National Institute of BUILDING SCIENCES™

Are Digital Twins Ready for Takeoff?
Trends and Implementation Challenges in the AEC Industry

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About the Speaker

- Regional Lead at Coda, a construction data analytics firm that is elevating the building experience for owners using proprietary tools and data-driven insights
- Worked in healthcare consulting for 10+ years
- Passionate about evolving technology in the AEC industry
- Specializes in BIM, VR/AR technologies and asset data management for facility owners
- Loves to travel around the world and spend time at airports

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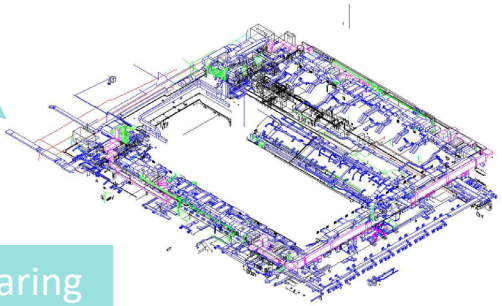
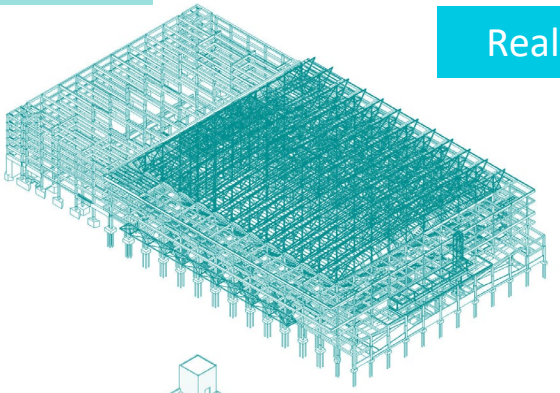
Digital Twins in the AEC industry



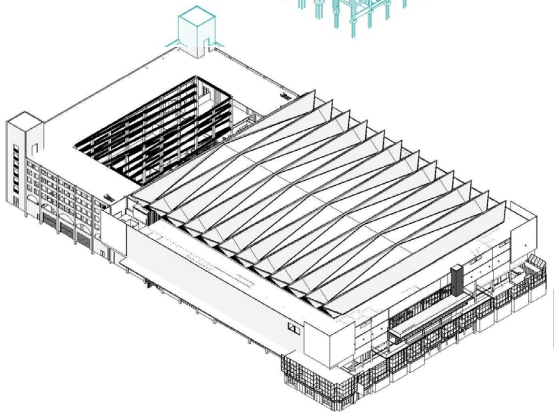
Bi-directional data sharing

Real-time data analytics

Physical asset synchronized with the digital twin



Insights for strategic decision-making



AI

Machine Learning

Components of AEC Digital Twins

Intelligent 3D Model
(Geometric Replica)

Parametric/ Static Data
(Attributes)

Live/ Dynamic Data
(Sensor Data)

Delivery Platform/
Interface

Digital Twin Challenges in AEC

Digital Twin is a relatively new term in the AEC industry

AEC industry is still defining Digital Twins and its integration with BIM

Use cases and applications being explored for the AEC industry and various markets

Proliferation of data from myriad sources - IoT sensors, AI, business analytics

GIS data, BIM data, BAS, occupancy sensors and data, EMCS data, SCADA systems, LiDAR data, IoT sensor data and analytics, O&M data CAFM systems, and CMMS

Digital Twin applications and use cases lack standardization

Building Performance

Facility operations and maintenance

Space management

Data-driven decision-making

Unclear ROI/ value proposition, approach and resources required for successful implementation

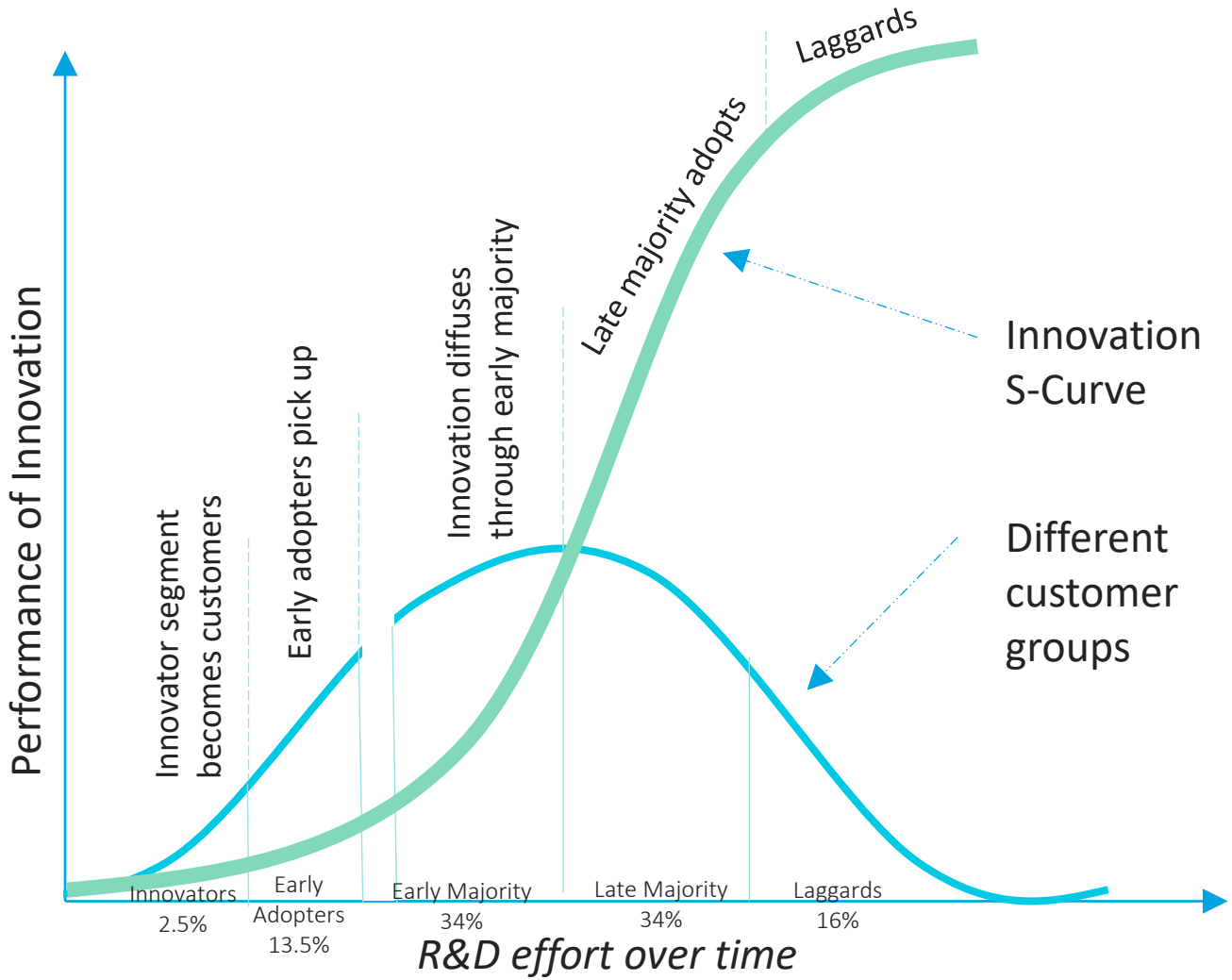
Processes, Data, Technologies

Various stakeholders/ decision makers

Different types of facilities and owners

Funding Sources

Digital Twin Adoption Phase



Digital Twin Level of Maturity

Multifamily Housing

Single family homes

No DT requirements yet

Minimal data standards

Commercial

Institutional

K-12 Education

Hospitality

Minimal DT requirements

Some data standards but may vary

Healthcare

Federal

Transportation/ Aviation

Higher Education

Data Centers

Establishing DT requirements

Complex, specific data standards

Digital Twin Requirements by Facility Type

Healthcare

Life safety

Patient well-being

Patient room and surgery planning

Hospital Wayfinding

Energy-intensive

Joint Commission and accreditation

Federal

Detailed specifications and standards

Multiple stakeholders

High security requirements

Data repository constraints

Large portfolio of buildings and facilities

Higher Education

Student Enrollment

Classroom availability

Student comfort

Smart Campus initiatives

Facility Maintenance

Energy consumption management

Transportation/ Aviation

Airline Activity

Levels of Service/ Comfort

Security & Public Safety

Compliance & Risk Management

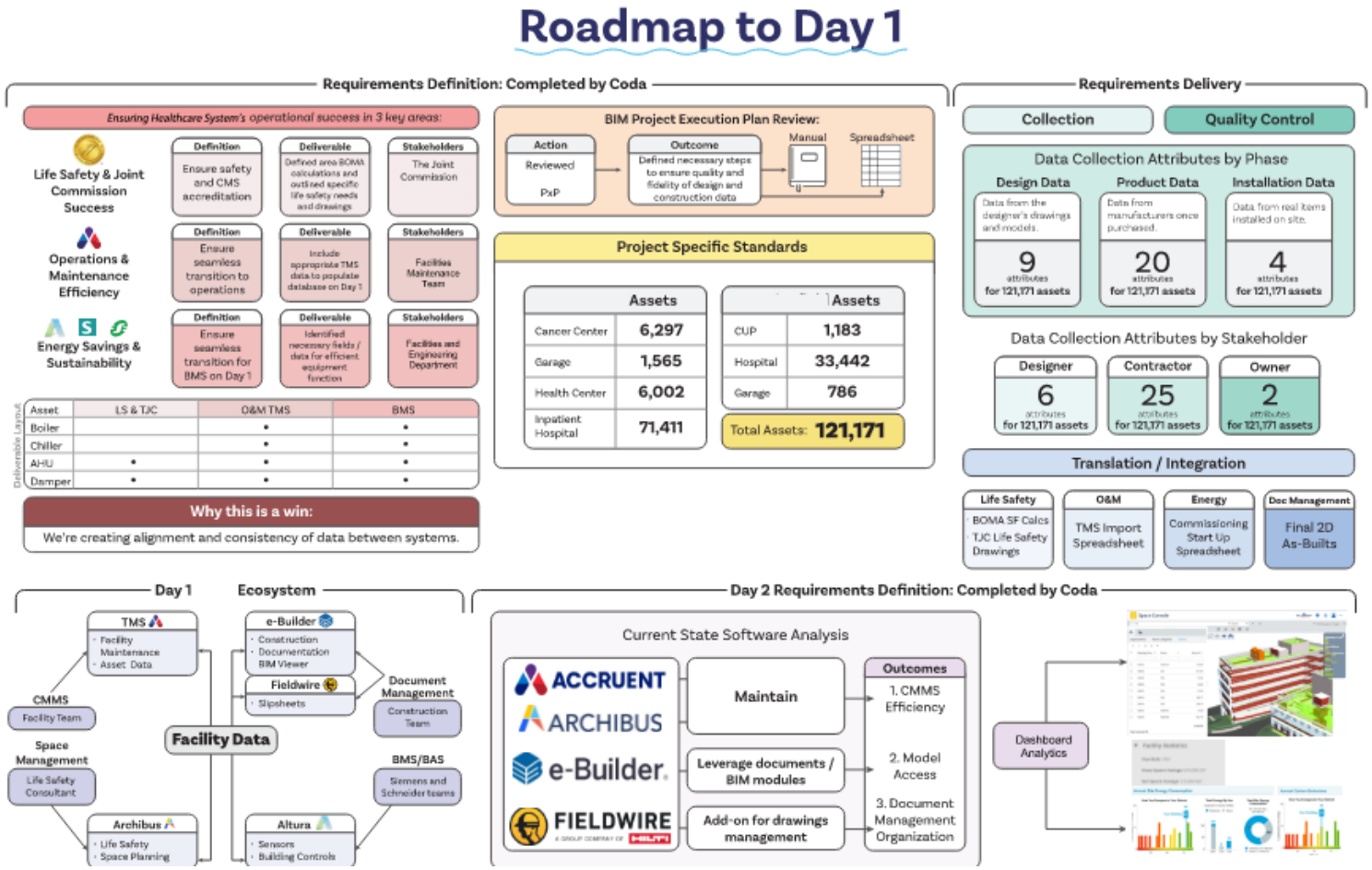
Net zero carbon emissions

Healthcare

Health System with 2 campuses and 7 critical facilities

"Why are Digital Twins important and what are some use cases and applications?"

Vision and Path to Digital Twin



"Digital Twins roadmap is essential to deliver the use cases envisioned by end users."

Federal/ Institutional

Walter Reed Medical Center Addition

"How to collect data for Digital Twins per project specifications?"

Digital Twin Data Requirements

Varied System level and Project Requirements

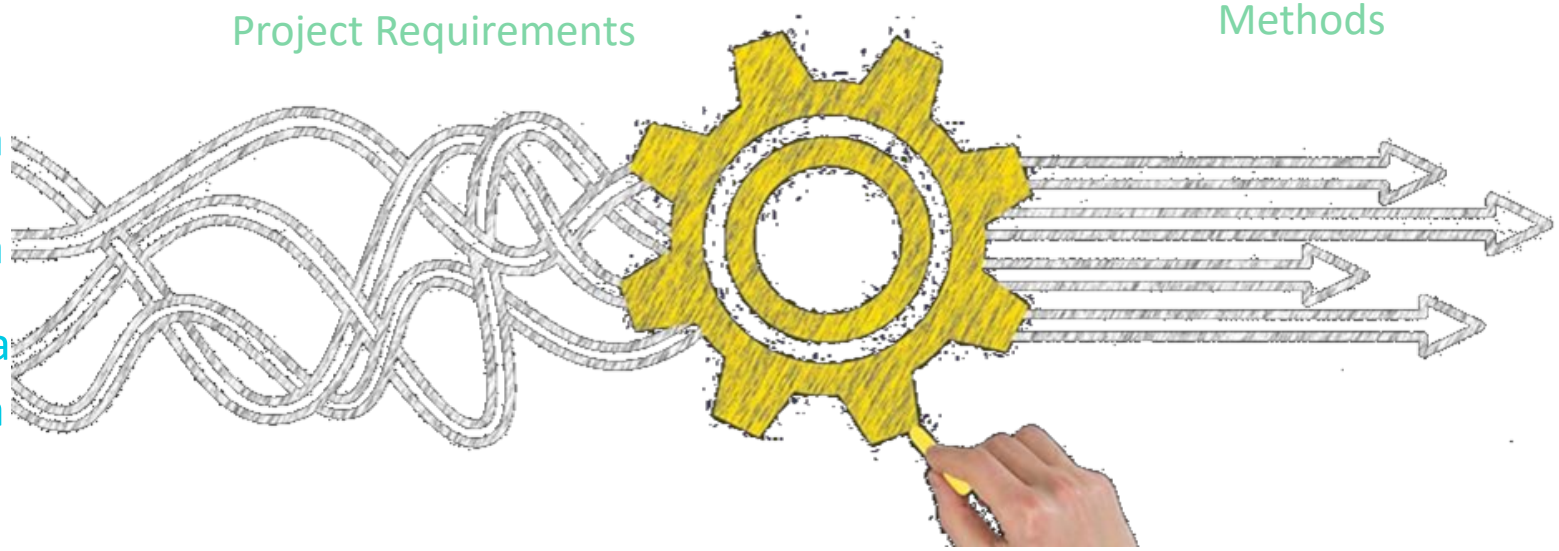
Well Defined Means & Methods

Design data

Procurement data

Construction & Field data

Commissioning data



Structured Data for Digital Twin Development:

- Project-centric
- Phase-specifc

"Data needs to be collected with the end in mind through a streamlined process."

Higher Education

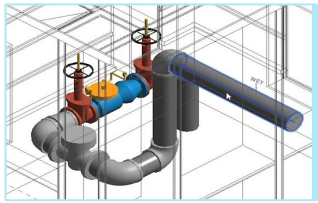
Johns Hopkins University

Bloomberg Center

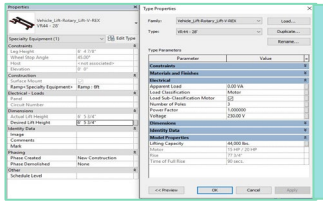
Hopkins Student Center

"How can the data be collected and integrated more efficiently?"

Digital Twins Data Flow



Geometric Data:
Shop Drawings
Model
LOD
Location



Parametric Data:
Classification
Room info
Design data
Product data

O&M Data:
Manuals
Warranty
Safety

Field Data:
Commissioning
Tags
Serial number
Sensors

Digital Twin Data Repository
Common Data Environment

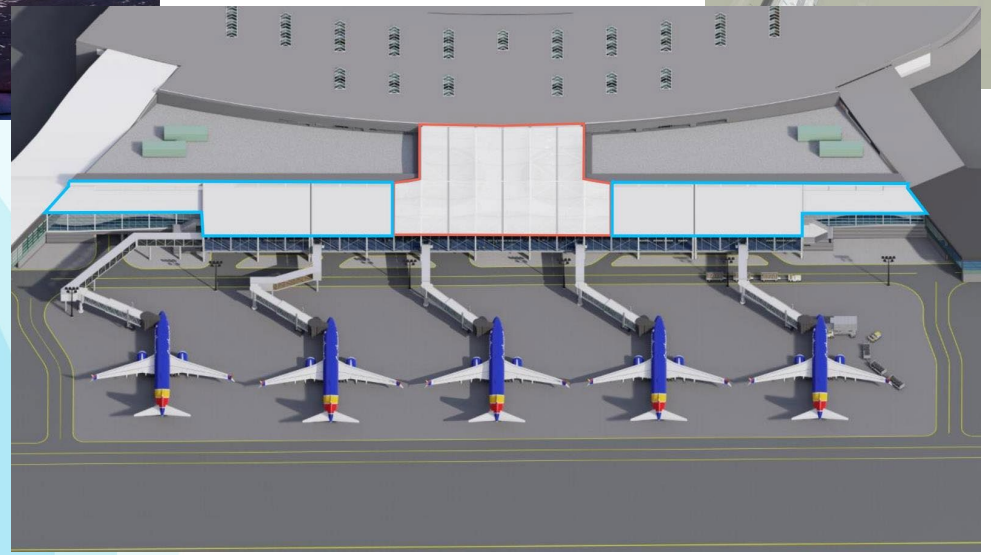
- Analytics & Productivity
- Space Management
- Building Performance
- Operations & Maintenance

"What often passes off as 'smart' buildings are often siloed, multi-format data sets."

Transportation/ Aviation

Kansas City International Airport

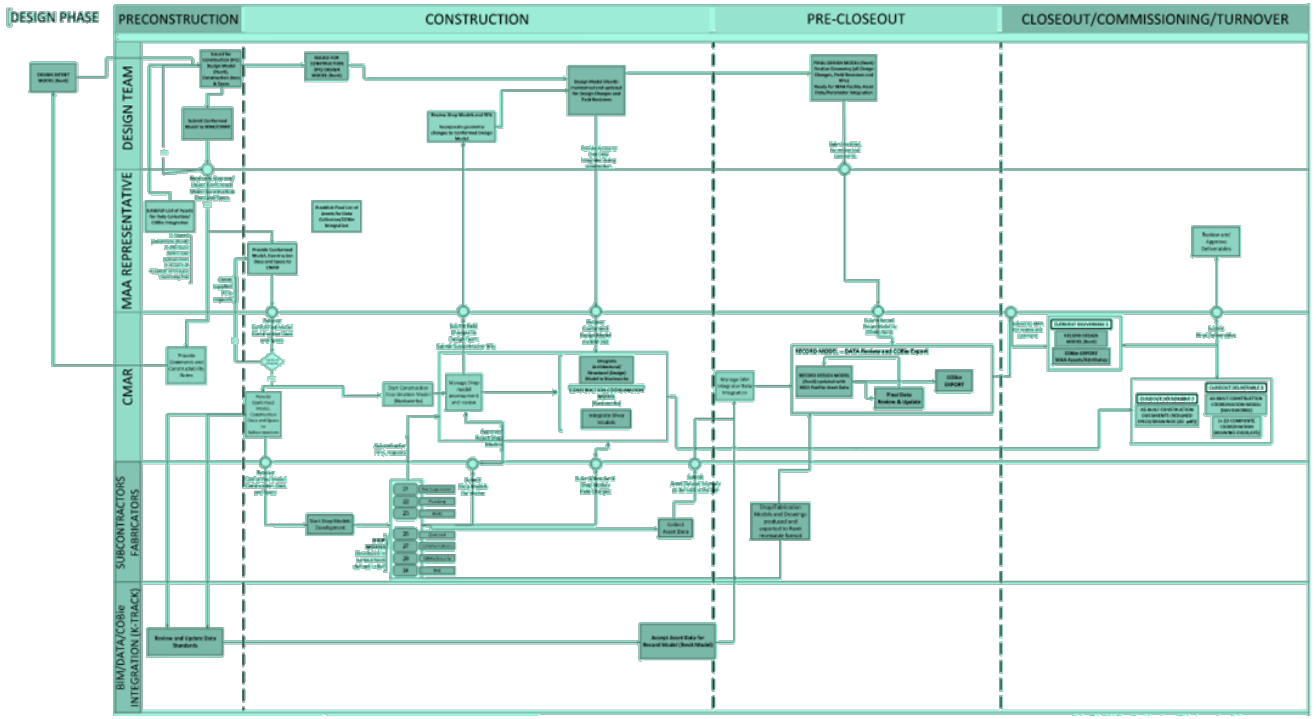
Chicago O'Hare Terminal 3



BWI Airport A/B Connector and Baggage Handling System

"How to ensure data integrity throughout the process?"

Digital Twins for Building Performance



"Data needs to be updated and maintained to optimize operations of a building or portfolio of buildings"

Next Steps: Call to Action

Vision and Roadmap
Feasibility studies and value proposition (ROI)

Contract language for owners to specify Digital Twin data requirements

Standards for data requirements through the development of Digital Twins

Integration of data frameworks and system architecture

Workflows to collect data and process for bi-directional data flow

Data management and updates to the Digital Twin during operations

Thank You