Please Consider Downloading and installing:

“ThingWorx View”

“HBR Augmented Reality”

“Vuforia Chalk” (iOS only)

Augmented Reality, IOT, Strategy. Creo, & ThingWorx

1 WHAT IS AUGMENTED REALITY?

aug·men·ted re·al·i·ty

noun

Superimposing computer graphics onto a live view of the world. Also known as “AR”

KEY CAPABILITIES OF **AR**

Visualize

Enhance the user's **view** of the physical world with the overlay of **real-world** or **hypothetical digital information:**

- IoT data
- Digital models
- Third-party data
- Business systems information

Instruct/Guide

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

- Real-time transfer of knowledge and expertise
- Digital step-by-step instructions to guide user

Interact

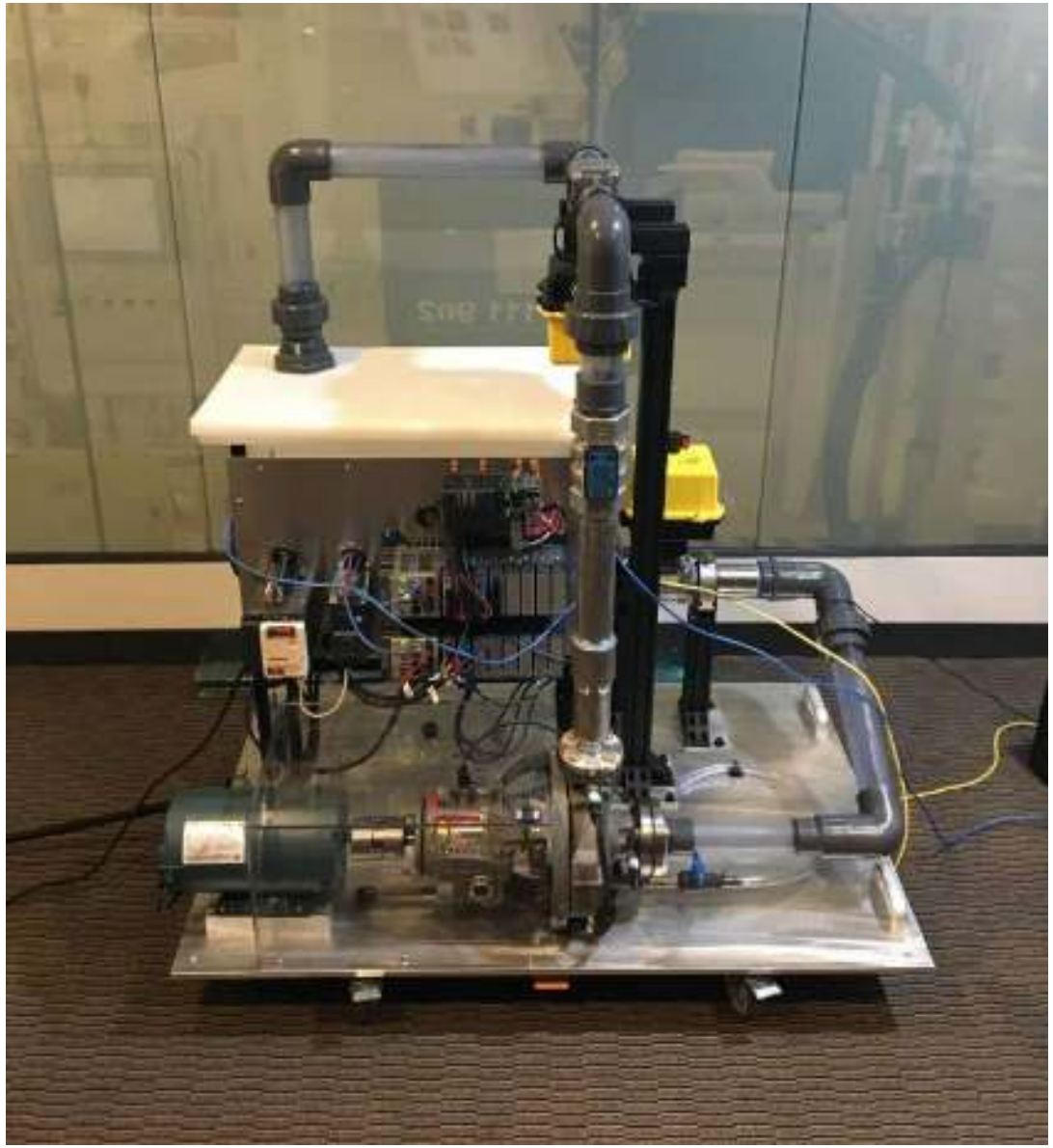
Manipulate digital graphics or extend a product interface through an **AR interface**

- Expand and customize control of product functions
- Modify digital designs
- Enhance physical products with digital experiences

COPYRIGHT 2017 © MICHAEL E. PORTER AND JIM HEPPELMANN

DEMONSTRATIONS

- HBR Article Handouts
- Tagged and Tagless Recognition
- Chalk and Chalk for Business



Studio was even better than I imagined. I was able to use it to quickly create AR experiences. Really easy to do. Great job."

- Uwe Hertweck, Mechanical Engineer

ThingWorx Studio

FREE Trial

Over 7,000 Participants

Create your own AR experiences in minutes:

- 30-day access via Trial Portal
- Quick-start guides and tutorials
- Community support

https://.studio.thingworx.com

2 AR / IOT STRATEGY

How is PTC focusing our attention?

November 2014

Value creation from Smart, Connected Products

October 2015

New organizational and operational paradigms from Smart, Connected Products

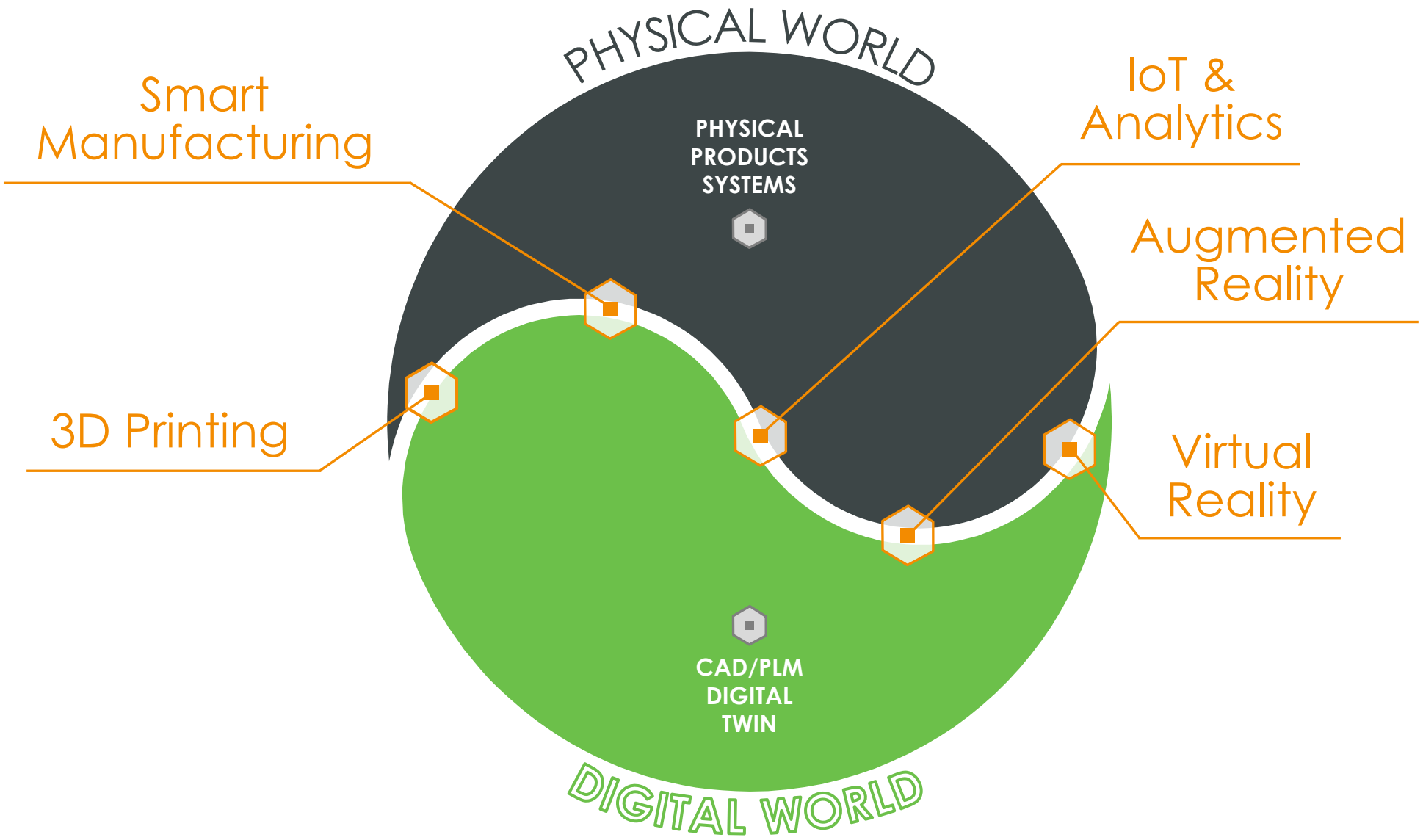
November 2017

New business strategies and assessment of the impact of AR

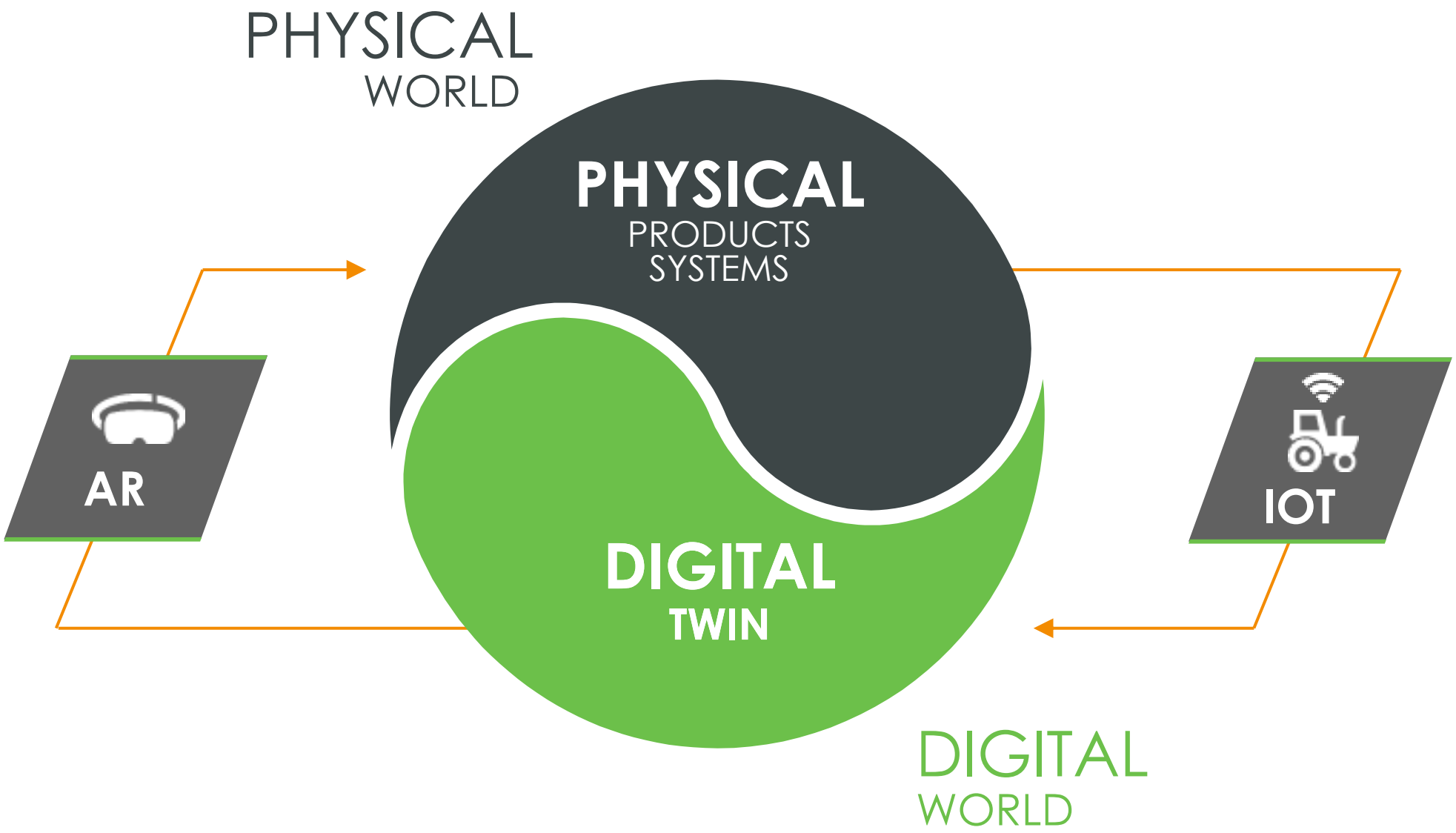
IOT, AR, and Industrial Innovation Resources from PTC

PHYSICAL DIGITAL CONVERGENCE

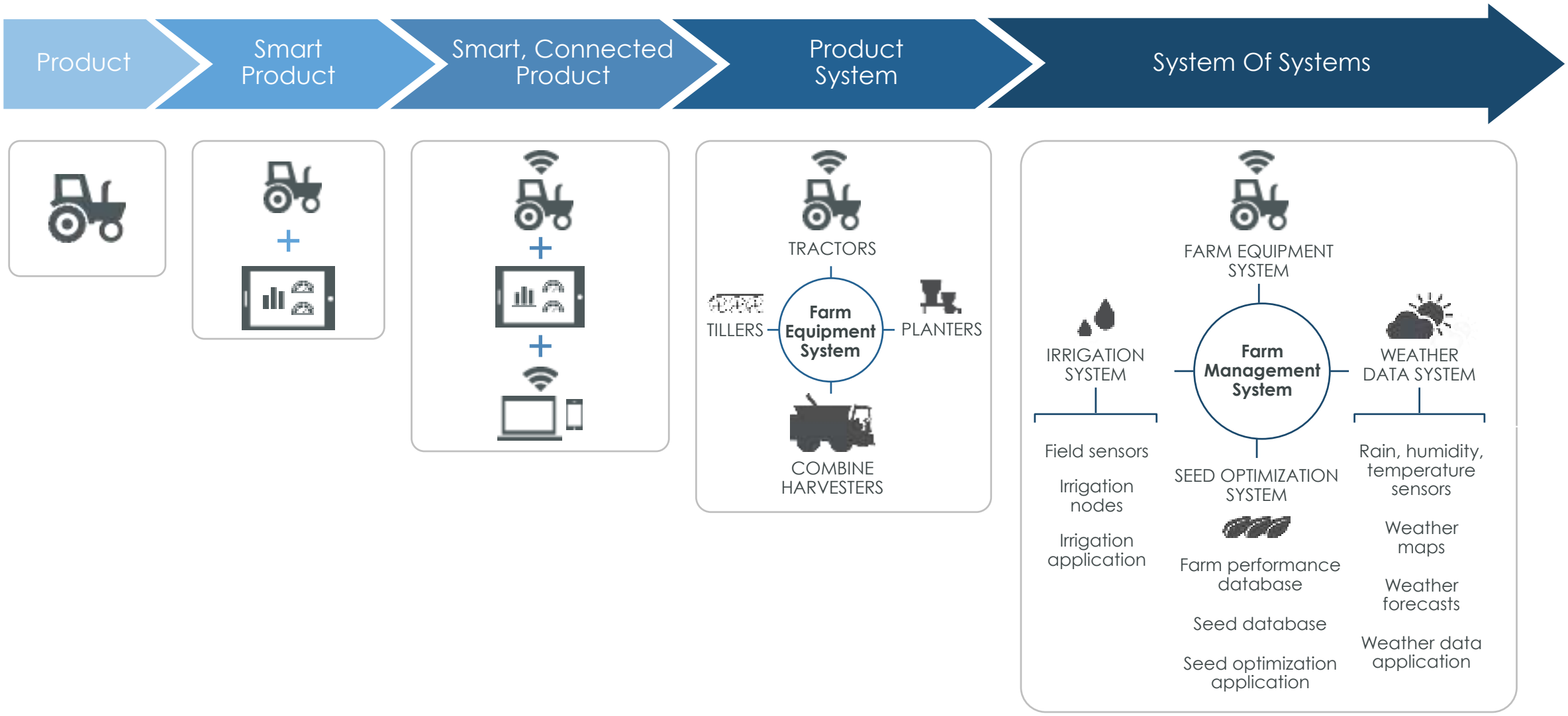
THE NEW FRONTIER OF INNOVATION



DELUGE OF DATA REQUIRES A NEW HUMAN INTERFACE



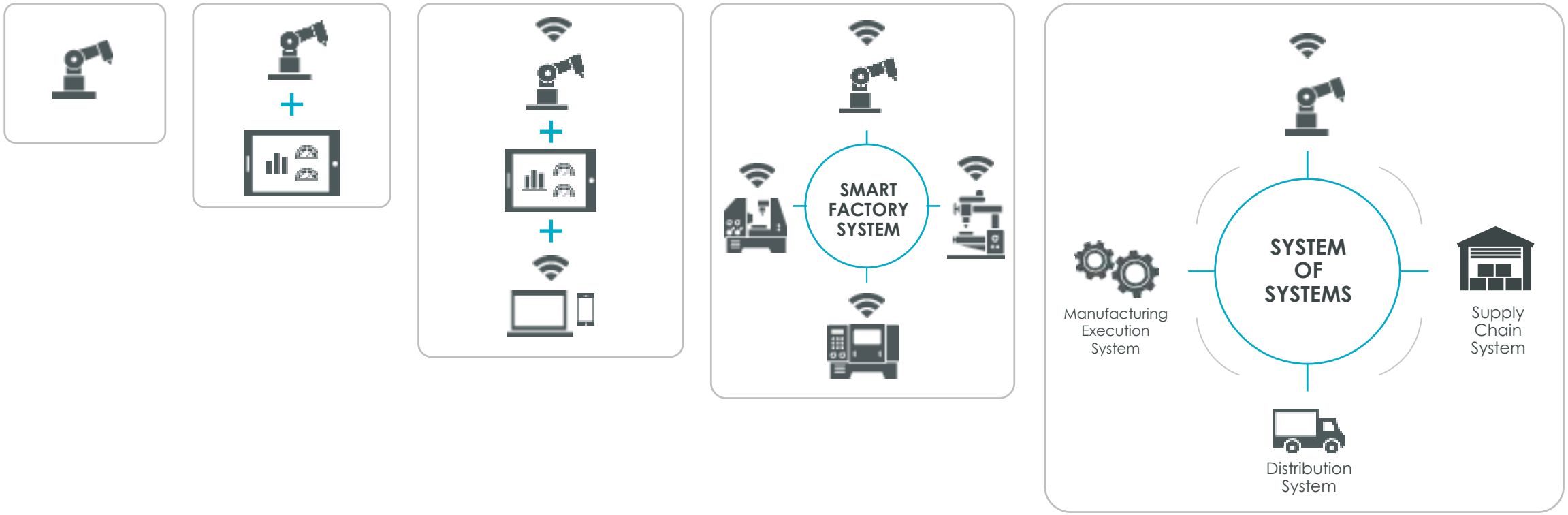
IOT AND AR CHANGE COMPETITION - ASSETS



IOT AND AR CHANGE COMPETITION - FACTORIES

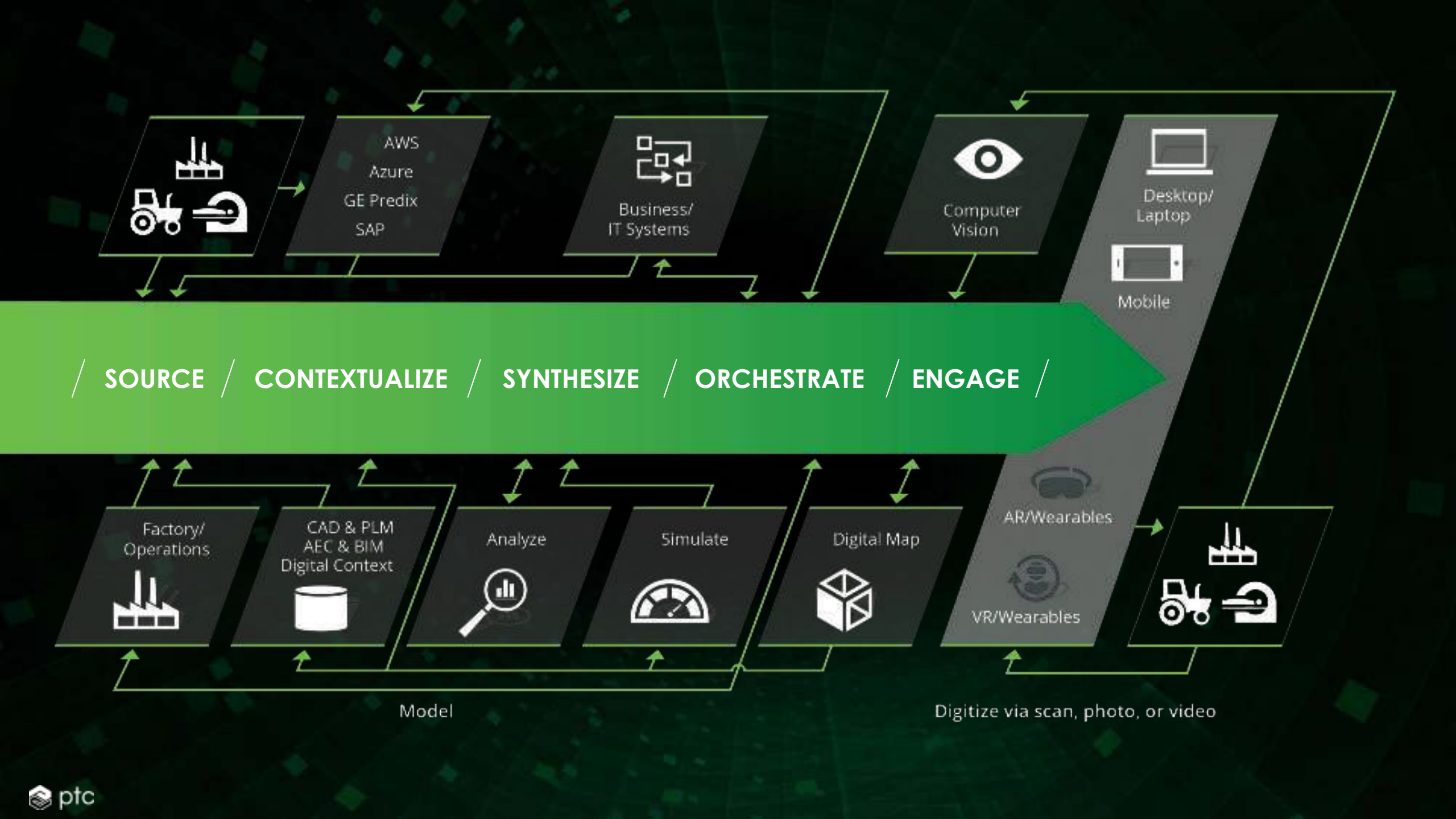
ptc

Product → Smart Product → Smart, Connected Product → Product System → System Of Systems



VALUE OF **AR** ACROSS THE ENTERPRISE

DESIGN	MANUFACTURE	SELL	SERVICE	TRAIN	OPERATE
Collaborative Design Review	Maintenance Work Instructions	Virtual Product Demonstration	Service Manual & Instructions	Job-specific Training	Head-up Display
Digital Design Review	Performance Dashboards	Augmented Brand Experience	Service Inspection & Verification	Safety & Security Training	Augmented Operator Manual
Augmented Interface	Operator & Assembly Work Instructions	Retail Space Optimization	Remote Expertise	Expert Coaching	Augmented Interface


AWS
Azure
GE Predix
SAP
Business/
IT Systems
Computer
Vision
Desktop/
Laptop
Mobile
/ SOURCE / CONTEXTUALIZE / SYNTHESIZE / ORCHESTRATE / ENGAGE /
Factory/
Operations
CAD & PLM
AEC & BIM
Digital Context
Analyze
Simulate
Digital Map
AR/Wearables
VR/Wearables
Model
Digitize via scan, photo, or video

ptc

DEEPER ASPECTS OF EACH PHASE OF INNOVATION

SOURCE

- Connect Anything – Remote Device to Enterprise System
- Industrial Protocol Drivers Powered by Kepware
- Native Cloud Support – AWS, Azure, Predix, and More

CONTEXTUALIZE

- Transform Physical to Digital Through Visual Application Modeling
- Any data – in motion, in use, or at rest
- Singular Data Representation

SYNTHESIZE

- Native integrated Anomaly Detection
- Improve future performance and results with automated prescriptions and simulations
- Easily incorporate 3rd party simulation tools for richer digital twin

ORCHESTRATE

- Deploy Anywhere – Edge to the Enterprise
- Asset Provisioning & Content Management
- Visual Alert & Rules With Workflow Management
- UX Builder for Web, Mobile and AR

ENGAGE

- Compelling visualization for mobile and AR/VR
- Rich 3D animation and IoT data for experience creation
- ThingMarks for unique AR experiences for each associated device

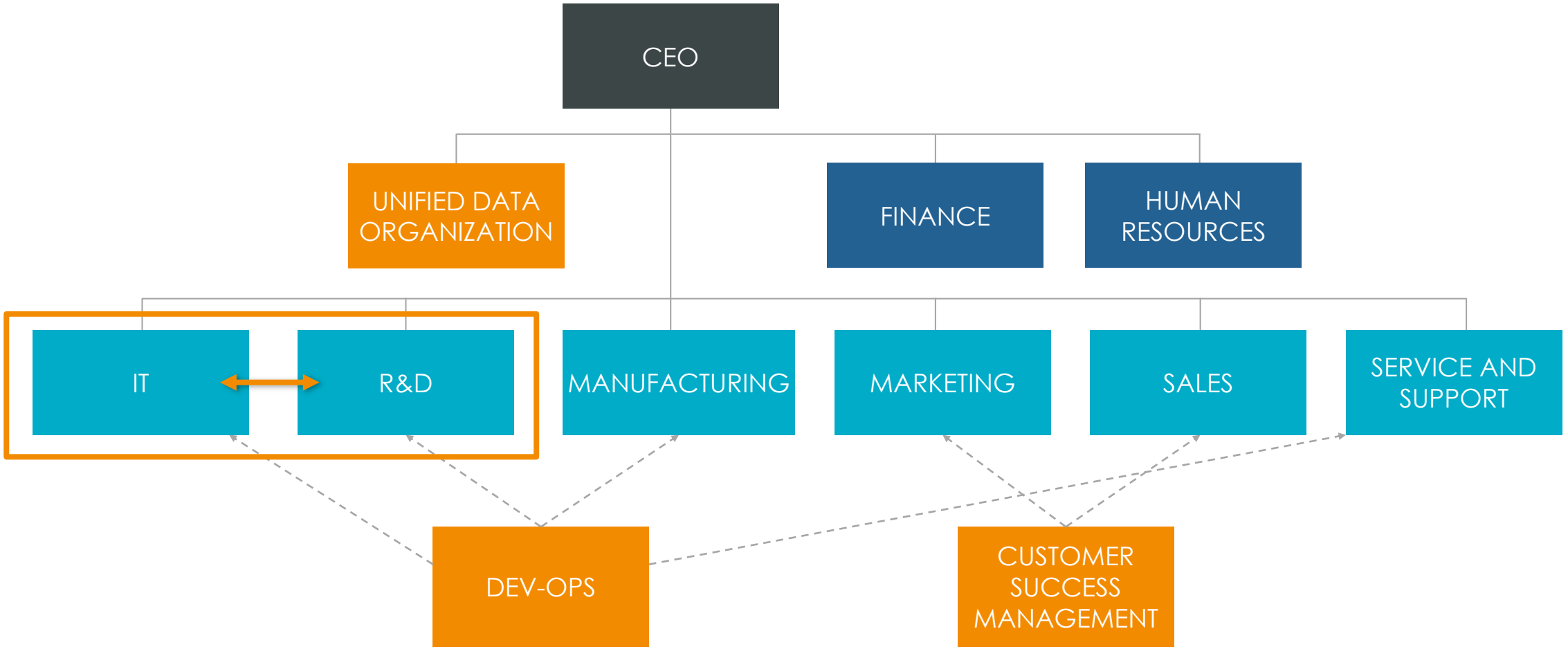
SCALE

- Enterprise-ready Deployment Architecture
- Millions of connected devices

SECURE

- Advanced Device Identity and Transport Security
- Platform-Wide Identity Management Including Single Sign-On

ORGANIZATIONAL ADAPTATION, NOT JUST TECHNOLOGY



3 IS IT REALLY TIME TO CARE?

Satya Nadella thinks augmented reality is another big, long-term bet for Microsoft, that could be bigger than the smartphone. Launched **HoloLens.**

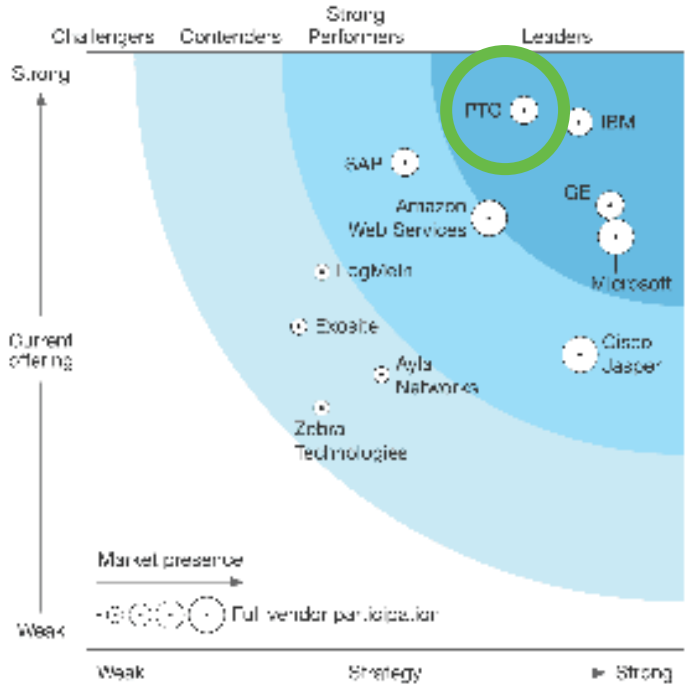
Tim Cook thinks Augmented Reality could be as big as the iPhone. Apple Recently announced iPhones 8 and X, designed to support AR and the **ARKit** software platform.

Sundar Pichai and Google recently announced Google Assistant, Tango, Google Glass II and **ARCore** for Enterprise Augmented Reality.

P.S. All three chose **PTC** to Help Accelerate the Adoption of AR in the Industrial Enterprise

What do the "Tech Generals" Say about AR?

IoT Software Platforms
Q4 '16



FORRESTER®

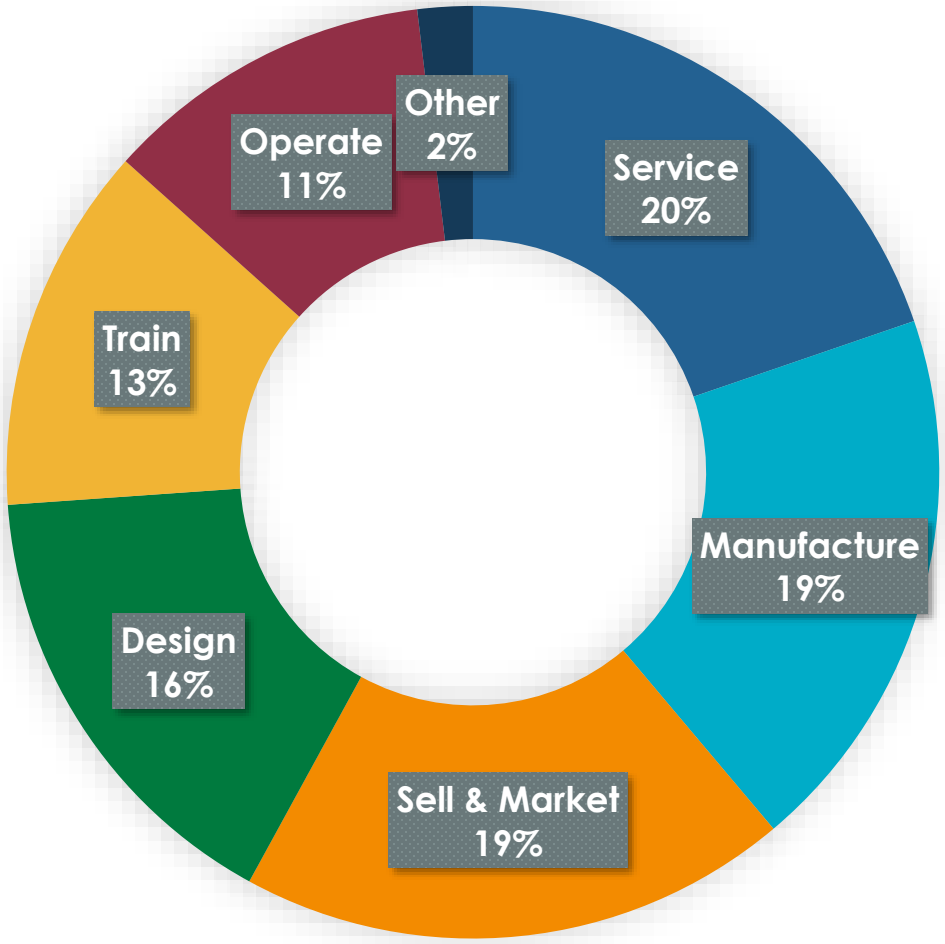
IoT Platforms (Software Vendors)
2017

IDC

Product Lifecycle Management
Q4 '17

FORRESTER®

Who has decided to play?



Highest-Value Use Cases

Service
Service Manual & Instructions

Manufacture
Operator & Assembly Work Instructions

Sell & Market
Product Virtualization

Where is AR being applied today?

WATTS

Reverse Osmosis R18 Series

Top quality, fully assembled RO systems

Four models for flow rates up to 30 GPM

Standard features

- Powder coated steel frame
- Electronic controller with feed and product water conductivity probe
- FRP side port pressure vessels
- Non metallic "Big Bubba" pre-filter housing
- Vertical heavy-duty multi-stage centrifugal pump
- Automatic inlet valve
- Low pressure shut-off with automatic restart
- Tank level input
- Pretreatment interlock input
- Adjustable recycle line
- Concentrate auto flush
- Pre-filter pressure gauges
- Pump discharge pressure gauge (liquid filled)
- Reject pressure gauge (liquid filled)
- Flow meter for product water
- Flow meter for reject water
- Flow meter for recycle water
- Check valve for product water

R18-06 shown with UV and chemical feed pretreatment options.

Standard options

- UV System prepiumbed pre or post RO
- Chemical feed pump installed and prewired

Specifications

Feed water connection	2" Flange
Product water connection	1.5" Flange
Reject water connection	1" Flange
Feed water pressure requirement (minimum)	60 psi
Drain requirement (maximum)	60 gpm
Motor horse power	10
Electrical requirement	230 VAC / 60hz
Phase	3
Amps	30
Membrane Qty.	6" x 40"
Typical rejection	98%

Other voltages available, please contact us for details.

Models

MODEL NO.	PRODUCT GPM	RECOVERY (ADJ.)	MEMBRANE QUANTITY	FEED WATER REQUIRED (MAX)	DIMENSIONS L x W x D	SHIPPING (LBS. EST.)
R18-03-1131130	15	50-75%	3	30 gpm	66" x 27" x 42"	1000
R18-04-1131130	20	50-75%	4	40 gpm	66" x 27" x 42"	1000
R18-05-1131130	25	50-75%	5	50 gpm	66" x 27" x 42"	2000
R18-06-1131130	30	50-75%	6	60 gpm	66" x 27" x 42"	2200

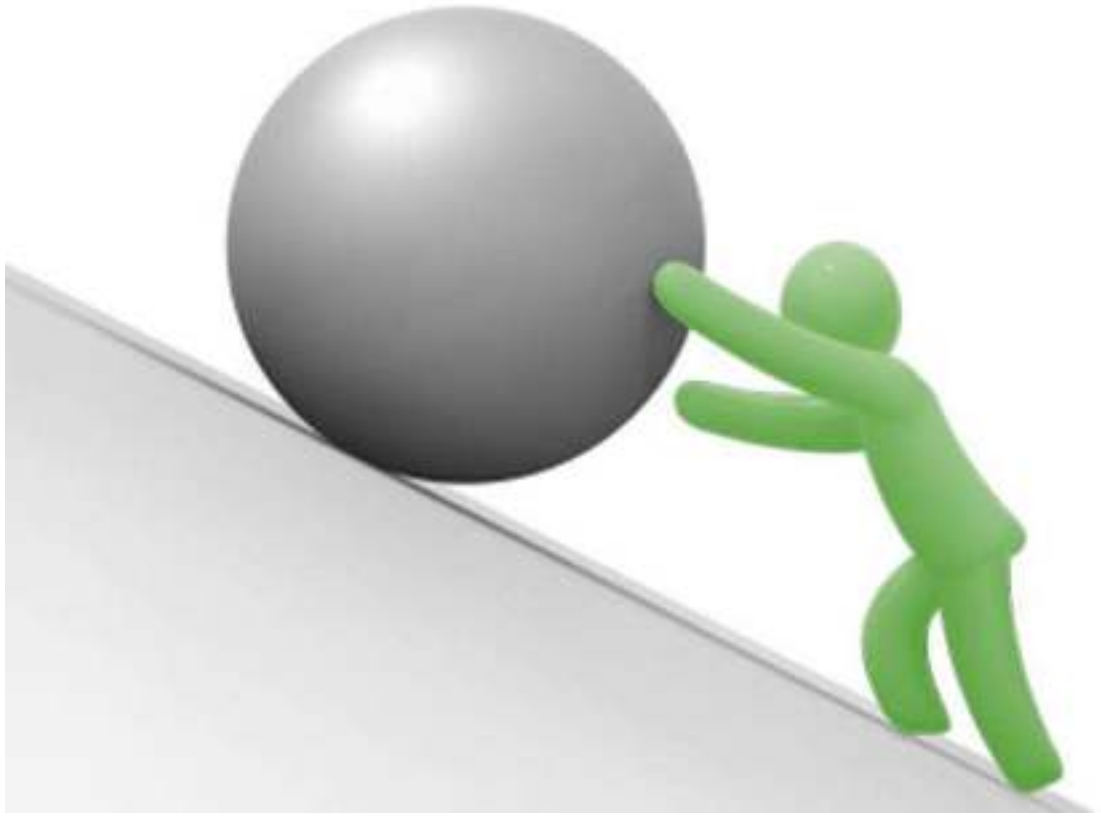
NOTICE

Performance specifications are based on 77°F feed water, 3 SDI or less, TDS below 2000 and pH of 7. Please see water temperature conversion charts to determine actual production rate for each installation. Chlorine reduction and other pretreatment may be required. Membrane rejection rates are based on membrane manufacturer's specifications. Pre-filter is Watts SEDC-150-PS synthetic pleated cartridge. Systems are designed for use with municipal and well water.

For Configurator and Applications Tools, please refer to the beginning of this catalog.

4 WHAT'S THE CATCH?

AR IN THE ENTERPRISE CAN BE CHALLENGING



- **Costly** to hire skilled programmers
- **Difficult** and **time consuming** to create compelling content
- **Overwhelming** to manage the explosion of purpose-built apps
- **Complex** to leverage IoT and business system data
- **Easy** to do once, **hard** to do at scale

So what can Creo and ThingWorx do to help?

5 USING CREO AND THINGWORX IN AN IOT / AR STRATEGY

ptc

creo®

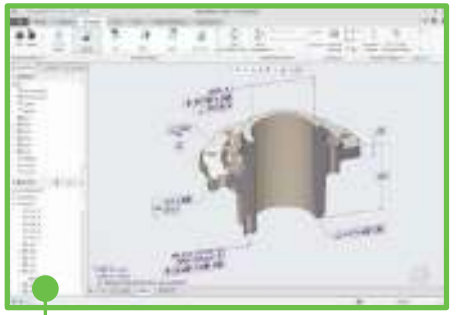
is the future of Smart Product Design.

Industry leading CAD Capabilities

Design for Connectivity & IoT

Augmented Reality

Design for Additive Manufacturing



Model Based Definition (MBD)

Design Smarter.

CREO AR IS SIMPLE CONTENT CREATION AND DISTRIBUTION… AT MEANINGFUL SCALE

Free Options embedded in Creo Essentials and Creo Engineer package from 4.0 M10 & up

New Creo AR Design Share Module (Individual or Enterprise)

- CAPABILITIES
  - Create & manage AR experiences
    - 5 Experiences, 6 month shelf life = Free
    - 10/50 Experiences, Unlimited shelf life = Moduel
  - Administrative control = Design Share
    - Add and remove authors & viewers
    - Add and delete models (AR Experiences)

- KEY BENEFITS OF DESIGN SHARE
  - Explicit, managed access control
  - Protect IP by preventing access to CAD data
  - Engage a wider range of stakeholders

CREO AR ENHANCES CUSTOMERS EXPERIENCES AND DESIGN REVIEWS

Share Design Experiences

Allow colleagues, partners & customers to consume design experiences in a more meaningful way

Visualize Interactive Design Experiences

Creo AR allows immersive design data to be reviewed in context and at scale

SHARE AR EXPERIENCES

Challenge

Tedious process to prepare and package models for distribution and review

Inefficient process for design partners & collaborations to access data that they need

Loss of productivity preparing files to be shared

Loss of company IP

Solution

Creo AR allows you to rapidly define and publish AR experiences which can be distributed instantly

Create AR experiences directly within Creo and share design data easily to distributed teams

Easily collect feedback from colleagues

Share design data without compromising IP

VISUALIZE AR EXPERIENCES

Challenge

Inability to convey size and scale with traditional methods

Inability to provide real-world context of how products operate

Limited support for interactive product demos

Solution

Creo AR allows for immersive design data with full context and scale

Interact, explore and engage with design data

Generate excitement with interactive AR experiences

ThingWorx Utilities

Asset Management

Workflow

ThingWorx Analytics

Automated Simulations

Automated Predictive Intelligence

Analytics Server

Real-time Edge Analytics

ThingWorx Foundation

Application Enablement

thing model API

Visual Application Modeling Environment

System Integration Services

Business Logic and Event Processing

Identity and Access Management

User Interface Builder

Reporting and Basic Analytics

IoT Data Management

Extensible Design

Identity and Access Management

Device and Cloud Adapters

Device Cloud

ptc: in cloud or on-premise
3rd party cloud providers

Big Data and Rules Engine

File Transfer, Messaging, Tunneling

SDKs and IoT Gateway

Edge Intelligence

Edge

Data Drivers

Bi-directional Communication

ThingWorx Studio

Data Prep and Drag & Drop Authoring Tool

Deployment Service

Mobile Device Viewer/ Digital Eyewear

Unique Physical Identifiers & Targets

ThingWorx Industrial Connectivity

Industrial Connectivity

Data Exchanges