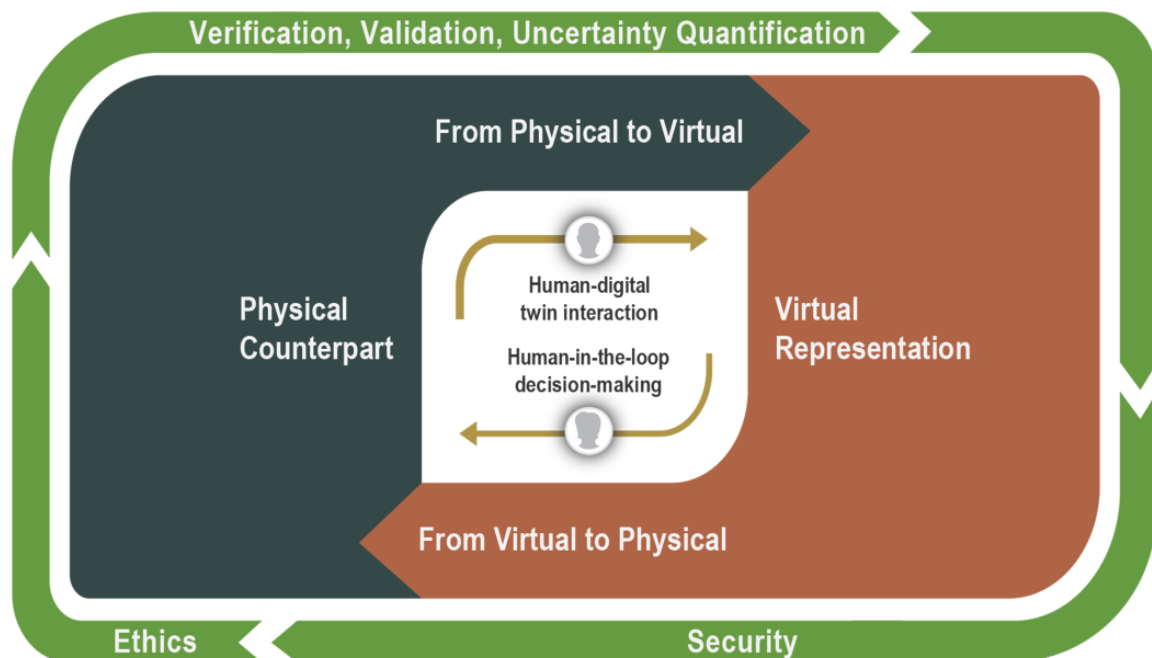
"A digital twin is a set of virtual information constructs that mimics the structure, context, and behavior of a natural, engineered, or social system (or system-of-systems), is dynamically updated with data from its physical twin, has a predictive capability, and informs decisions that realize value. The bidirectional interaction between the virtual and the physical is central to the digital twin."

The NASEM report presents several key challenges for digital twins:

- 1) "Fit for purpose" problems to address,
- 2) Verification, Validation and Uncertainty Quantification (VVUQ) of dynamic, interacting virtual and physical assets,
- 3) Bi-directional, real-time assimilation of measurable data,
- 4) Interoperability of physical and virtual assets that can be sustained long-term through rapidly changing technologies,
- 5) Democratizing access of digital twins that are ethical and appropriately used.

[Click here to find full report](#)

A Digital Twin is More Than Just Simulation and Modeling



Day 2: 9:15-10:15am ---- *Below is a workspace to prepare the large flip chart*

BDT Ideas TEAMING Session: Round #1 – Getting Started: Using the Definition

BDT Idea Name:

Draw NASEM Loop for your TEAM BDT Project:

Describe the following features of your BDT:

- 1. Fit-for-Purpose**

- 2. Verification, Validation, and Uncertainty Quantification (VVUQ)**

- 3. Physical Assets/Data Collection/Sensors**

- 4. Mathematical and statistical foundations for BDT**

- 5. Virtual to Physical Control Algorithms/ Expert in the loop**

- 6. Ethics, security issues**

- 7. Team Science Approach, Governance**

List all who contributed to this work:

Day 2: 3:45-4:30pm ---- *Below is a workspace to add to the morning flip chart*

BDT Ideas Teaming Session: Round #2 – Thinking About the Requirements and Assessment Criteria Templates

List Critical Requirements:

Think about critical assessment questions:

1. What is the problem you are trying to solve?
2. How will a BDT solve this problem?
3. What makes your BDT realistic?
4. What enables your BDT to changes and mature over time?
5. What is the physical model?
6. What is the virtual model?
7. What information will be passed between the physical and virtual assets in real-time?
8. What are the ethical issues that must be considered in developing and using this BDT?

What expertise is missing from your team?

List all who contributed to this work.

Assessment Criteria for BDT

- A. How should audiences evaluate the level of maturity for each of the BDT development challenges?**

- B. How can audiences gain an understanding of the current status/state of the project?**

- C. How can audiences gain an understanding of the context of the project's evolution from concept to product?**

- D. How can you reduce the audience's skepticism and increase confidence that the writer is realistic about where their project is in development?**

List all who contributed to this work: