

Realizing the Value of the Digital Twin

Digital Thread Track
Ian Boulton, Sr Director WW PLM, PTC



Presenters Bio – Ian Boulton, PTC

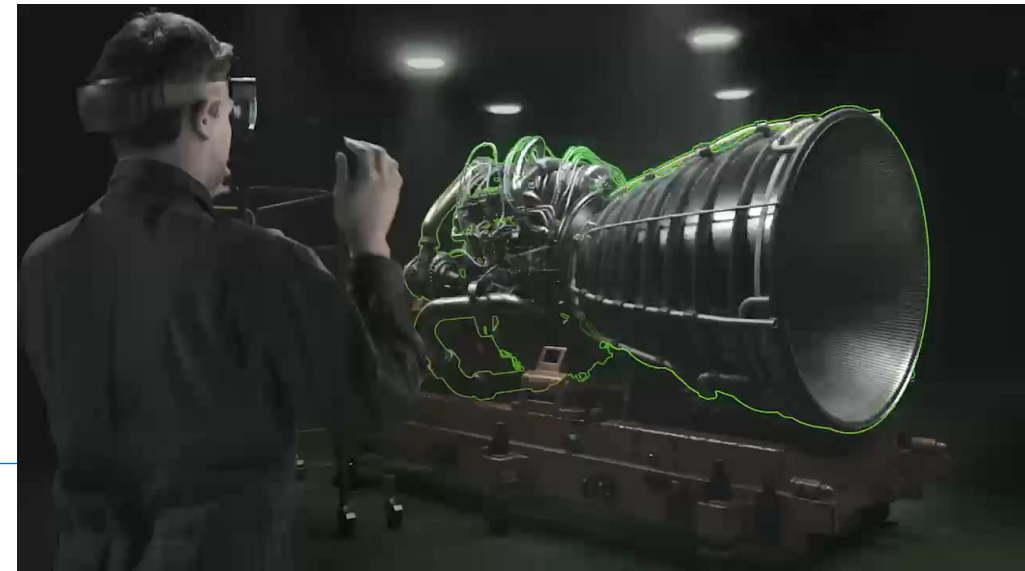
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- In his current role, Ian is responsible for driving digital transformation success at PTC PLM customers and ensuring that A&D industry requirements make their way into the PLM solution roadmaps at PTC.
- Ian is a former maintainer who served in the UK RAF. Ian worked in industry at BAE SYSTEMS and then Logistics Business Systems before joining PTC in 2007.
- At PTC Ian has focused on helping PTC customers drive digital transformation throughout their organization, working with clients such as the US Navy, US Army, Lockheed Martin and Raytheon.
- A proud naturalized US citizen, Ian lives in Tucson AZ with his wife Shannon Boulton.



Realizing the Value of the Digital Twin

- **What is a digital twin?**
- A digital twin is a virtual representation of a physical product, process, person, or place that can understand and predict its physical counterparts. A digital twin has three components: a digital definition of its counterpart (generated from CAD, PLM, etc.), operational/experiential data of its counterpart (gathered from Internet of Things data, real-world telemetry, and beyond), and an information model (dashboards, HMIs, and more) that correlates and presents the data to drive decision making.



Settings or use cases for digital twin

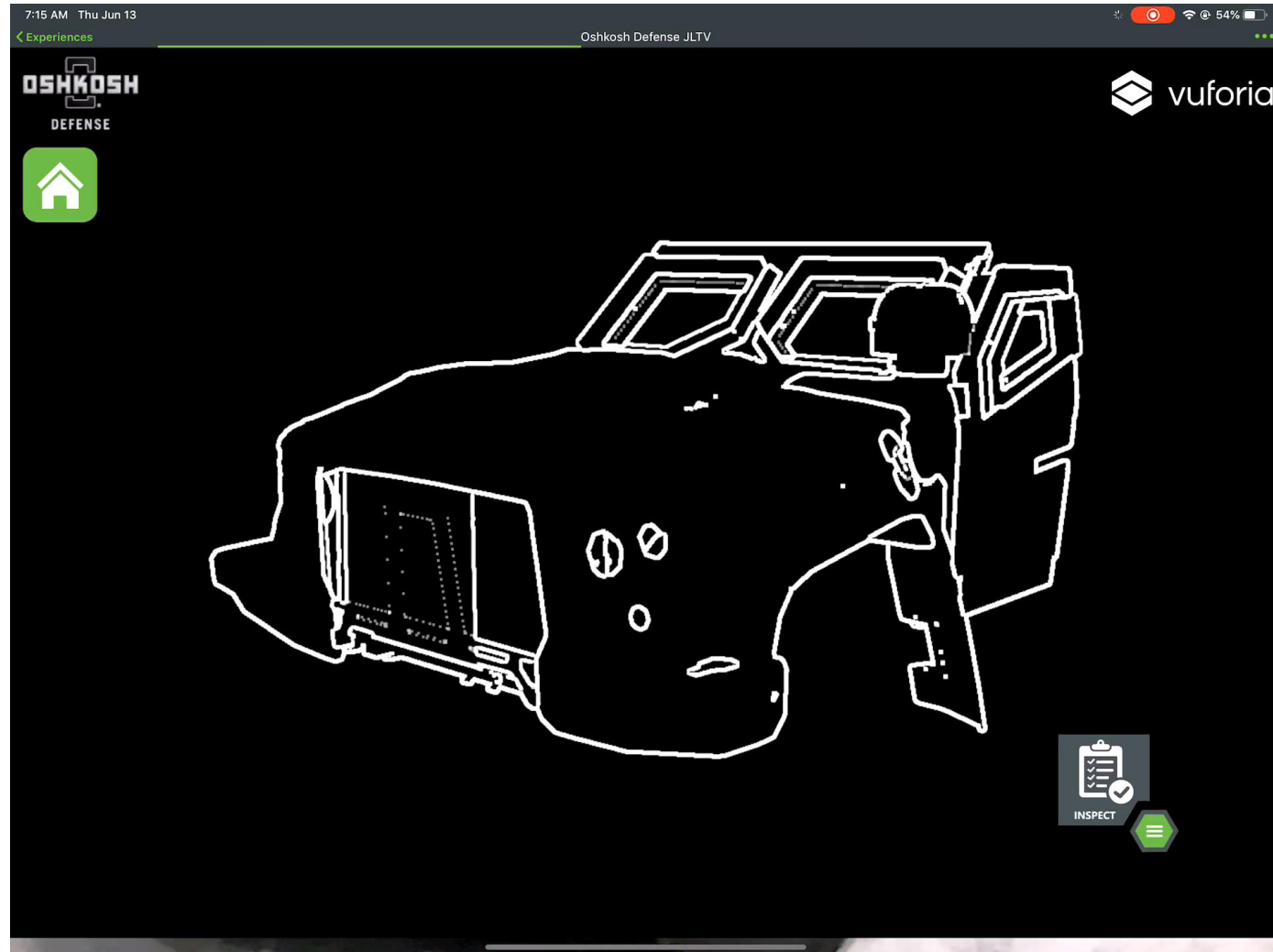
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- **Product Based**
- **Typically, a virtual product instance that reflects the exact configuration of the physical twin**
- **Facility/Setting/Workspace**
- **Can be an Environment, Facility, Workspace or industrial process that is being accessed in real time.**

Product Based Digital Twins

Example: Digital Overlay of a Ground Vehicle

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Building a digital twin

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SOURCE

From where will you source the definition and activity data?

CONTEXTUALIZE

How will you organize and map data for retrieval?

SYNTHESIZE

What types of insights will the digital twin drive?

ORCHESTRATE

What actions will the digital twin direct or trigger?

ENGAGE

How will people interact with the digital twin?

Things as application building blocks

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Things

Vehicle 1



Vehicle 2



Vehicle N



RESTful APIs

ThingWorx Kepware
Server

Edge SDKs

OPC-UA Modbus MQTT SNMP
OPC-DA Honeywell GE Siemens
BACNet Allen-Bradley ■ ■ ■



PLC



OPC SERVER



RTU / FLOW
COMPUTER



DATABASE/
APPLICATION



SENSOR &
ACTUATOR

Thing Template



Properties



Services



Events

Subscriptions

Properties

- Temperature
- Humidity
- Acceleration
- FaultCode1 to N

Services

- Create WO
- Send Notification
- Score Model

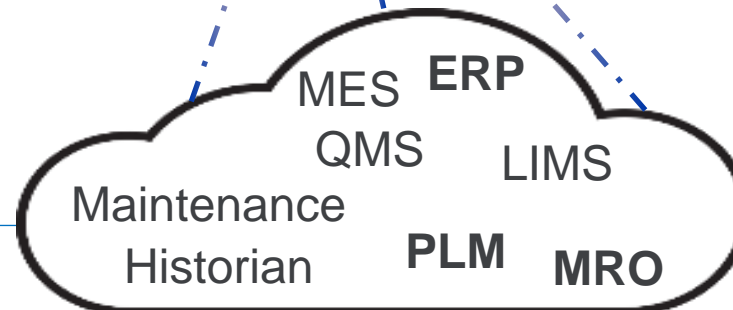
Events

- Alert
- Fault Code High
- Inspection Failed

Subscriptions

- Fault Code WO
- Temperature Threshold

Enterprise Data Systems and Data Stores



Summary

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- **Product Based Digital Twins:**
- **Used to manage fleets or individual products**
- **Used to plan/predict product performance – what if scenarios**
- **Can be real time monitoring, or predictive in nature by employing ML and Simulation (FEA etc)**
- **Often used in the context of CBM+/Logistics and Maintenance/EAM (MRO etc)**

Workspace/Process Based Digital Twins

Digital Twins in the Factory – Workspace collaboration and analytics

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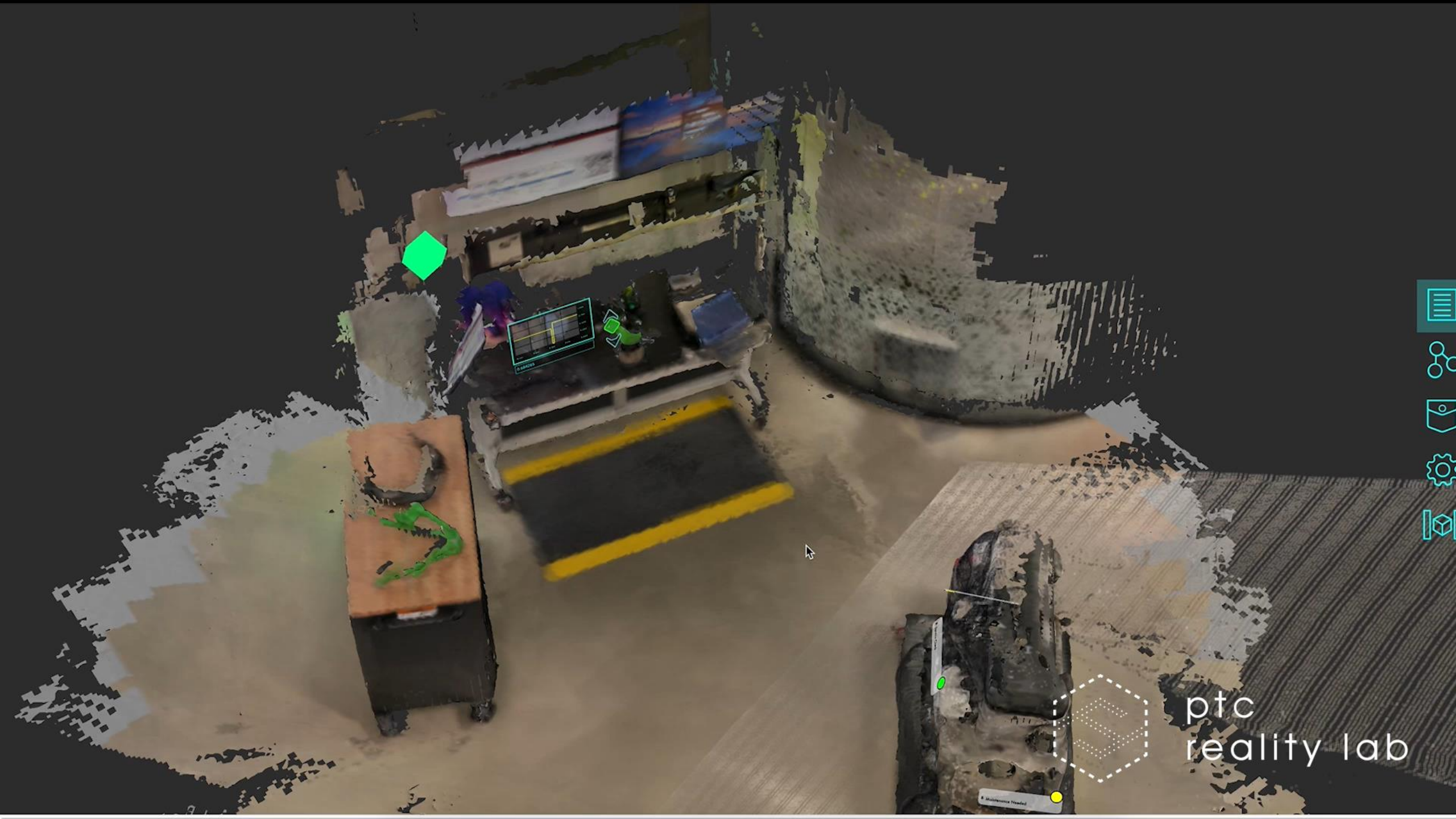
- **Leverage digital infrastructure, scanning, spatial computing, AI and mixed reality to transform the workplace/factory**



Acquire digital twins of the work environment

Use spatial computing to map and optimize the human/machine interactions

Allow for virtual telepresence/remote assistance, supervision and people analytics



ptc
reality lab

Digital Twins in the Factory – Workspace Execution

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- **Leverage digital infrastructure, to manage the workflow and work processes**



Drive the digital work instruction via the engineering content in PLM – Process plans, GD&T, CTQ

Capture the execution steps and create the digital fingerprint

Digital Twin Challenges

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- Technology – Embrace the art of the possible, innovate..
- Business process re engineering – move from paper/blueprint to electronic
- Organizational Change Mgt – this is key
- IT - equipment and hardware – Laptops, Notebooks, Tablets, AR glasses
- Security - Regulatory approval/policy must keep up with technology
- Connectivity – G5/Wi-Fi, Ethernet, Secure Cloud
- Data – Capture, Usage, Generation, Analytics, Adaptation

Value and ROI of Digital Twin Employment

Opportunities - Engineering excellence

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Financial Value*

~7%-9%

EBITDA improvement

Operational Impact

5-10%

Annual improvement in cost of poor quality

20-30%

Reduction in time to industrialization

25-40%

Design cycle time

30-70%

Faster time to implement change orders

Top Use Cases

Model-Based Product Development

Concurrent Engineering

Configuration Management

Design Innovation

Enterprise Change and Quality Management

Simulation-Driven Design

Design for Manufacturing

Customer Success Stories



Opportunities - Manufacturing efficiency

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Financial Value*

5-10%

Reduce operating cost²

Operational Impact

5-20%

Increase throughput

5-30%

Increase yield

5-60%

Increase worker productivity

20-30%

Reduce unplanned downtime

Top Use Cases

Real-time Production
Performance Monitoring

Asset Monitoring and Utilization

Digital and AR Work Instruction
and Assistance

Connected Work Cell

Predictive Analytics for Quality
and Maintenance

Supplier Collaboration and Supply
Chain Management

Customer Success Stories

Vestas

BAE SYSTEMS

brembo

CIMC

WOODWARD

**Carlsberg
Group**

Opportunities - Customer Operations

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Financial Value*

10%

Incremental revenue growth

Operational Impact

5-80%

Reduce warranty claims

12-70%

Increased aftermarket consumables
and service revenue

30-80%

Increase product as a service

41-50%

Reduction in time-to-market

Top Use Cases

Data Driven Design

Connected Revenue Models

Automated Consumable Sales

Usage Based Up-Sell and
Cross-Sell

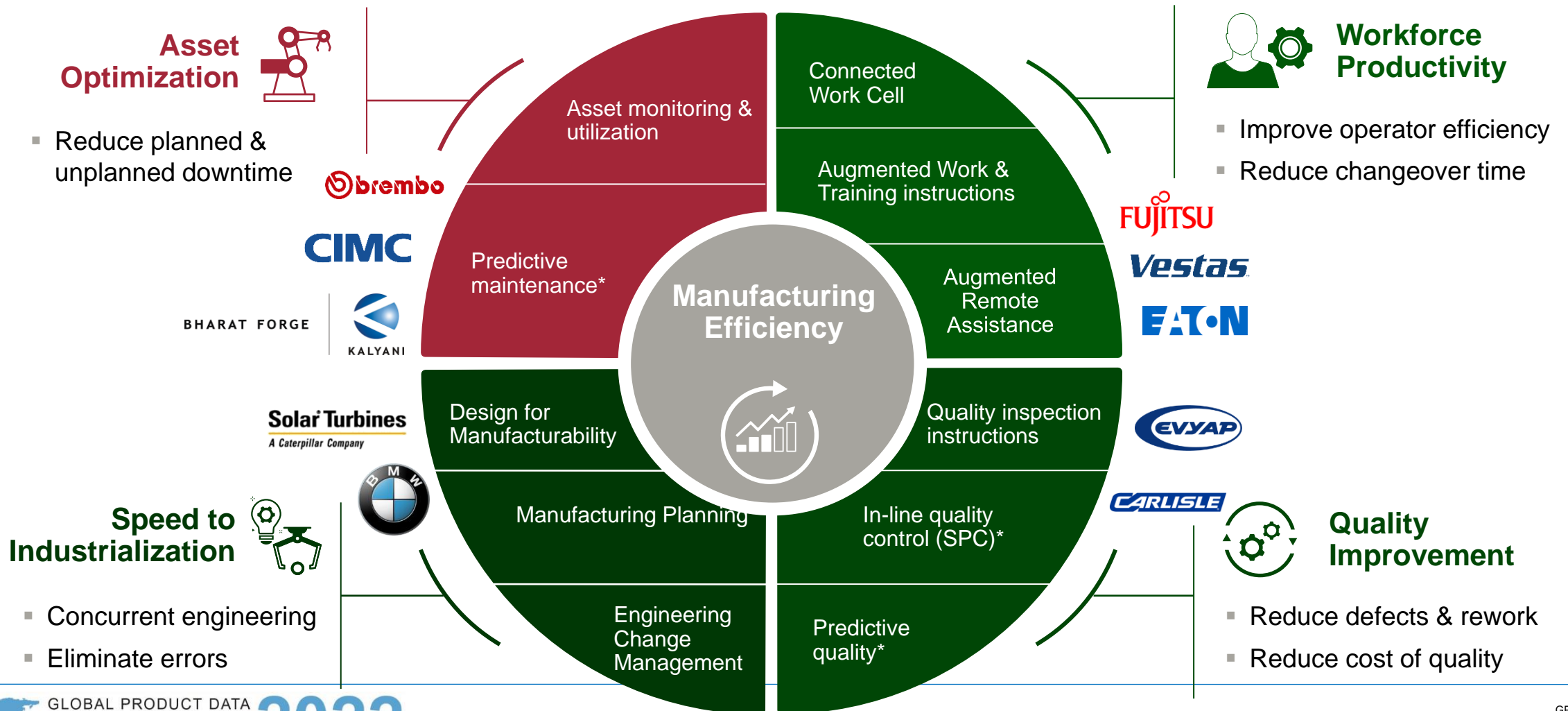
Connected Product Management

Customer Success Stories



PTC digital manufacturing Solutions Portfolio addresses top MFG Concerns

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Q&A

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