



VALUE OF AR IN THE ENTERPRISE

Glenn Fields, VP, Vuforia GTM

Matt Sheridan, Sr. Director, Vuforia GTM

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liveworx.com | [#LIVEWORX](https://twitter.com/LIVEWORX)



A decorative graphic in the top-left corner consisting of several overlapping, colorful lines (pink, yellow, blue) that form a shape resembling a 'W' or a cluster of lines.

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- HISTORY OF AR
- WHY AR IN THE ENTERPRISE NOW?
- DIGITATION OF ENTERPRISE
- AR VALUE EXAMPLE
- CHALLENGES & CAPABILITIES
- GET GOING

aug·men·ted re·al·i·ty

noun

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

HISTORY OF AR ENABLING DEVICES

LIVE WORX 16

Ivan Sutherland created the first head mounted display



1968

Battlefield Augmented Reality System (BARS)



1999

The release of the iPhone



2007

Google Glass



2013

JSF Smart Helmet

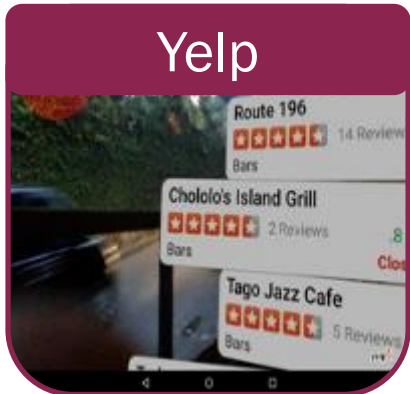
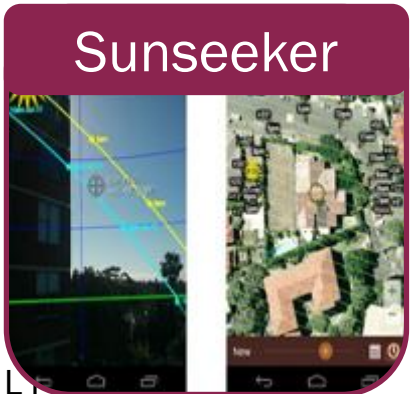
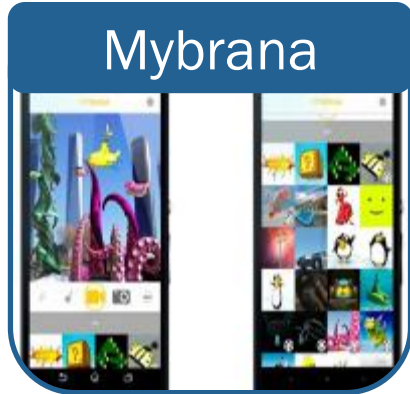
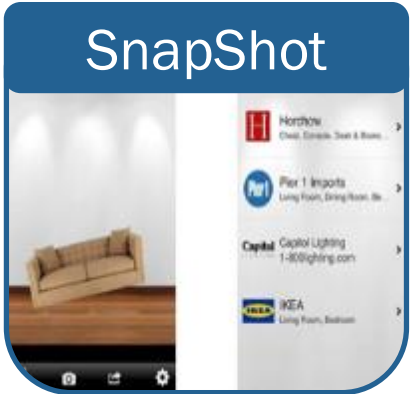
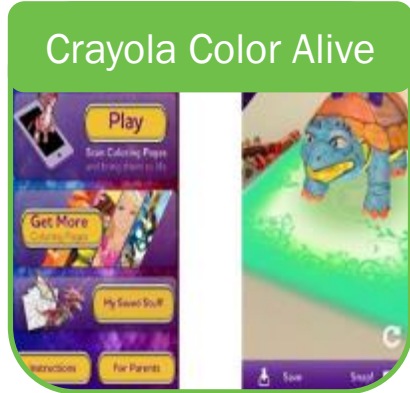


2014



2016

TOP 15 AUGMENTED REALITY APPLICATIONS (SOURCE: TOMS GUIDE FEB 2016)



CONSUMER AR DESIGN VS INDUSTRIAL ENTERPRISE AR DESIGN



Commercial



Industrial



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AUGMENTED REALITY IS GROWING



New Projects

(in thousands)



* Created by PTC customers

AR IN THE ENTERPRISE



Market & Sell

- *Product visualization & demonstrations accelerates sales*
- *Targeted interactive advertising increases brand loyalty*



Create

- *Virtual design collaboration connects disparate teams*
- *Prototype quality assurance reduces defects and rework*
- *Rapid digital Prototyping speeds time to market & optimizes portfolio*



Operate

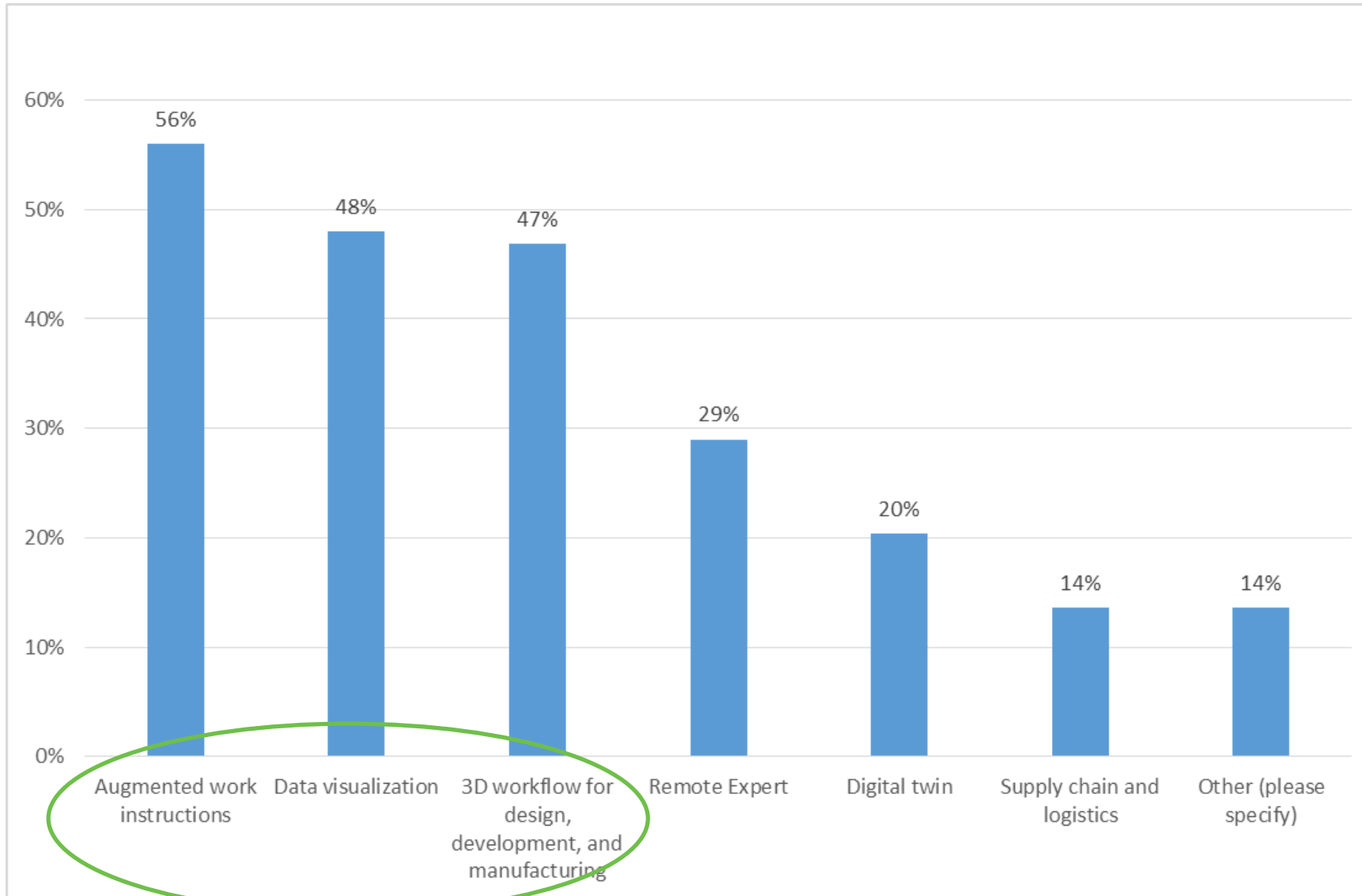
- *Quality assurance reduces defects*
- *Performance dashboards provide insights to drive efficiency*
- *Real-time work instructions reduces errors & defects*



Service

- *Service dashboards & instructions improve efficiency and accuracy*
- *Customer self-service instructions reduces costs*
- *Remote expertise reduces travel & training costs*

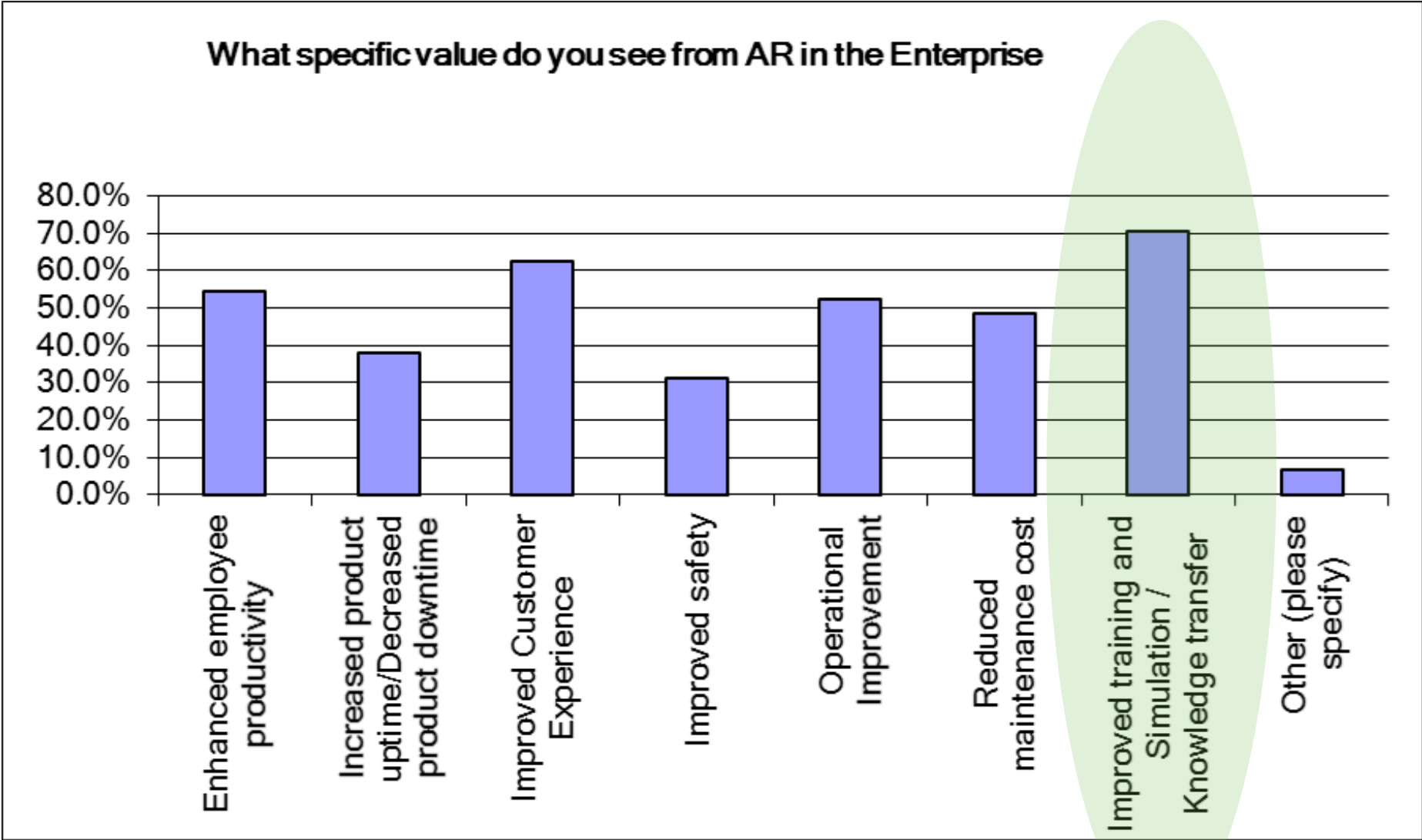
AUGMENTED REALITY ENTERPRISE USE CASES



TOP THREE

- Augmented Work Instructions
- Data Visualization
- 3D Workflow for Design

VALUE OF AR IN THE ENTERPRISE



70%
of respondents
indicate potential
value through AR
training

COMPANIES ARE INVESTIGATING

*Recent news from Digi-Capital showed that in the 1st quarter of 2016, investment in Augmented Reality and Virtual Reality grew to **\$1.1 billion** (compared to \$700m total in 2015).*

*➤ In the second **augmented reality project**, the Rochester Institute of Technology ... will make virtual shop floor instruction guides with AR, and capture data to improve future manufacturing processes*

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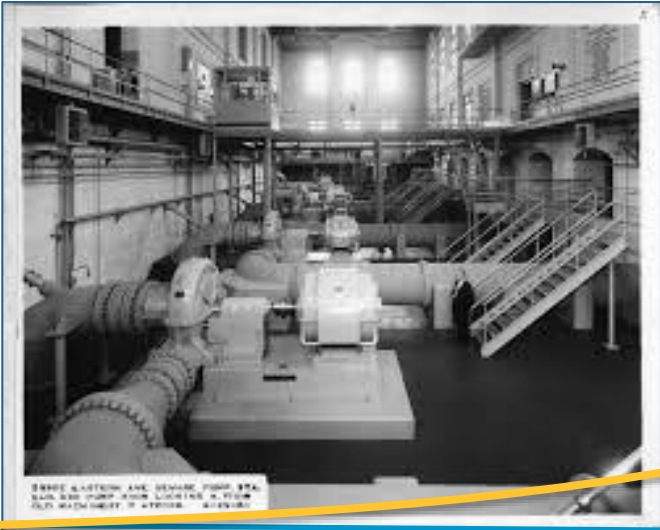
EVOLUTION OF SENSORS



WIFI Sensors



No Sensors



Time

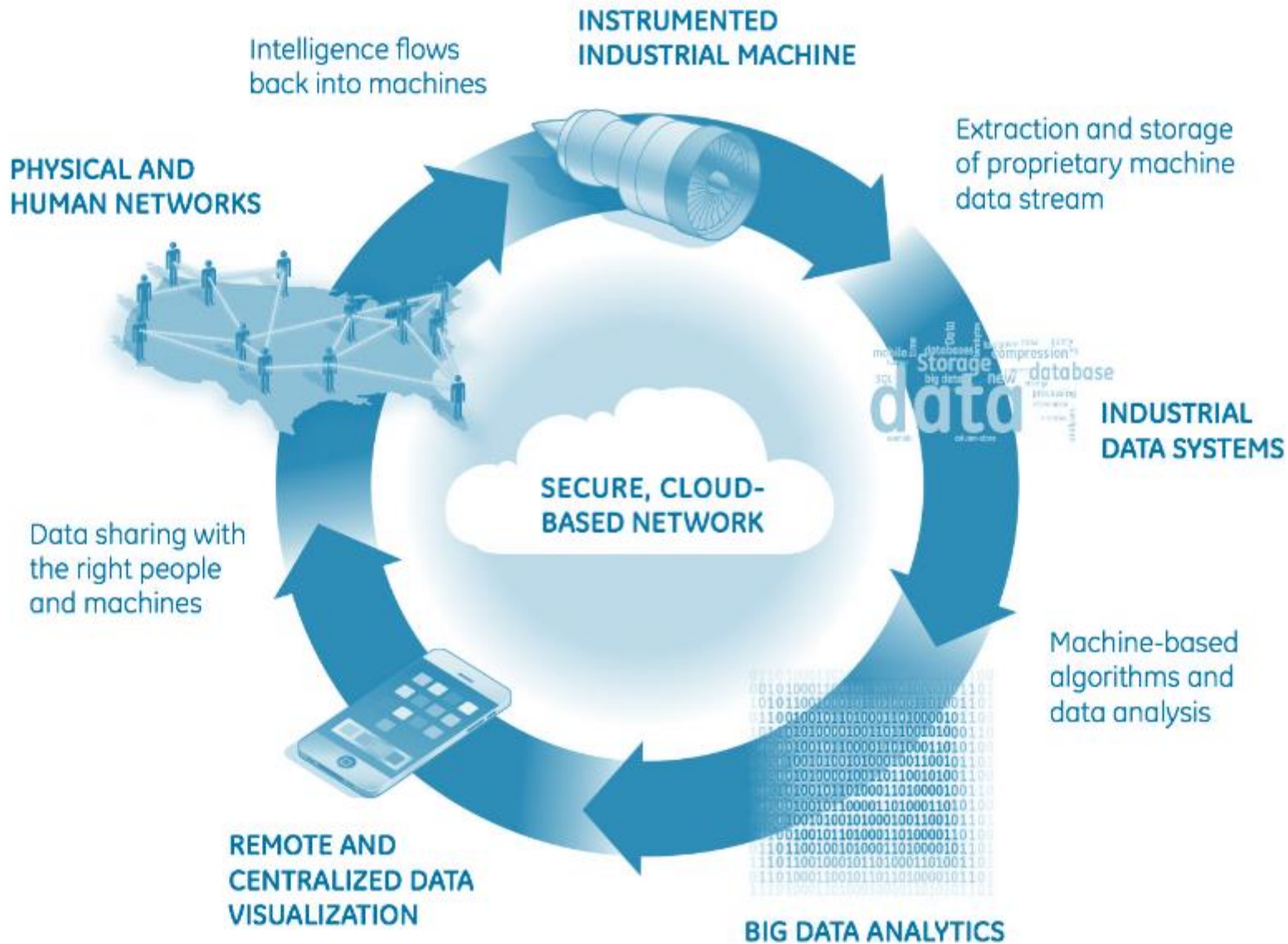
INDUSTRIAL INTERNET OF THINGS



BRILLIANT
FACTORY

DIGITIZATION
OF THE
FACTORY

4TH INDUSTRIAL
REVOLUTION



SMART
CONNECTED
PRODUCTS

INDUSTRY 4.0

INDUSTRIAL
INTERNET OF
THINGS

AR ENABLES THE VISUALIZATION AND CONTEXTUALIZATION OF DATA



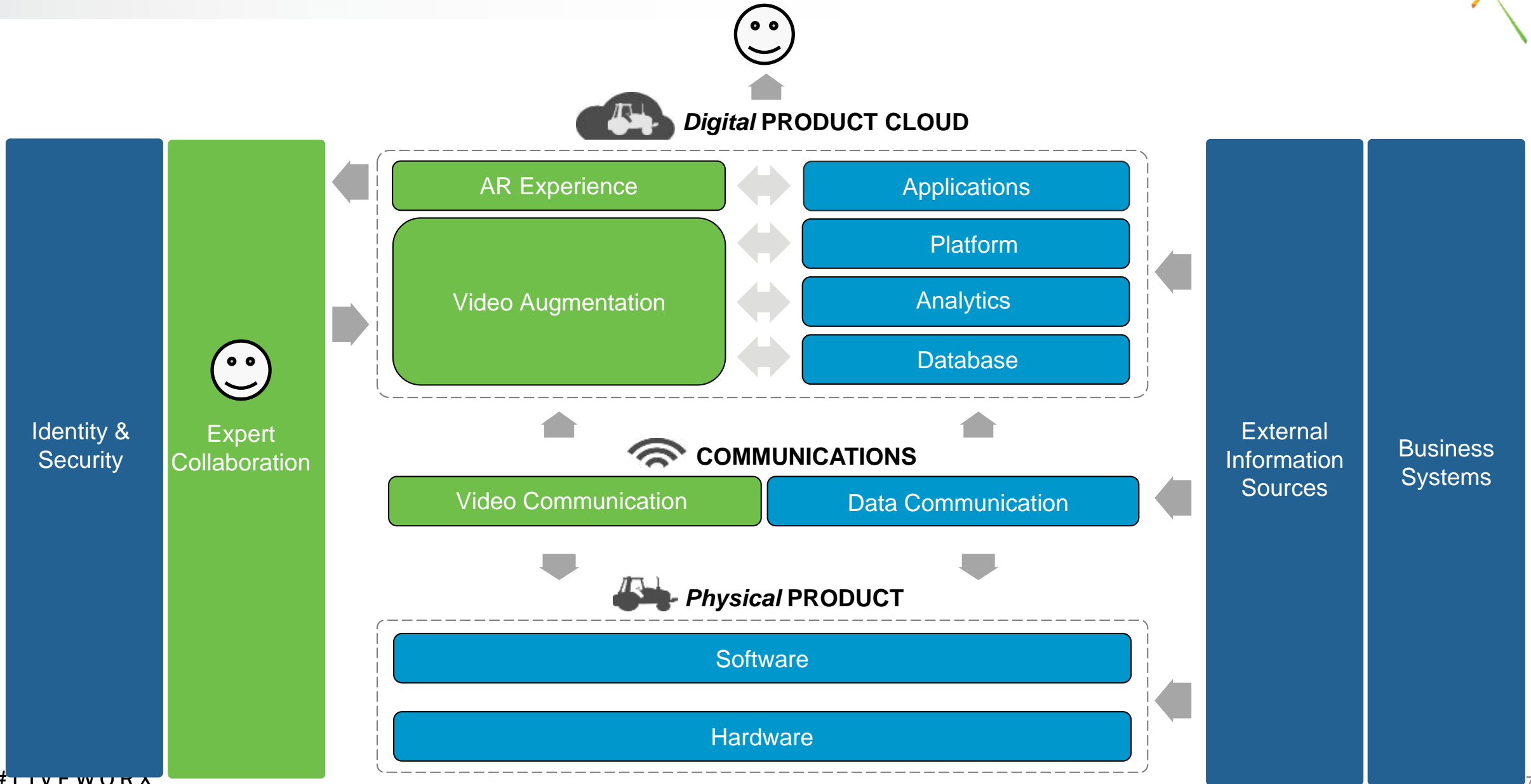
INTERNET OF
THINGS

Ability to digitally **talk** to
physical things to
monitor and control

AUGMENTED
REALITY

Ability to **see and experience**
the digital attributes of
physical things

AR AND SCP TECHNOLOGY STACK



AR WORKFORCE TRANSFORMATION



- **The Manufacturing Industry will likely face an expected shortage of 10 million workers globally**
 - Baby boomer retirements
 - Shortage of adequately skilled replacements
 - Industry expansion



- **AR technologies can mitigate the effects of the skill gap in Manufacturing and other industries**
 - Next-generation training tool; AR guided workforce
 - Digitization of knowledge bases
 - Recruitment appeal for the digitally native workforce



- **Macro implications of AR and the new-gen workforce**
 - Demand for high-skilled and experienced labor decreases
 - Collaboration transforms workforce distribution

AR is well positioned to transfer skills across the organization to a far greater extent than “old-style” training methodologies, such as paper-based manuals and DVDs.

– Manufacturing Institute, Deloitte,
World Economic Forum



Next-Generation Training Tool

- Augmented reality can improve speed and quality of training
- AR enables intuitive, in-context visualization that create a richer training experience



Digitized Knowledge Base

- Augmented reality can ensure the retention of tacit knowledge through video capture
- Expert insight can be digitally delivered remotely
- AR Solutions will eliminate the dependency on hard copy instruction



Recruitment Appeal

- Appeal to digitally native generation
- New generations of the workforce will expect access to digital information

DATA VISUALIZATION



Ability to **see and experience** the digital attributes of physical things

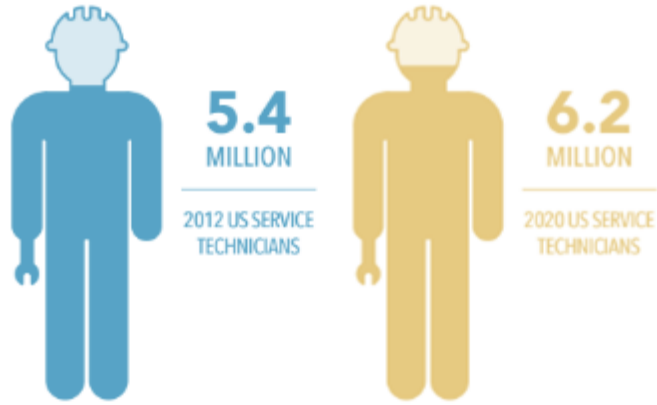


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EXAMPLE: VALUE OF AR WITH SERVICE



Services is a growing revenue stream.
Skilled labor is a challenge.



The greatest savings in [AR] field service will come from diagnosing and fixing problems more quickly and without needing to bring additional experts to remote sites.

First Time Fix (FTF)

Mean Time to Repair (MTTR)

Mean Time to Service (MTTS)

Mean Time to Install (MTTI)

Critical service measurements

In 2017, Smartglasses may begin to save the field service industry **\$1 Billion** per year

~Gartner 2013 (a bit dated but illustrates potential)

<http://www.gartner.com/newsroom/id/2618415>

SERVICE MANUALS, PRODUCT DRAWINGS & DIAGRAMS?



TOOLING TABLE

SCREW DESCRIPTION	PARTS LIST FIND NO
200-20 UNF-2	51, 52
200-20 UNF-2	51, 52, 55, 72
112-40 UNF-2	59, 60, 64, 71
112-40 UNF-2	74, 76, 83, 86, 115
118-40 UNF-2	68, 70
118-52 UNF-2	95
118-52 UNF-2	95
4-60-18 UNF-7A	13, 26

TABLE I. CONNECTION GRANT

FIND NO	WIRE ASSY
0332	WIRE ASSY
0334	WIRE ASSY
0433	WIRE ASSY
0518	WIRE ASSY
0519	WIRE ASSY
0520	WIRE ASSY
0521	WIRE ASSY
0522	WIRE ASSY
0523	WIRE ASSY

TABLE II. BEARING GREASE

FIND NO (BEARING)	GREASE
26	21
28	21
38	21
40	21
41	21
42	21
43	21

NOTES - UNLESS OTHERWISE SPECIFIED:

- USE IDENTIFICATION CROSS-REFERENCE DRAWING
- VENOR ITEM - SEE VENOR ITEM CONTROL DRAWING
- REFERENCE DESIGNATION PREFIX: 343
- PARENTYMBOL INFORMATION IS FOR REFERENCE ONLY
- TORQUE SCREW TO 13 IN-LB ± 10%, -1 ONLY
- CONNECTOR WATING PER TABLE I
- LUBRICATE INDICATED SEAL SURFACES USING 40 FIND NUMBER 32
- REMOVE AND RECARD WELAR FROM FIND NUMBER 44 AFTER INSTALLATION OF STATOR, BUT PRIOR TO INSTALLATION OF BRUSH RING
- FIND NUMBERS 44 AND 45 CONSIST OF A ROTOR, CENTER, AND BRUSH RING
- INSTALL FIND NUMBER 104 TO BOTH LEADS ON FIND NUMBER 43 PER NOTE 300
- ORIENT BRUSH RING ON FIND NUMBER 44 AS SHOWN. INSTALL USING SUPPLIED SCREWS PER NOTE 300. TORQUE TO 44 ± 4 IN-OZ
- INSTALL BRUSH RING ON FIND NUMBER 45 WITH ORIENTATION MARKINGS ACROSS FROM EACH OTHER USING SUPPLIED SCREWS. RETAIN PER NOTE 300 AND TORQUE TO 11 ± 1 IN-LB
- SECURE WIRES FROM FIND NUMBERS 44, 45, AND 46 USING FIND NUMBERS 76, 85 OR 84
- ORIENT ALIGNMENT MARKS ON FIND NUMBERS 35, 43, AND 45 AS SHOWN BELOW
- LUBRICATE THE OUTER DIAMETER OF FIND NUMBERS 35 AND 40 AND THE WATING BEARS IN FIND NUMBER 1 USING FIND 904
- INSTALL FIND NUMBER 89 PER DIM. SAFETY WIRE ORIENTATION SHOWN IN THE PICTORIAL IS FOR REFERENCE
- WIRE FIND NUMBER 56 TO FIND NUMBER 40 PER WIRING DIAGRAM. DO NOT TWIST WIRE IN SHOWN DIMENSION. 50I PER NOTE 300
- INSTALL FIND NUMBER 105 AT SOLDER CONNECTIONS OF FIND NUMBERS 89 AND 41 PER NOTE 300
- SOLDER RELIANT AND REINFORCE WIRE LEADS OF FIND NUMBER DIMENSIONED PER NOTE 300 IS PRESENT. SOLDER PER NOTE 300 USING FIND NUMBER 107 AND 107-1 LEADS BACK INTO WINDS
- WIRE FIND NUMBER 43 TO WIND NUMBER 41 PER WIRING DIAGRAM. SOLDER PER NOTE 300. INSTALL FIND NUMBER 507 WIRE SPLICES PER NOTE 300
- TORQUE INDICATED SCREWS IN AN ALTERNATING CROSS PAT

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(PARTS LIST CONTINUED ON SHEET 2)

1	2	3	4	DESCRIPTION	QTY	UNIT
1	1	1	1	CEX100-1	1	PCB
2	2	2	2	CEX100-2	1	PCB
1	1	1	1	CEX102-1	1	PCB
1	1	1	1	CEX102-2	1	PCB
1	1	1	1	CEX103-1	1	PCB
1	1	1	1	CEX104-1	1	PCB
1	1	1	1	CEX105-1	1	PCB

How much training and experience is needed to service these products?



FIRST TIME FIX

Resolve service issues, correctly, the first visit

- SERVICE TECHNICIAN AVG SALARY – ~\$55K a Year*
- COMPANY A – 88% FTF Rate | COMPANY B – 63% FTF Rate
- 400 JOBS A DAY
- COMPANY A completes 100 more jobs a day (88% - 63%)* 400
- 250 days a year = 25,000 extra visits to complete work
- Company B needs 25 more people to compete with Company A
→ 25 * 55K = \$1,375,000

AR CAN IMPACT FTF DELIVERING IN-CONTEXT ORGANIZATIONAL KNOWLEDGE

❖ THIS IS A EXAMPLE BASED ON REPORTS FROM SERVICEMAX. OTHER SERVICE METRICS TO INVESTIGATE INCLUDE MTTR, MTI and SLA contracts. 

❖ http://www.payscale.com/research/US/Job=Field_Service_Engineer%2c_Medical_Equipment/Salary#CareerPaths

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Explosion of Purpose-Built “Apps”

Difficulty of Authoring Augmented Reality Apps

Difficulty of Identifying “Things” and the right Apps for those “Things”



Vuforia Studio

Enterprise

1

Simple UI Design

Easy to use “drag and drop” user interface environment for ease of authoring in a codeless environment

2

Content Integration

Seamlessly integrate existing 3D Creo content and SLM data for powerful 3D workflow and augmented service work instructions

3

AR Animations

Create animated Augmented Reality experiences quickly and effortlessly with Creo Illustrate

4

Internet of Things

Integrate IoT sensor data and enterprise system data from ThingWorx to enable Augmented Reality data visualization

5

Hardware Agnostic

Can be used with smart phones, tablets, and wearable devices utilizing Android and iOS regardless of vendor.

PTC Vuforia Studio is the only Augmented Reality software designed with the enterprise customer in mind.



Vuforia**Studio**
ENTERPRISE



Vuforia**Experience**
Service



Vuforia**View**
ENTERPRISE

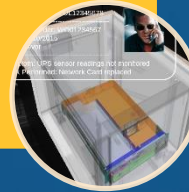
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GET GOING!

- Review Opportunities
- Determine ROI
- Define Use Case

Plan



- Design
- Develop
- Test

Pilot



- Deploy
- Measure
- Optimize

Production



Q&A

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TAKE A FRESH LOOK AT THINGS

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