Harnessing BIM to Realize Digital Twins

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Senior Director & General Manager, Autodesk Tandem
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Digital Twin
Opportunities and Challenges
What is a Digital Twin?
Transforming the Built Asset Lifecycle

- Design & Construction
- Procurement
- Portfolio Planning
- Portfolio Management
- Asset & Portfolio Analysis
- Asset Knowledge
- Commissioning
- Handover
- Space Planning & Utilization
- Predictive, Planned & On-Demand Maintenance
- Performance Monitoring & Tuning

Digital Thread

Plan Design Build
Digital Twin Maturity

Source: Verdantix - Smart Innovators: Digital Twins For Buildings, June 2020
95.5% of all data goes unused in engineering & construction\(^1\)

58% of owners said they’ve used or plan to use design-build, moving away from traditional design-bid-build\(^2\)

\(^1\) Source: Big Data = Big Questions for the Engineering and Construction Industry, FMI Report
\(^2\) Source: Design-Build Utilization, FMI Combined Market Study
Owners receive this... 

...when they need this!
Impact of Data-Driven Digital Transformation on the Return on Capital Employed (ROCE) for Owner-Operators

- No actions: 0.6%
- Data-sharing infrastructure and capabilities: 1.0%
- Data-centric talent: 1.8%
- Incentive-based contracts: 2.8%
- Combined effect: 1.0%
- Total: 7.2%

Source: Building More Value With Capital Projects, Accenture
Smarter Operations
Gain operational efficiency and improve the occupant experience by leveraging the digital twin's reflection of your assets, spaces, and systems.

Greater Insight
Optimize your portfolio and inform future investments based on the operational knowledge and usage analytics provided by your digital twin.

Digital Handover
Accelerate operational readiness by starting with the end in mind and harnessing the BIM process to handover a digital twin.
Autodesk Tandem enables you to harness the BIM process to make digital twins a highly-repeatable, natural output of the project lifecycle.
Specify
Data Requirements and Operational Outcomes
Specify Data Requirements and Operational Outcomes

CLASSIFICATION SYSTEMS

Select Classification:

To add a custom classification system:
1. Select a classification template and click Download. This exports an editable template of the system.
2. Open the template in Excel or other spreadsheet app as needed.
3. Click Add Classification to import and save the custom classification to your system.

PARAMETER SETS
Asset Identity Data

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<thead>
<tr>
<th>Name (required)</th>
<th>Data type</th>
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<tr>
<td>Serial Number</td>
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<td>Warranty Documents</td>
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<tr>
<td>O&amp;M Manual</td>
<td>Link</td>
<td>✓</td>
</tr>
<tr>
<td>Product Data Sheet</td>
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+ Add Parameter

FACILITY TEMPLATES

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Classification in use</th>
<th>Parameter sets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospital Template</td>
<td>MasterFormat</td>
<td>Defined: 17</td>
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<tr>
<td>Data Center</td>
<td>Categories - Short</td>
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<tr>
<td>Demo Template</td>
<td>LTU Specs</td>
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<tr>
<td>Demo Set</td>
<td>Categories - Short</td>
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<tr>
<td>Simple Group Sample</td>
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</table>
Capture
Asset, Space, and System Data During Design and Construction
Capture

Asset, Space, and System Data During Design and Construction

Asset Type

Asset Parameters as specified in the Facility Template
Verify
Completeness and Accuracy of Asset, Space, and System Data
Autodesk Tandem’s – Asset Information Model
Review inventory of asset data for selected spaces
Outcomes of Digital Handover

Accelerate operational readiness through easy access to detailed facility information

Transparent collaboration between all stakeholders
Transforming the Built Asset Lifecycle with Autodesk Tandem
Smarter Operations and Greater Insight

Autodesk Tandem provides the context to connect operational data and systems. With these connections, you can answer and visualize complex questions like:

- if this component fails what spaces are affected?
- Where are these assets and how do I access them?
- How does the built asset perform against my desired outcomes?
Connect
Operational Solutions and Data

Access
Operational Information through a Single Pane of Glass
Predict and Inform

Analyze data for a single facility or data across your portfolio to predict insights and inform decisions.
The Road to Digital Twin Maturity

Source: Verdantix - Smart Innovators: Digital Twins For Buildings, June 2020
“This is what it means to have a partner and not a software vendor! This is an important topic for us and having a thought-leadership role on Autodesk Tandem will be good for the future.” – Chief Technologist

- Water Treatment facilities
- Existing and new facilities
- Multiple buildings
- Digital delivery before physical delivery
- Turn-key solution for their clients
- Improve future design decisions
- Easy to use and understand
- Excellent performance
- Valuable partnership
“I like being on this side of the software versus the this-is-what-they-gave-me side”
– Facilities Manager

- Corporate Headquarters
- 8 Million Square Foot Facility
- 30 Buildings

- Improve FM through connected BIM and asset data
- Effective document access
- Supports the rapid evolution of their campus

- Roadmap meets their needs
- Link to BIM 360 is awesome
- No model federation necessary
# Planned Workflows and Personas

<table>
<thead>
<tr>
<th>Workflow</th>
<th>Integrate</th>
<th>Specify</th>
<th>Capture</th>
<th>Verify</th>
<th>Monitor</th>
<th>Operate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power a digital twin ecosystem via open access to asset and space information built on Autodesk Forge</td>
<td>Setup and manage classification, data models, and permissions</td>
<td>Aggregate, view, query, update, and normalize object and asset data</td>
<td>Validate object and asset data deliverables via user defined rule sets</td>
<td>Monitor facility performance through a single pane of glass</td>
<td>Improve efficiency in performing predictive, planned, and on-demand maintenance</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Personas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enterprise Developers</td>
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<tr>
<td>3rd Party Developers</td>
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<tr>
<td>BIM Manager</td>
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<tr>
<td>Capital Project Manager</td>
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<tr>
<td>IT/Data Manager</td>
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<tr>
<td>BIM Manager</td>
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<tr>
<td>Architects</td>
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<tr>
<td>Engineer/Designer</td>
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<td>Project Managers</td>
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<tr>
<td>Commissioning Agents</td>
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<tr>
<td>BIM Manager</td>
</tr>
<tr>
<td>Commissioning Agents</td>
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<tr>
<td>Facility Manager</td>
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<tr>
<td>Operations Manager</td>
</tr>
<tr>
<td>Facility Manager</td>
</tr>
<tr>
<td>Maintenance Technicians</td>
</tr>
<tr>
<td>Occupant</td>
</tr>
</tbody>
</table>

AEC Project Team Persona ● Owner/Operator Persona ● Developer Persona