INDUSTRIAL INNOVATION & DIGITAL TWIN

Robin van Raak

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OUR TEAM

Platinum PTC Partner
CAD/CAE/CAM – PLM/IoT/AR

Channel CGTech Partner
VERICUT

Channel ANSYS Partner
Advanced CAE

PTC PLM VIP Partner – Since 2019
PTC PLM Preferred Partner – Since 2012

550 # of customers today

35 # team members

Software

Training

Services

550

35

Breda

Sint-Eloois-Winkel

# of customers today

# team members
EXPERTISE IN THE ENTIRE PRODUCT DEVELOPMENT PROCESS

<table>
<thead>
<tr>
<th>Product Lifecycle Management</th>
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<td>Ideation</td>
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Concept & Detailed Development

Verification – Validation – Simulation - Prototyping

Tooling Design & Manufacturing Prep | Manufacturing

Technical illustration & Documentation

End to End Advanced Simulation

Industrial Transformation (IOT) & Augmented Reality (AR)
AGENDA

1. What is Digital Transformation
2. Digital Thread & Digital Twin
3. Industrial Innovation Platform
4. How to build your journey
Digital transformation is application of digital capabilities to processes, products, and assets to improve efficiency, enhance customer value, manage risk, and uncover new monetization opportunities.

Bill Schmarzo – former CTO, Dell EMC Services, now CTO, IoT & Analytics Hitachi Vantara
IS DIGITAL TRANSFORMATION NEW?
BUT IT IS DIFFERENT THAN IT WAS BEFORE …

Speed
Complexity
Global Nature

Milestones in the digital evolution
MARKET TRENDS DRIVING INDUSTRIAL DISRUPTION

WORKER SHORTAGE
Ten million jobs with manufacturing organizations cannot be filled today due to a growing skills gap.

GLOBAL MANUFACTURING PMI

RISK & COST PRESSURE
Global Manufacturing PMI at lowest level since 2016 due to deteriorating global export orders and business conditions.

J.P. Morgan

DIGITAL DISRUPTION
At the current churn rate, about half of today’s S&P 500 firms will be replaced over the next 10 years.

Standard & Poor’s
AVOID ‘KODAK MOMENTS’
AVOID ‘KODAK MOMENTS’

1996
MarketCap: $28B
140,000 Employees

2012
Bankrupt

2012
MarketCap: $1B
Employees: 13
Acquired by Facebook

Today
MarketCap: $100B
DISRUPTIVE IMPACT …
Shipments of the Apple Watch surpassed the total sales of the Swiss watchmakers, in 4Q2017.

Source: IDC Quarterly Wearable Device Tracker, Nov 2017; Apple: Federation of the Swiss Watch industry
What about Digital Thread and Digital Twin?
DIGITAL THREAD AND DIGITAL TWIN
ORGANIZATIONAL SILOS LIMIT INNOVATION

Business Decision Makers
ERP | CRM | EAM | MRO

Decision-makers cannot plan for the future without visibility into the entire value chain.

Manufacturing Floor
MES | ERP | EAM | LIMS | Assets

Challenges in supporting mass customization and globalization.

Sales & Marketing Team
CRM | CPQ

Sellers are challenged with how and if products are used. Lack of up-to-date and accurate design makes it difficult to demonstrate products effectively.

Field Service
CRM | ERP | DMS | FSM | Warranty

Disconnected service arms are less effective at providing a first-time fix in the field.

Every domain creates valuable data.

Engineering Team
CAD | PLM | ALM | CAE
MBSE | TECH PUBS | RETAIL

Increasing need for managing designs and product configurations across the product life cycle.

Sales & Marketing Team
CRM | CPQ

Every domain creates valuable data.
To **understand** and **predict** the **performance characteristics** by leveraging real-world **sensor** and/or related **business system** data.
### POWER OF PTC’S TECHNOLOGY PLATFORMS

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<tr>
<th>3D</th>
<th>LIFECYCLE</th>
<th>ORCHESTRATION</th>
<th>EXPERIENCE</th>
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<tr>
<td>Associative 3D Modeling</td>
<td>Requirements Management</td>
<td>IT &amp; OT Data Acquisition</td>
<td>Object Recognition &amp; Tracking</td>
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<td>Generative Design</td>
<td>Content Management</td>
<td>Contextualization</td>
<td>Spatial Recognition &amp; Tracking</td>
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<tr>
<td>IOT-Connected 3D Digital Twin</td>
<td>Project Collaboration, Governance &amp; Workflow</td>
<td>Data Analytics &amp; Visualization</td>
<td>Experience Authoring</td>
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<tr>
<td>3D Work Instructions</td>
<td>BOM Management</td>
<td>Business Process Flow</td>
<td>Expertise Capture</td>
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<tr>
<td>Configured Digital Mockup</td>
<td>Change &amp; Configuration Management/Digital Thread</td>
<td>UX Composition</td>
<td>Logical Procedure Guidance</td>
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<tr>
<td>3D Spatial &amp; Object Capture</td>
<td>Product Variability Management</td>
<td>Domain-specific Logic Composition</td>
<td>Ad Hoc Collaborative Experiences</td>
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<tr>
<td>Design for Additive</td>
<td>Manufacturing Process Management</td>
<td>Domain-specific Data Models Composition</td>
<td>HMI / Experience of Things</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>Service Process Management</td>
<td>Industrial Protocol Translation</td>
<td>Multi-Platform Device Support</td>
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<tr>
<td>Multi-CAD Collaboration</td>
<td>Quality Management</td>
<td>Digital Content Management &amp; Remote Access</td>
<td>Content Management</td>
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<td>Real-time Simulation</td>
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**Technology Platforms:**
- **creo**
- **windchill**
- **thingworx**
- **vuforia**
WE ACCELERATE INNOVATION BY ENABLING DIGITAL THREAD ACROSS YOUR ENTERPRISE

**Product & Service Innovation**
Differentiate your company and create new revenue, services, products, and opportunities by developing new business models.

**Service Optimization**
Connectivity delivers increased visibility, cost control and customer satisfaction. Insights from products and customer usage fed back into the enterprise for increased visibility.

**Engineering Excellence**
Foundation for Digital Thread – Digital Product Definition is leveraged and enhanced across the enterprise and brought back to engineering.

**Manufacturing Efficiency**
Ensures right manufacturing instructions are digitally delivered to the right factory supporting mass customization, globalization, product introductions.

**Sales & Marketing Experience**
Understand product usage and experience products in the real world in 3D, at scale, in context, anywhere instantly and securely.

**Digital thread**

- creo®
- windchill®
- vuforia®
- thingworx®
YOU CAN’T FLY A DIGITAL AIRPLANE

"The goal is not to become a digital company. Instead, for industrial companies to capitalize on digital technologies to defend and advance their competitive advantage.”
INDUSTRIAL INNOVATION PLATFORM
OUR INDUSTRIAL INNOVATION PLATFORM
EMERGING TECHNOLOGIES

Acceleration of tools for product design
Creo as a platform unites technology trends across the supply chain.
MODEL BASED DEFINITION

Icon circle:
- NC Programming
- Manufacturing Process Planning
- Annotated 3D CAD Model
- Assembly
- Work Instruction
- Technical Illustration

Central diagram:
- Model Based Design
- Engineering calculations
- Simulation
- Manufacturing
- Inspection
- Inspection Report Automation Creation
- Design Automation
- Detailed Design Communication
- Product Costing

Sectors:
- Model Based Definition
- Communication
- Automation
- Inspection
- Manufacturing
- Process Planning
- Technical Illustration
- Assembly
- Work Instruction
- Annotated 3D CAD Model
- NC Programming

Other notes:
- "Inspection Report Automation Creation"
PTC & ANSYS PARTNERSHIP

Revolutionize product design by removing the barriers between CAD and CAE

Partnership provides best and broadest portfolio of engineering simulation software

PTC and ANSYS will put best in class design and simulation capabilities integrated into one product at the fingertips of every Design Engineer
ANSYS DELIVERS PERVERSIVE SIMULATION FROM IDEATION TO OPERATIONS AND BEYOND

IDEATION
80% of costs locked in early in the design phase

MANUFACTURING
Reduce weight of part by 25% through topology optimization and additive manufacturing

OPERATIONS
Increased performance with 10-20% reduction in maintenance costs

DESIGN
Reduce development time 9X while warranty costs 89% more likely to decrease

IN PRODUCT
Reduce time needed to validate autonomous vehicles from 10,000 years to 2-3 years
ANSYS OFFERS THE ONLY TRUE SIMULATION PLATFORM WITH BEST-OF-BREED SIMULATION ACROSS ALL MAJOR PHYSICS

Market Leader Across Individual Physics with Industry-Leading Platform

- Fluids
- Structures
- Electromagnetics
- Semiconductor Power
- Mission-critical Embedded Software
- Optical

Materials Information

Platform
THINGWORX INTEGRATION HUB – EXAMPLE

Factory Data (Sensor data); dynamic data

Role-based Navigate Apps
Role-based Manufacturing Apps
MES Apps
ERP Apps

Message Bus (Tibco)

Connectors/OData/REST

ThingWorx Flow (BPM)

Master Data (PLM Info); Static Data

Assets/Devices
PUTTING INDUSTRIAL IOT TO WORK

**Solutions**
- Engineering Excellence
- Service Optimization
- Product & Service Innovation
- Manufacturing Efficiency
- Sales & Marketing Experiences

**Apps**
- Thingworx: operator advisor
- Thingworx: asset advisor
- Thingworx: controls advisor
- Thingworx: production advisor
- Thingworx: navigate
- Thingworx: software content management

**Industrial IoT Platform**
- Connect: Industrial Protocol Drivers, Business System Connectors
- Build: Digital Twin Modeling, Data Transformation
- Analyze: Analytics Management, Auto-ML
- Manage: Workflow Composition, Logic Engine
- Experience: UX Composition, App Management

**Cloud Services**

**Existing Landscape**
- IT Systems, OT Systems, Assets, External data feeds

**Azure**
WHAT IS AUGMENTED REALITY?

Superimposing computer graphics onto a live view of the world.

Also known as “AR”
WHERE AR IS BEING USED TODAY

Top 3 High-Value Use Cases

Service
Augmented Procedural Guidance
Remote Expert Guidance

Manufacture
Machine Set-Up & Change-Over
Assembly & Process Work Instructions

Sell & Market
Product Visualization & Demonstration

Sample of 107 companies. Average of 2.3 functional areas chosen per respondent.
AUGMENTED REALITY PROVIDES NEW CAPABILITIES

**VISUALIZE**
Enhance the user’s view of the physical world with the overlay of real-world or hypothetical digital information.

**INSTRUCT/GUIDE**
Train or guide users on how to perform a task through the overlay of digital instructions or real-time expert guidance.

**INTERACT**
Manipulate digital graphics or extend a product interface through an AR interface.
AUGMENTED REALITY SOLUTIONS

vuforia® studio™
For Content Creators
• Scalable AR authoring and publishing solution for industrial enterprises

vuforia® chalk™
For Remote Assistance
• Easy-to-use mobile AR collaboration tool for real-time remote expert guidance

vuforia® engine™
For Developers
• Flexible AR development toolkit when building custom apps from the ground up

vuforia® expert capture™
For Expert Knowledge Capture and Transfer
• Enables frontline workers to capture and transfer knowledge when and where it happens
• PLM is connecting the dots and a first step toward realizing a **Digital Twin**

• A crucial step is managing a **Complete Digital Product Definition**

• Start combining **Mechanical, Electrical** and **Software** data into 1 product definition and (several) **BOM’s** (eBOM, mBOM, sBOM)
WINDCHILL FOR DIGITAL PRODUCT DEFINITION

MCAD, ECAD & Software Data Management

Parts Classification

Component Supplier Management

Manufacturing Planning

Change Management

Workflow / Approvals

Requirements Traceable

Secure Access

BILL OF MATERIALS MANAGEMENT

Product Visualization / Validation

Quality Management

Platform Structures

Project Management
Digital Transformation is not a hype but reality.

Create a Roadmap that supports your strategic goals.

Start with Validated Use Cases that deliver rapid first value.

Let us be your Trusted Partner with Expert Guidance and Support.