National Institute of BUILDING SCIENCES™

Integrating BIM and Digital Twins: Unveiling a Position Paper for the AECO Industry

September 4, 2024 | Session Overview

Speakers

Marc Goldman, Director, AEC Industry, Esri

Zahra Ghorbani, BIM Manager, Office of Physical Plant, Department of Architectural Engineering, Penn State

Kimon Onuma, President, ONUMA, Inc.

Scott McClure, Image Matters, LLC

Moderator

Johnny Fortune, Executive Director, National BIM Program, National Institute of Building Sciences

Integrating BIM and Digital Twins Overview

The integration of BIM and Digital Twin technologies in the Architecture, Engineering, Construction, and Operations (AECO) industry comes with many advantages.

On September 4, 2024, NIBS hosted a webinar with subject matter experts Marc Goldman, Director, AEC Industry, Esri; Zahra Ghorbani, BIM Manager, Office of Physical Plant, Department of Architectural Engineering, Penn State; Kimon Onuma, President, ONUMA, Inc.; and Scott McClure, Image Matters, LLC, to discuss a newly released position paper developed by the National Institute of Building Sciences.

The paper was written by leading AEC practitioners, educators, consultants, and technology leaders, and it dives into the innovations and efficiencies of BIM and digital twins.

The webinar broke down technical capabilities and promoted efficiency. It also highlighted key insights of the position paper.

Johnny Fortune, Executive Director, National BIM Program with NIBS, served as moderator.

How the Position Paper Works

The panel broke down the paper sections, including the executive summary, introduction, definitions, the workgroups, sub-sections, and calls to action.

It contains four sections: Public Perception, Use Cases, Execution, and Data Frameworks.

Scott McClure discussed the public perception of digital twins.

“[Public perception is] undervalued as an essential component of the integration efforts,” he said. “Why do we need to involve the public in the technical complexities? We know public perception drives public opinion.”

The Definitions

The panel covered the definitions of BIM and digital twins.

These include:

- Building Information Management (BIM) – the acquisition, analysis, retention, retrieval, and distribution

of built environment asset information all within an information processing system.
- Building Information Model (BIM Model) – digital representation of physical and functional characteristics of a built environment asset.
- Building Information Modeling (BIM Modeling) – generating and using a shared digital representation of a built asset to facilitate design, construction, and operation processes to form a reliable basis for decisions.

When breaking down digital twins, the team came up with "a virtual representation of real-world entities and processes, synchronized at a specified frequency and fidelity."

A digital twin can:

- Transform business by accelerating holistic understanding, optimal decision-making, and effective action.
- Use real-time and historical data to represent the past and present and simulate predicted futures.

Digital twins are motivated by outcomes, tailored to use cases, powered by integration, built on data, guided by domain knowledge, and implemented in IT/OT systems.

The paper introduced three categories of digital twins, including digital twin prototype, digital shadow, and cyber-physical systems.

Use Cases

Zahra Ghorbani, BIM Manager, Office of Physical Plant, Department of Architectural Engineering, Penn State, covered positions on use cases.

She highlighted that use cases are the cornerstone of digital twins. Sub-positions include use case applicability, state of standards, and physical-digital relationship.

She stated that depending on the use case at hand, the level of relationship between physical and digital will vary.

Execution – Sub-Positions

Kimon Onuma, President, ONUMA, Inc., covered digital twins execution sub-positions. Onuma said uses cases must be precise.

"You can't just say, 'I need a digital twin,'" he said. "It's a system of systems – systems talking with each other."

Sub-positions include Agility and Simplicity, Minimum Viable Products, Asset Lifecycle Management, Scalability, The Creation of BIM and Digital Twin, and Expanding the Horizon.

Position Paper Calls to Action

Marc Goldman, Director, AEC Industry, Esri, said BIM and digital twin can be executed by harnessing the differences between both.

"BIM can serve as a basis for delivering digital twins by streamlining execution," he said.

The panel offered several calls to action. These include:

- Engage the NIBS Digital Twin Integration Subcommittee
- Address public perception of BIM and digital twin
- Implement and standardize BIM and digital twin
- Optimize data management for BIM and digital twin
- Refine BIM and digital twin use cases
- Advance development and scaling of BIM and digital twin

Download the position paper.