



# Harnessing Digital Twin data across the property lifecycle

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**VP + GM, Operate Solution**

# Industry 4.0 – steam to sensor

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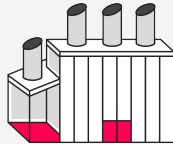
## First industrial revolution

Water and steam power



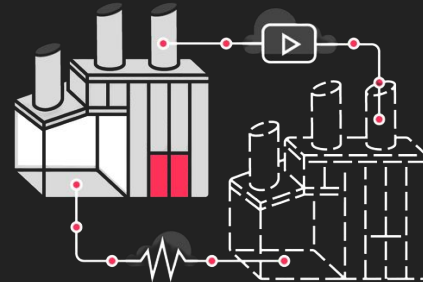
## Second industrial revolution

Oil, gas and electric power



## Third industrial revolution

Computers, advanced telecommunications, data analysis



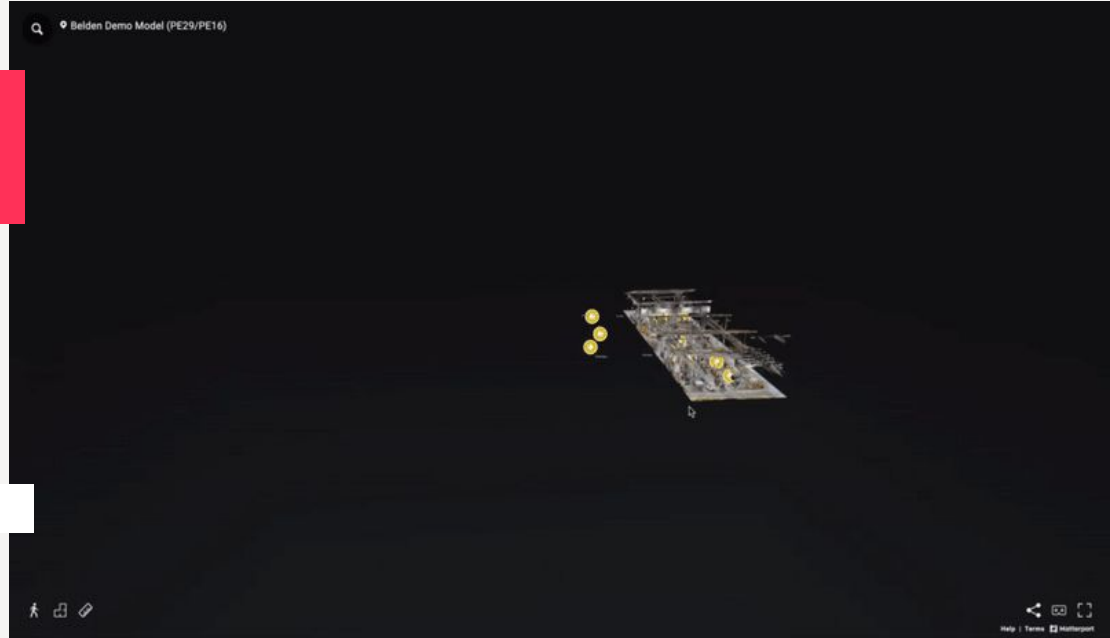
## Industry 4.0

Smart factories – Digital twin, Internet of Things (IoT), Cloud computing, AI/ML, Edge computing

# Introducing digital twins

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A Digital Twin is a **living digital representation** of a **real-world system** that is **dynamically updated with data** to mimic the structure, state, and behavior of the real-world system in order to **improve business outcomes**.



Real-World  
System



→  
Connected World

Digital  
Twins



→  
Business  
Outcomes



# Industry trends for digital twins

Large  
Market

\$66B

Valuation of broad Digital Twin  
market

Increased Adoption  
by manufacturers

63%

Have developed / are developing a  
digital twin strategy

Manufacturing is  
the leading industry

74%

Share of Market Valuation with  
the majority looking at Digital Twins in  
the Smart Manufacturing Strategy

Pivotal for  
Sustainability

92%

Achieved more sustainable  
products and processes with  
average 16% improvement in  
sustainability metrics



# The benefits of digital twins in industrial operations

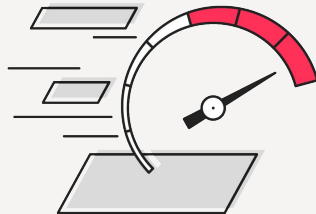
Driving down cost and complexity in IoT, AI/ML, and spatial computing

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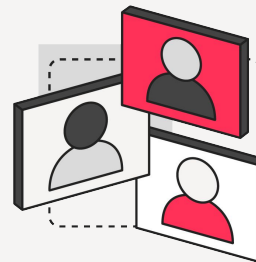
## Improve asset performance

Root cause and correct operational issues by combining disparate data sources into a single, comprehensive, real-time 3D view of your assets



## Enhance productivity

Help field operators quickly pinpoint and address equipment and process anomalies from the shop floor

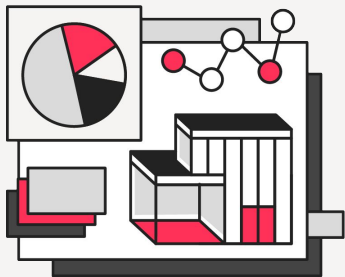


## Connect remote experts

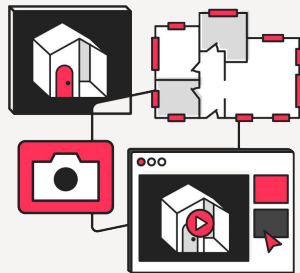
Bring 360 operational awareness to remote subject matter experts

## However, building a digital twin is hard

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Using data from  
disparate sources



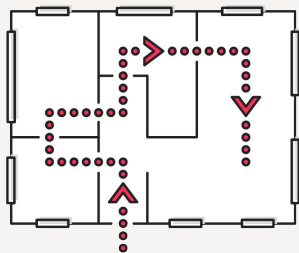
Modeling assets over  
their lifetime



Creating effective  
visualizations

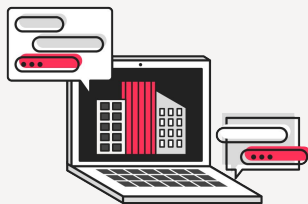
# Digital twin levels

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Engineering design and visual representation.

**L1 Descriptive**



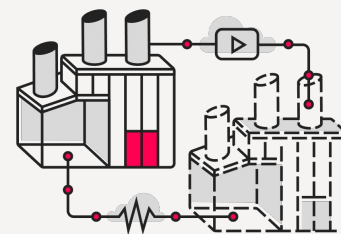
Integration of IoT, asset history, and maintenance data.

**L2 Informative**



Predictions of unmeasured quantities and future states based on continued operations.

**L3 Predictive**



Updatable models to drive actionable insights.

**L4 Living digital twin**

# Digital twins can drive **high performance** and **sustainability**

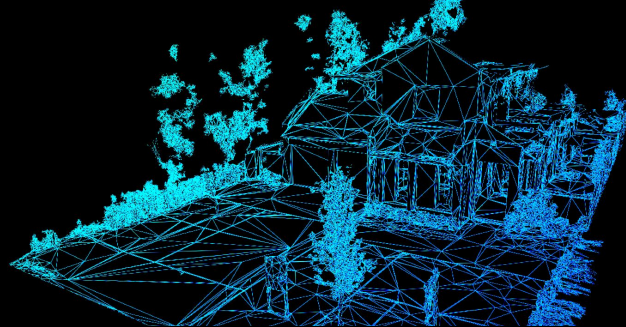
Extent to which organizations agree that the below are the key drivers of their digital twin investments:



# Unlocking value of any property throughout its **lifecycle**



# Intelligent Surfaced Data



**Living Room**

**Room Information**

Area  
**388** sq. ft.

Dimensions  
**20 ft 9 in** x **19 ft 8 in**

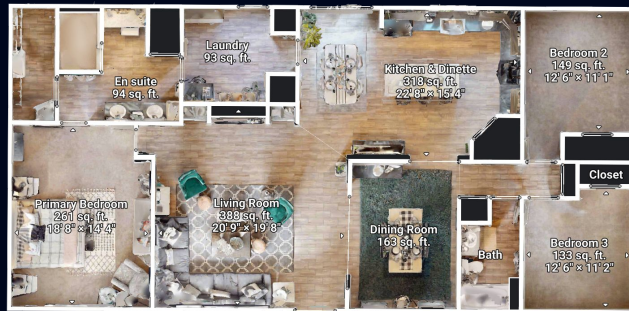
Height  
**8 ft 6 in**

Full Wall Length  
**88 ft 0 in**



## Room Dimensions and Labels

Area and room dimensions in every model are automatically measured, including ceiling heights, to help you truly understand the scale of a space. Common rooms are automatically labeled, with the ability to identify more than 20 different room types.

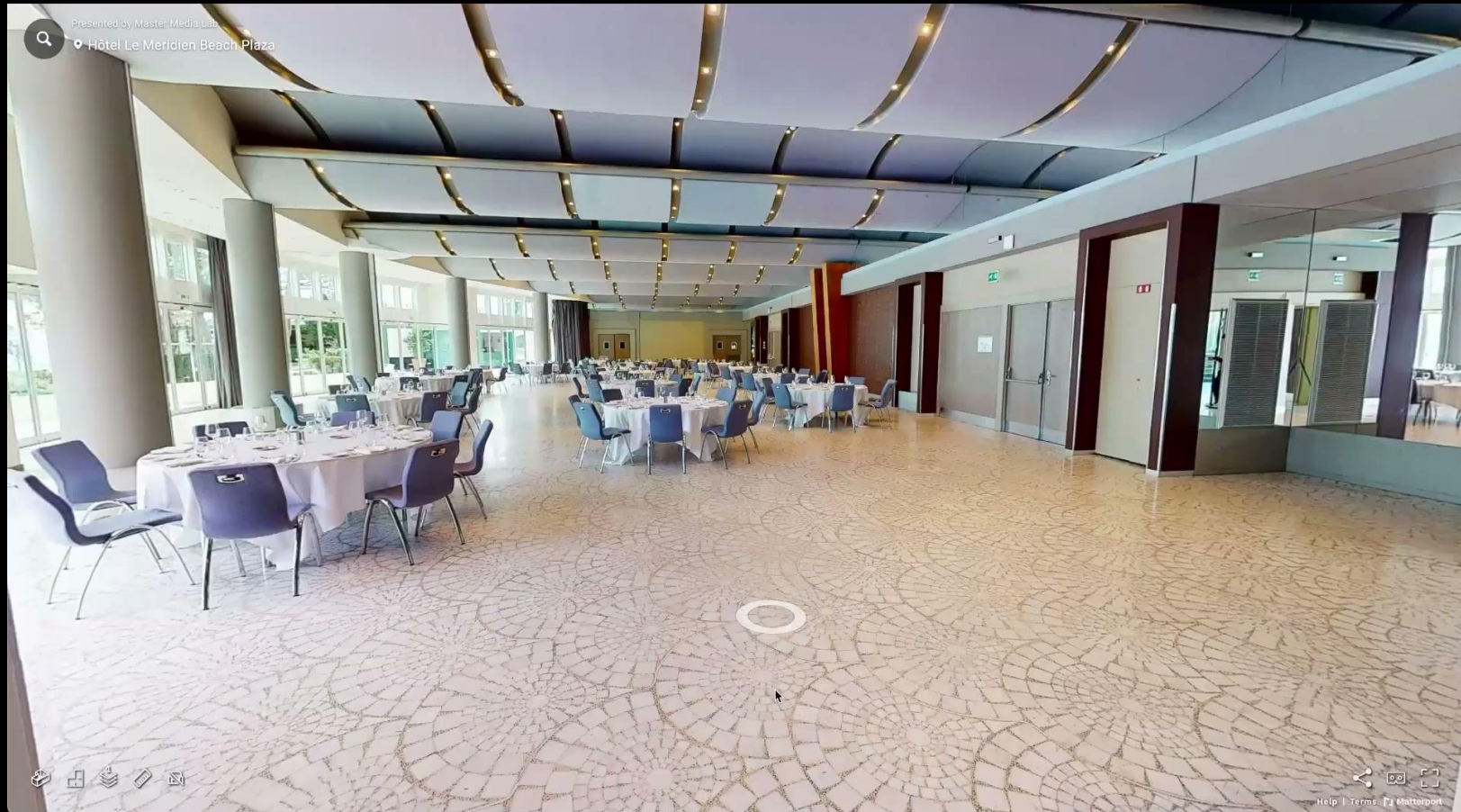


## Property Layout

Instantly see the layout of properties while maintaining control. Fully editable with a simple, point-and-click tool to **adjust walls, openings, and room names**. Ability to add or remove doorways and walls with measurements updated in real-time with each change.



# Defurnish for **capital planning**



# The building lifecycle

## 1 Plan & Design

Save time capturing existing site conditions. Gain efficiencies in building information modeling (BIM), and remodeling processes.

## 2 Build

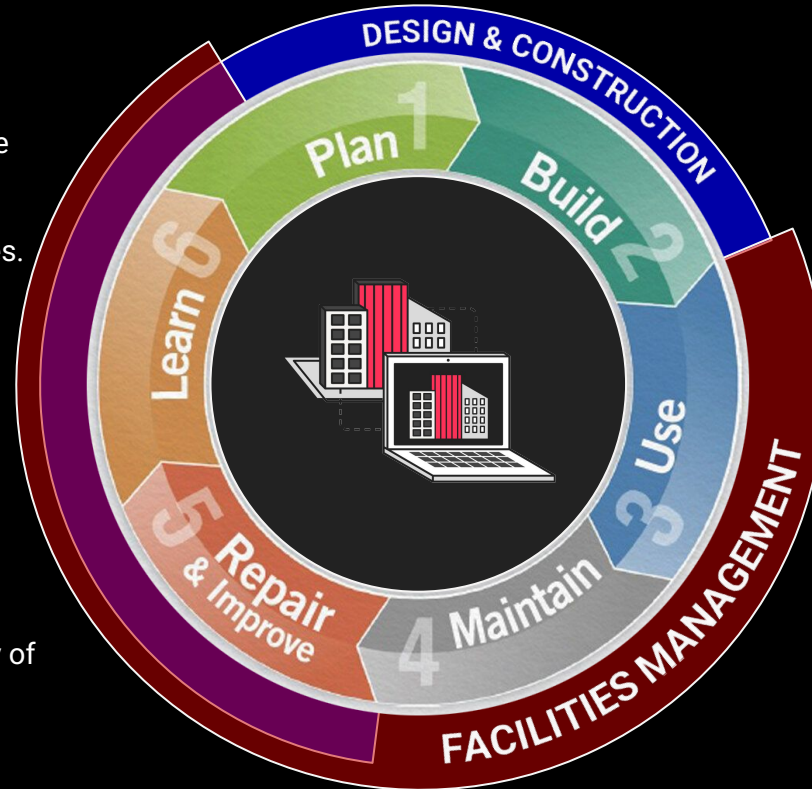
Streamline workflow documentation, material estimation, and stakeholder collaboration.

## 3 & 4 Use & Maintain

Increase ROI by reducing costs of facility management, ongoing maintenance, and asset documentation.

## 5 & 6 Insure and Repair

Decrease risk with accurate 3D documentation. Increase quality of underwriting, claim cycle speed, material replacement and improvements.





# The building lifecycle **costs**

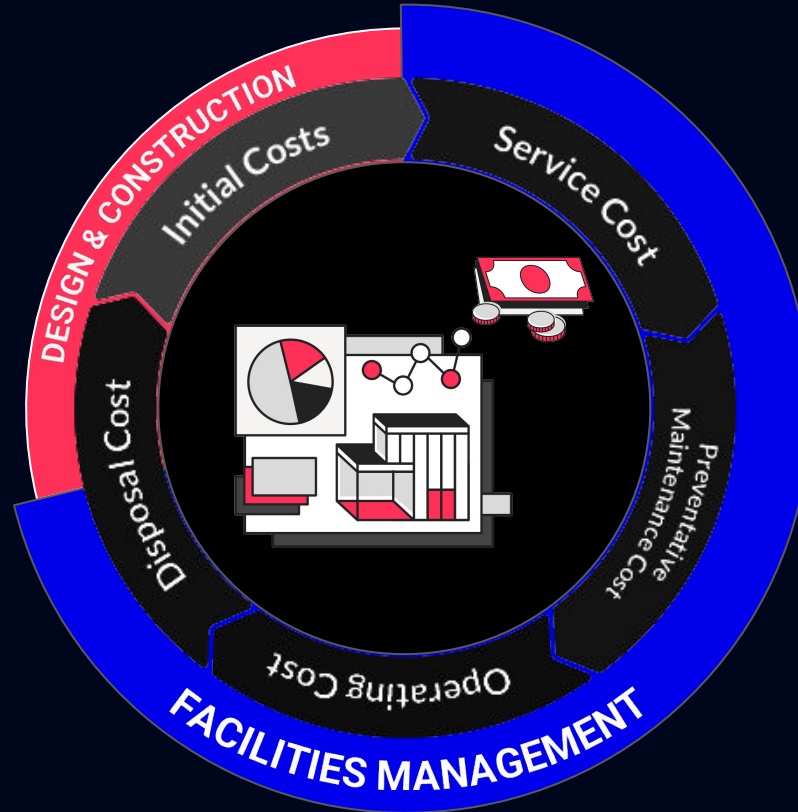
Typical commercial building over a **30-50 year lifespan**

## Initial Costs

Acquisition **5-10%**  
Construction **20-30%**

## Disposal Costs

End-of-Life **5-10%**  
Demolition  
Repurposing



## Operation Costs

Energy **60-70%**  
Proactive Maintenance  
Management  
Long-term Replacement  
Repairs

# The Cost of a **Fragmented Industry**

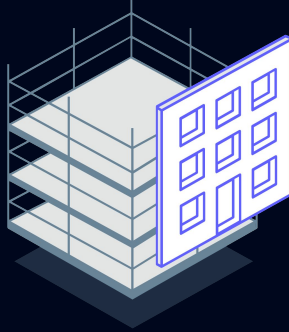


Teams

# 35%

of time is wasted on  
non-optimal activities  
(14+ hours/person/week)

*Source: Construction Disconnected – FMI Report*



Projects

# \$280B

industry annual rework costs  
caused by poor project data  
and communication

*Source: Construction Disconnected – FMI Report*



Business

# 95.5%

Of all data goes unused in  
engineering & construction

*Source: Big Data = Big Questions for the Engineering  
and Construction Industry – FMI Report*

# The As-Built Challenge: **Long Delays & High Costs**

**80%**

**of construction rework** stems from inaccurate or outdated as-built drawings.

*Source: National Institute of Building Sciences study*

**15%**

Integrating digital models with as-built data can **reduce construction time** by 10-15%

*Source: Dodge Data & Analytics*

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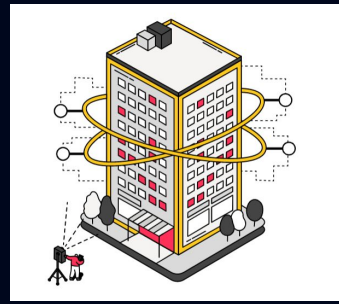
“Manual as-built generation can cost projects **\$10,000 - \$50,000 per building.**”

*Source: McKinsey Global Institute report*

Communication across  
properties and projects is hard

**Let digital twins do the talking**

# Macro Backdrop



High Interest  
Rates

Labor  
Shortages

Aging  
Workforce

Driving increased focus and investment on Digital  
Twins, BIM, Data, and Sustainability

# Digital twins for the **entire project lifecycle**



## Pre-construction

- As-Built Documentation
- Condition Assessments
- Design / Risk Assessments
- Concept / Detailed Design
- Construction Planning
- Scan-to-CAD / BIM file
- Estimation

## Construction

- Progress Monitoring
- QA / QC
- Issue & RFI Coordination
- Work package sign off
- Milestone Documentation
- Safety Training

## Close-out & Operate

- Closeout Documentation
- FM Database
- Spec / Warranty Documentation
- Training/Onboarding Asset
- Building Promotion Asset

# Digital twins for the **entire project team**



## Pre-construction

- BIM Manager
- VDC Manager (Virtual D&C)
- Architect
- Engineer



## Construction

- General Contractor
- Sub Contractors
- Specialty Trades



## Close-out/Operate

- Building Owner
- General Contractor
- Project Management Provider
- Developer (Land)



# Design & Construction

A visually immersive, interactive, accurate 3D model of a space at any stage of the building lifecycle.



## For architecture

### **Save time and reduce costs.**

Easily capture as-built conditions and kickstart your design process with high-fidelity, 3D data.

## For engineering

### **Reduce site visits and remove the guesswork.**

Make decisions faster and streamline your workflow without repeated and costly visits to the jobsite.

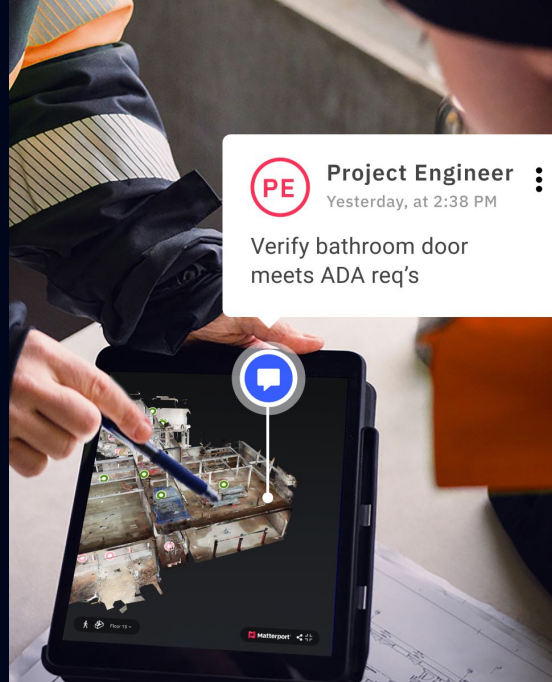
## For construction

**Improve communication and reduce risk.** Document project milestones and collaborate on issue resolution and progress monitoring.

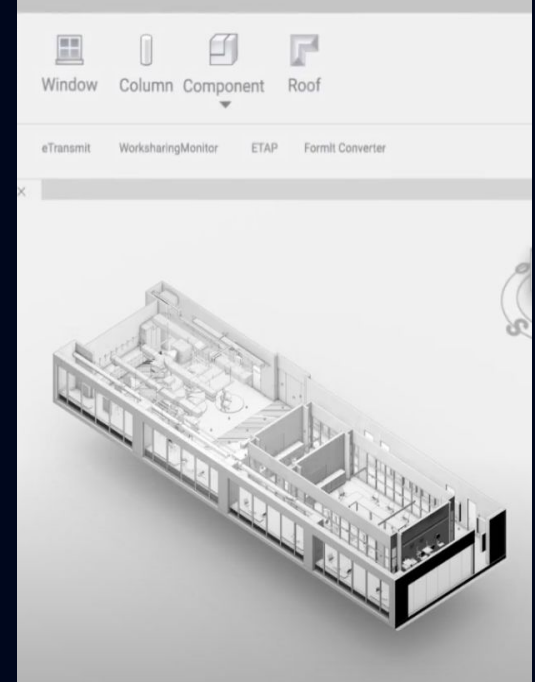
# Reality Capture Workflow for **Design & Construction**



**Capture & Document**



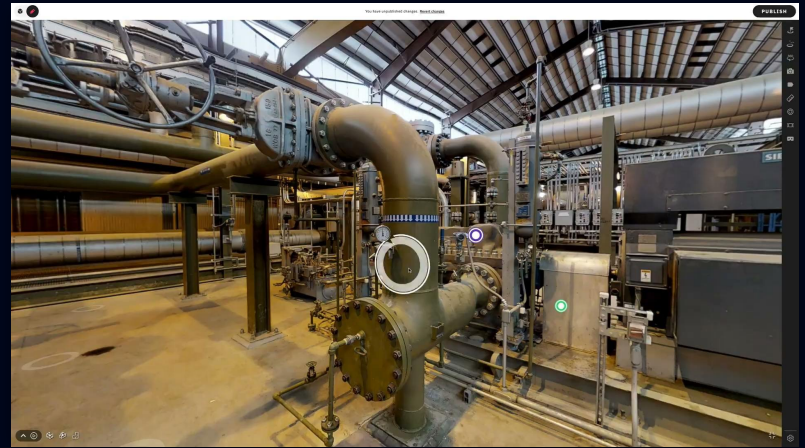
**Collaborate**



**Integrate**

# Facilities Management

**A visually immersive, interactive, accurate 3D model of a space to serve every occupant with insights, asset records, training, and access 24/7.**



## For Maintenance

### **Stay operational 24/7**

Manage your assets and maintain operational efficiency throughout every planned or unplanned event.

## For Management

### **Stay ahead of facilities workflows**

Connect and train your people, document your assets, and fast-track your decision making processes.

## For Value

### **Save time and money**

Resolve issues remotely.

Reduce travel expenses, stay on schedule and on budget.

# Reality Capture Workflow for **Facilities Management**



Capture & Document



Collaborate



Execute



# Industry Tools

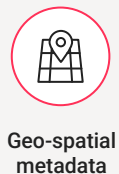
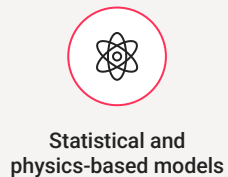
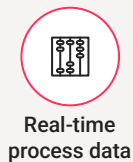
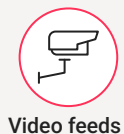
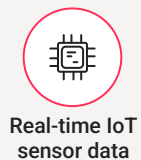
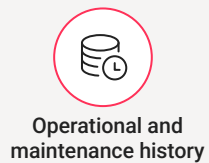
## Add-ons & Integrations

Ready to jumpstart & connect with your existing design tools.

- Collaborate on projects more efficiently with visual site context from digital twins in leading 3rd party platforms.
- Get BIM / CAD files from your Matterport scan to jumpstart the initial documentation and design assets
- Scan and rescan as you track construction progress and milestone document installation, and quality of building products.
- Ensure RFIs and Issues are logged, understood and resolved in Autodesk Construction Cloud.



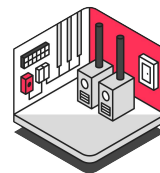
# Digital Twin Benefits



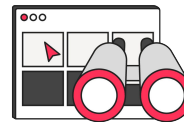
## 3D Digital Twin

End-user web application

Integrated asset  
Model 3D visualization  
Insights



Predictive maintenance



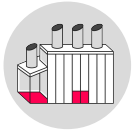
Remote monitoring



Production optimization

# Smart factory digital twins

## Use cases discovery



### Lean Daily Management

- Comprehensive visual insight and collaboration of all daily operations with a Digital Twin
- Commercial Users create multiple views



### Asset Performance

- Monitor system and asset performance
- Reduce Downtime and improve OEE
- Reduce maintenance costs and improve RUL



### Connected Worker

- Frictionless workflow that allows customers to "bind" operational data from their data lakes with their Matterport 3D models to create dynamic, connected, and up-to-date digital twins.



### Production Monitoring

- Enterprise level insights and a common monitoring mechanism
- Identify and improve key quality KPIs (Yield, scrap ratio, OEE and rework)



### Sustainable Manufacturing

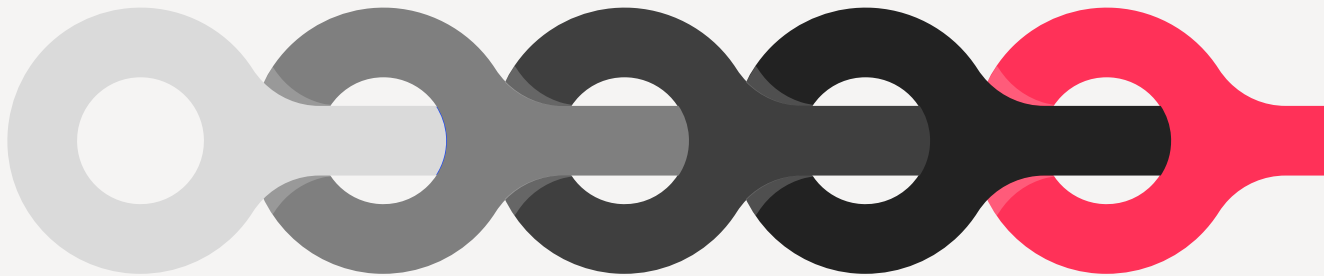
- Optimize energy and emissions
- Reduce cost and wastage
- Manage sustainability data

# Connected Worker



79% of manufacturing executives cite workforce productivity as a vital KPI for smart factory initiatives.

Field operators and maintenance teams are overwhelmed with data from siloed sources, making it difficult to prioritize maintenance tasks.



## Augment Knowledge

Deepen employee understanding of facilities, knowledge retention and transfer by leveraging data.

## Immersive Experience

Provide technicians with an immersive view of plant on mobile/desktop overlaid with rich contextualized data

## Remote Collaboration

Improved productivity by enabling cross-functional collaboration, remote assistance and spotting and resolving anomalies proactively

## Single pane of glass

Data and alerts from disparate systems in a single pane of glass, including machine status, output, maintenance records, and operating manuals

## Quicker Onboarding

Minimized time for new hires to understand and action metrics with contextualized data and immersive environments enriched with AR/VR



# Transformation Pillars

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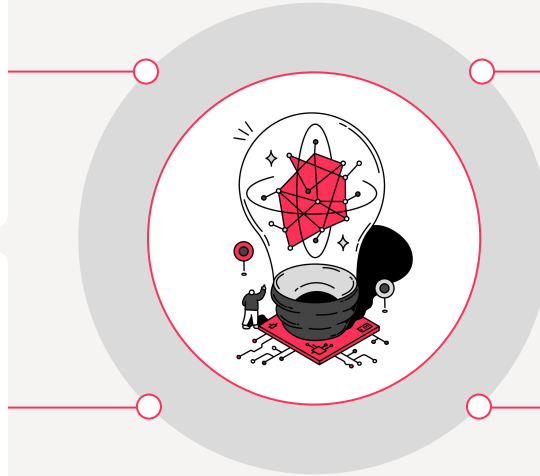
## Mobile Private Networks

Provides manufacturers with secure data transmission, seamless collaboration and adaptability to industry requirements.

Enhanced efficiency and productivity with reliable connectivity tailored to your operational needs

## Edge Computing

Faster response times, improved scalability and reduced network congestion to optimize data intensive applications, immersive user experiences and the full potential of innovative services



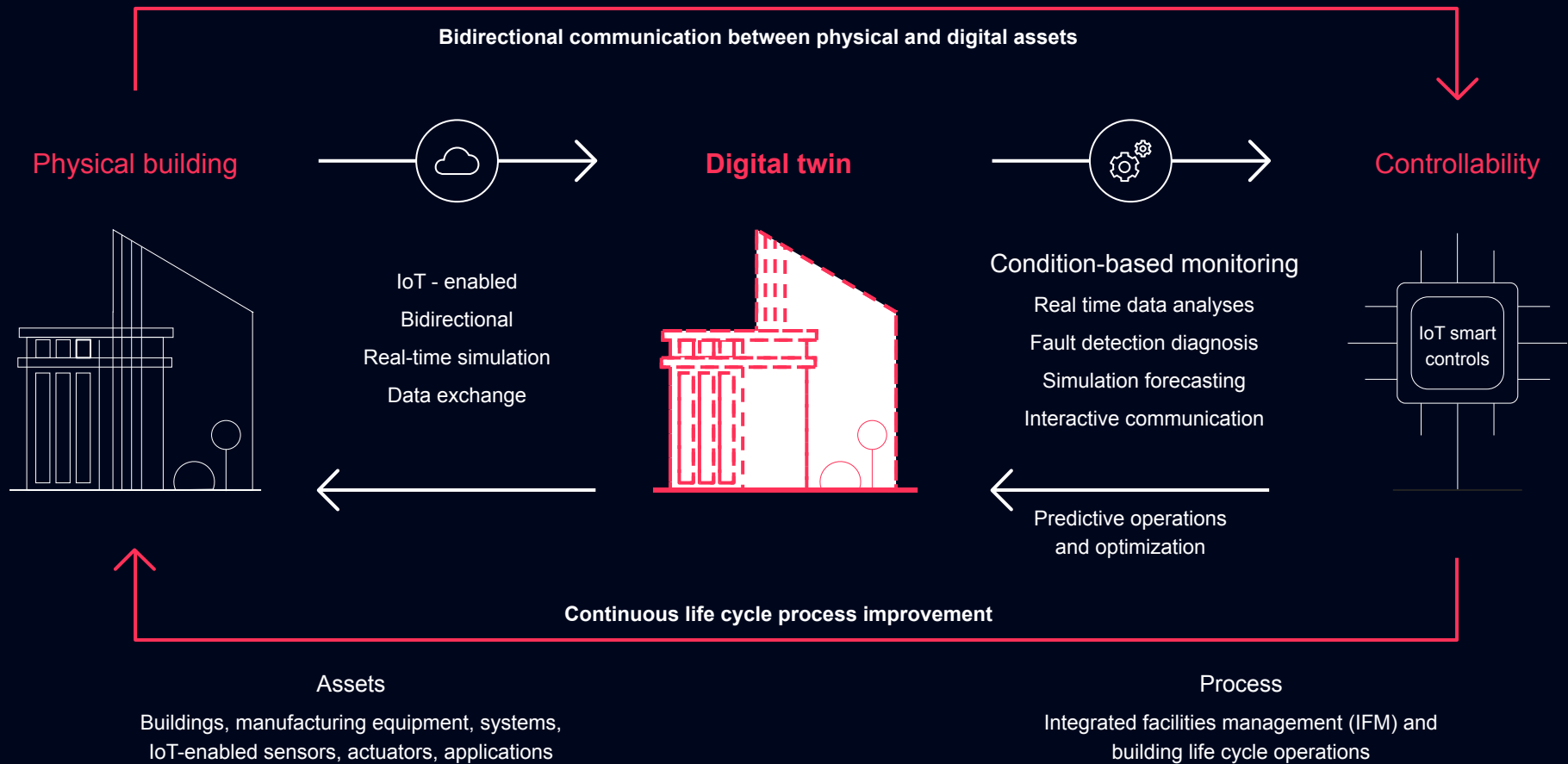
## Digital Twins

Virtual replicas for real time monitoring, optimization and predictive maintenance.

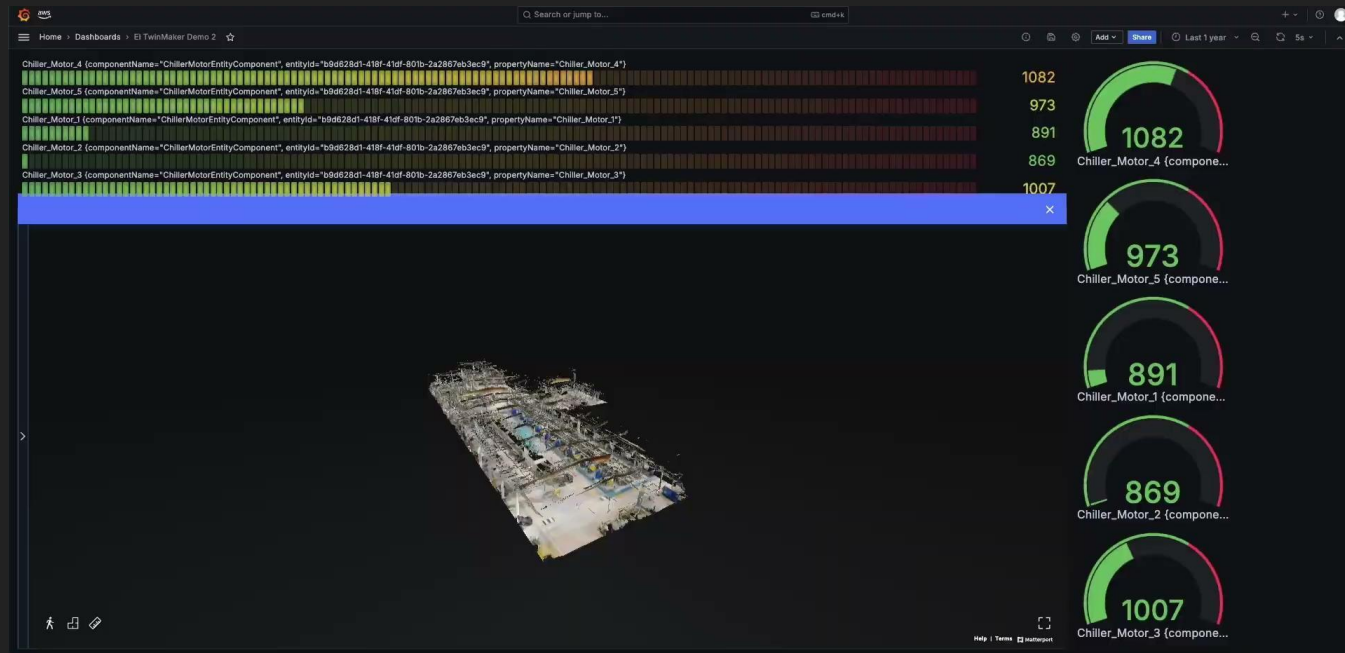
Drive operational efficiency, minimize risk and enable data driven decision-making

## Internet of Things (IoT)

Real-time data and insights by connecting physical devices and systems to digital twins. IoT provides manufacturers with predictive maintenance and autonomous decision-making capabilities.

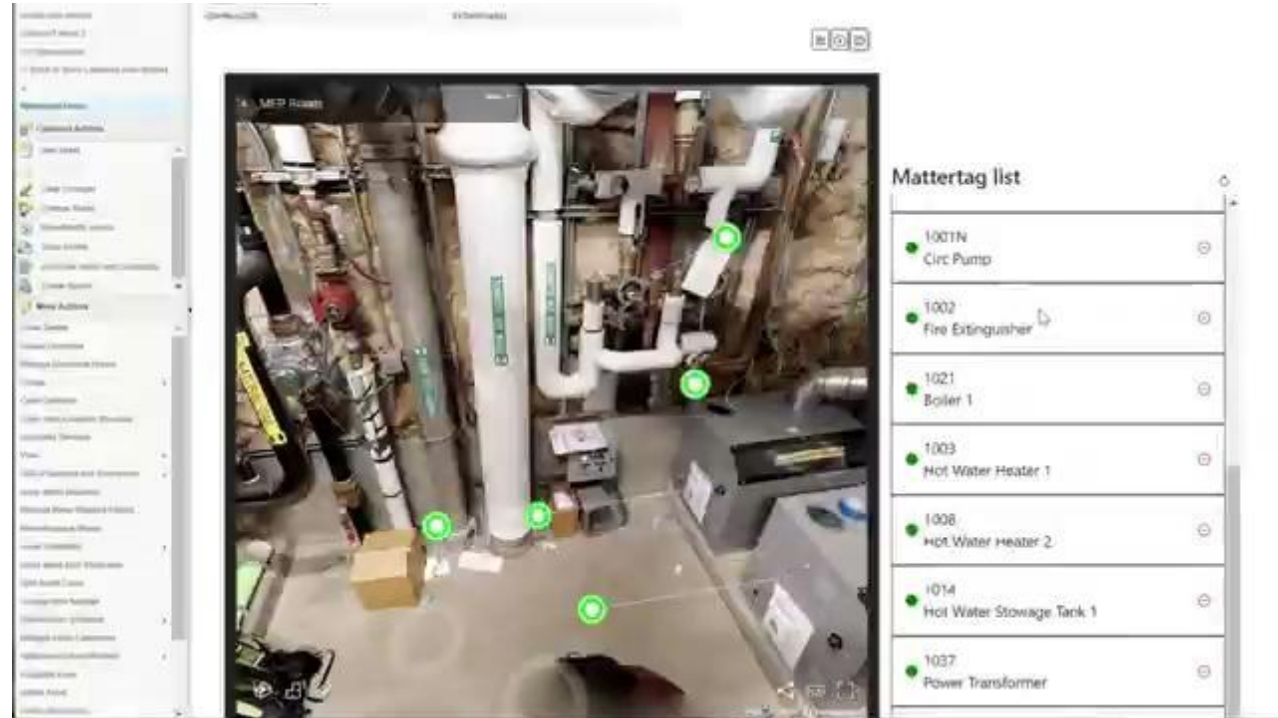


# Demo | Connected Digital Twins



# IBM Maximo

Cost effectively streamline virtual visual walk-downs, surveys, and everyday management needs by integrating digital twins with IOT sensor data and Maximo.





**THANK YOU**