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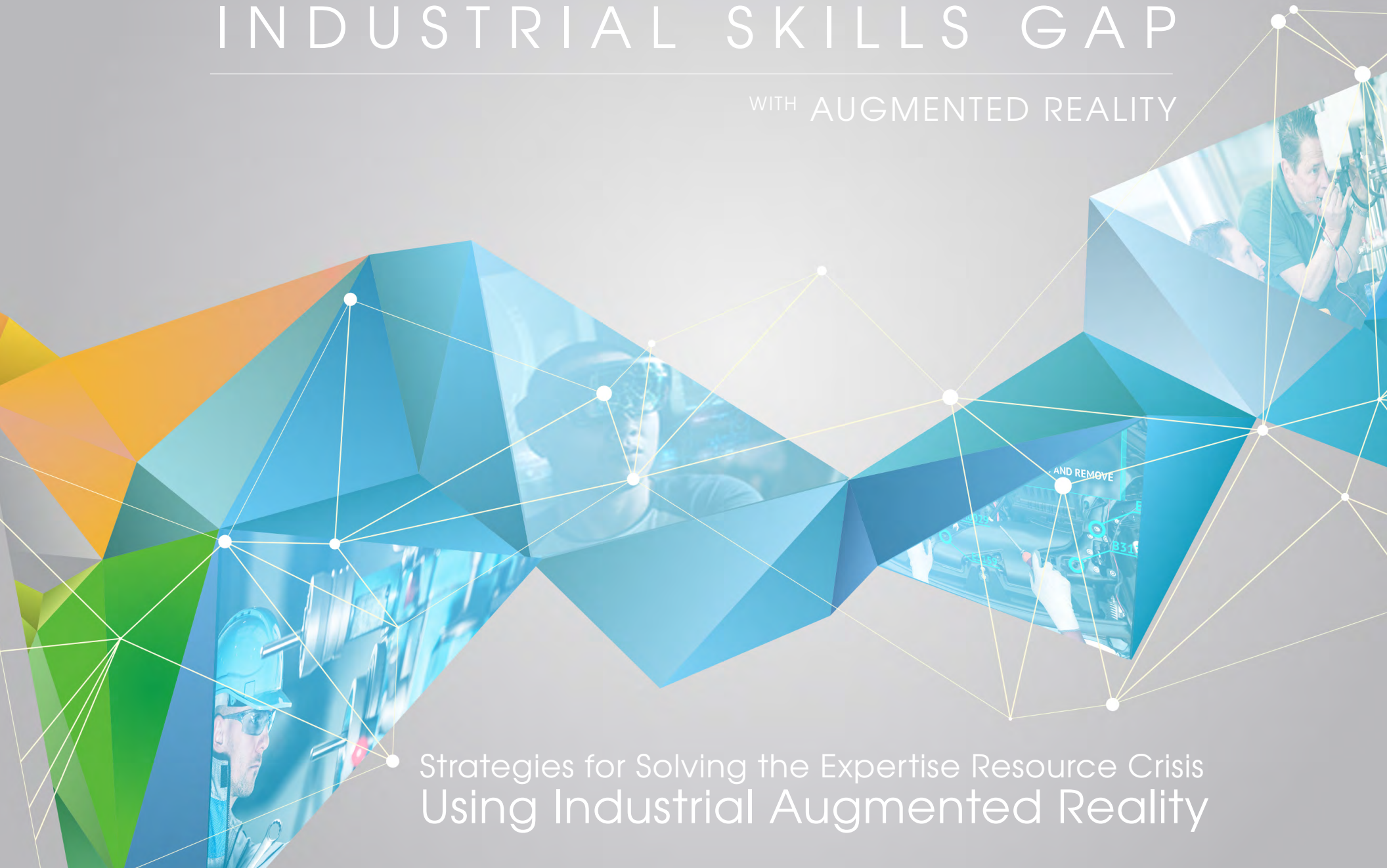
CLOSING THE INDUSTRIAL SKILLS GAP WITH AUGMENTED REALITY



Strategies for Solving the Expertise Resource Crisis Using Industrial Augmented Reality

Facing the Industrial Skills Crisis

The challenge to keep and retain skilled workers is hardly new, but the skills gap has been accelerating in recent years. By 2025, analysts anticipate **over 2,000,000 skilled manufacturing jobs will go unfilled**. Compare that to 600,000 unfilled jobs in 2011.[1]

Pain points for industrial skills

Many fields are experiencing a shortage of professionals—particularly those with career-spanning expertise. Within industrial markets, there are several job functions across the value chain that are most affected, including:

Manufacturing

- Setup and changeover
- Assembly
- Operation
- Maintenance

Service

- Field Service Technicians
- Senior Service Experts

The skills gap is more than just a retirement problem

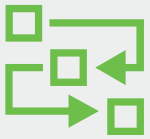
While a retiring workforce is a primary driver, there are complex pressures making it difficult to maintain steady and skilled worker resources.

Skills Gap Pressures

A lack of systems to produce new generations of skilled workers.

Competition with other types of jobs.

Continued global economic expansion means more jobs, in more locations.



Physical assets requiring skills are becoming more complex and individualized.

[1] Deloitte: The skills gap in US manufacturing 2015-2025 outlook

Strategies for Closing the Skills Gap

There are three methods that companies employ to maintain their reservoir of skilled expertise:

Slowing the skills drain

By 2022, over 26% of manufacturing workers will be over 55.[1] Age-based attrition is inevitable and difficult to address, but organizations can focus on extending career length, even if only for a few years.

Maximizing current skills

Companies can also focus on methods to amplify the effectiveness and efficiency of their current skilled workforce. This requires organizations to enable existing experts to do more, without increasing their workload—particularly as these experts approach retirement.

Refilling the skills reservoir

Long-term solutions require replenishing the reservoir of skills. 26.4% of field service technicians are contracted, but third-party solutions can be expensive, while negatively impacting customer satisfaction. Recruitment and in-house skills development yield better results, but come with a longer time-to-value.

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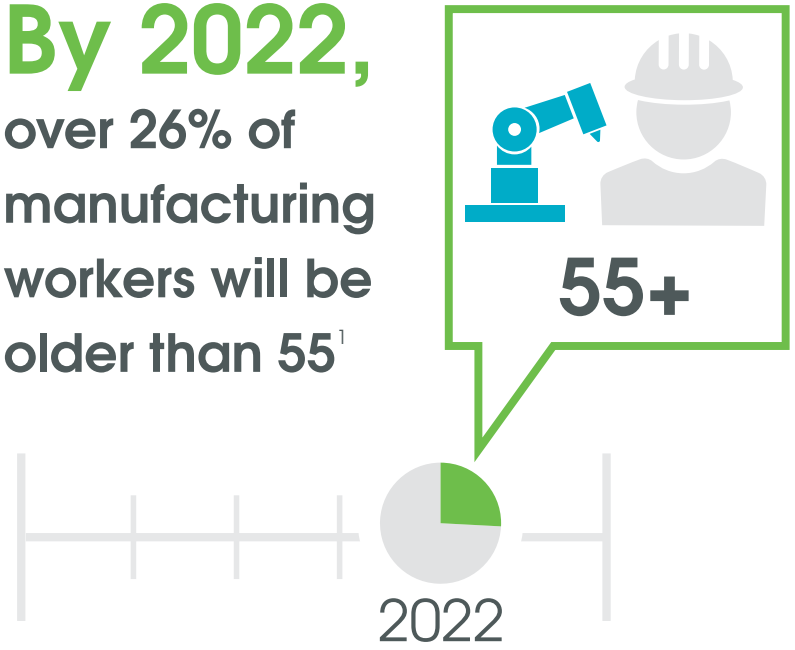


[1] https://www.shrm.org/hr-today/trends-and-forecasting/research-and-surveys/Documents/Preparing_for_an_Aging_Workforce-Manufacturing_Industry_Report.pdf

How AR Fits into the Skills Gap Strategy

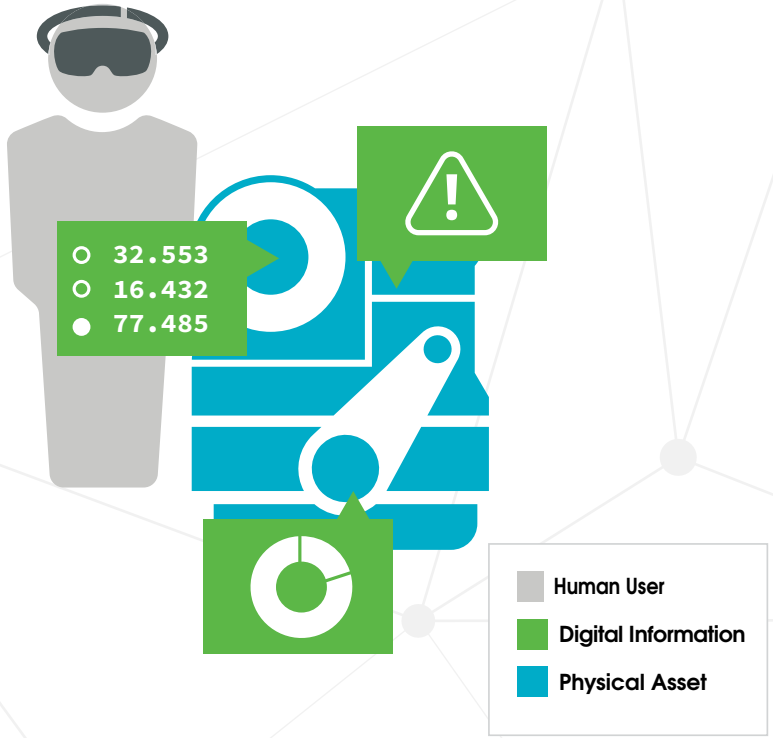
As assets become increasingly customizable and are utilized across a global value chain, methods to ensure competency and mastery become both more expensive and less effective. From printed manuals and training classes, to delivering experts on site, traditional methods provide diminishing returns. Meanwhile, industrial augmented reality is quickly proving more effective.

What is industrial augmented reality?

AR technology provides users with a way to perceive and use previously hidden or inaccessible information about their environments. Thus augmenting reality with useful, contextual data. AR is consumed via hardware, (such as a tablet, smartphone or purpose-built AR wearables), to overlay digital information on top of physical assets and environments. AR software, like PTC's Vuforia products, recognizes the physical asset, and "locks" the digital information in a way that allows users to interact with the asset information three-dimensionally and hands-free.

Why is industrial AR a game-changer?

Commercial AR and VR get the most press, but AR spending in industrial markets is expected to reach nearly $7B by 2024, dwarfing higher-profile markets like gaming and automotive. What's the reasoning?



AR proves its value—cost effectively

AR proof-of-concepts are easy to create and demonstrate value—investments are small and returns are rapid.

AR doesn't disrupt existing technology

AR exists in parallel to OT and IT technology, without disrupting existing infrastructure and investments.

AR requires a low technical hurdle

With the right tools, subject matter experts can create and refine effective AR content, with little to no coding experience.

AR can utilize existing digital assets

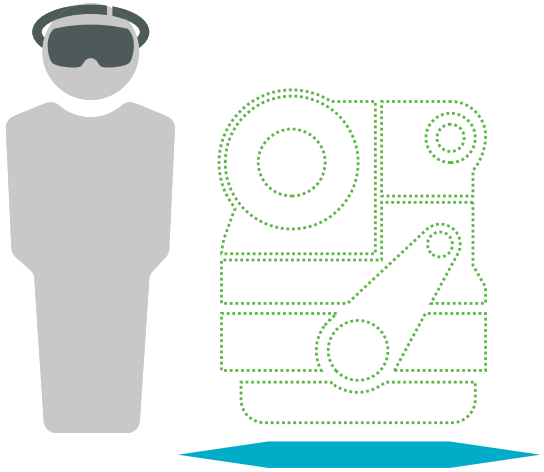
Repurposed CAD and other digital files created during the design of physical equipment can enrich AR experiences.

AR is flexible and extensible

AR experiences can easily be updated to reflect changes to products and procedures. AR is less dependent on translation requirements.

Relevant AR Industrial Applications

While AR experiences are highly customizable and evolving, three main application types have emerged as highly effective at closing the skills gap:



Product visualization

AR product visualization applications utilize augmented overlays of information, and can even provide interactive digital twins of the physical assets themselves. Product visualization is used for both training and guidance. AR can replace traditional training labs or simulations. It can also reduce risk if training involves working in hazardous environments.

Procedural guidance

Procedural guidance utilizes the overlay of AR instructions, equipment status, or performance data atop physical assets in the workplace. This benefits workers across the experience/skill spectrum and is more focused on serving as a reference for either highly complex, customizable, or frequently changing assets.

Remote assistance

Remote assistance virtually connects experts and workers around a specific piece of equipment. Typically combining attributes of AR and video-chat with annotations from a remote expert, a shared-view of the work environment can be a highly effective, visual medium for collaboration and problem solving.

Closing the Skills Gap with AR

Augmented reality is proving to be highly effective at all three strategies for closing the industrial skills gap:

Using AR to slow the skills drain

- **Remote assistance** apps allow experts to share expertise, without physically having to travel on-site. This reduces the burden on senior experts, while retaining them longer as "virtual gurus."
- As experts reach retirement age, they can provide consulting on AR experiences using **product visualization** and **procedural guidance**. This turns their individual expertise into a shareable skills resource.

Using AR to amplify current skills

- **Remote assistance** reduces the cost of providing highly skilled support. By lowering costs, companies can direct skilled resources to help smaller, more remote customers.
- **Procedural guidance** provides workers with nstruction, equipment status, and performance data while they're working. Newer workers can become effective in the field faster, with reduced risk of novice errors. It also benefits workers of all skill levels with step-by-step depictions of equipment and process customization.

Using AR to refuel the skills tank

- **Product visualization** has proven to build skills faster—from competency to mastery. Workers using AR learn faster, with improved retention.
- Coordination between **production visualization**-centric training, and on-the-job **procedural guidance** can further accelerate skills growth.
- **Remote assistance** can pair experts with newer workers more easily, allowing gurus to virtually act as mentors to junior workers.

AR Success Snapshot: GSI

GSI, AGCO's brand for delivering industrial agriculture solutions for grain, seed-processing, and protein-production was looking to reduce the time and cost of training for operation and maintenance. By using PTC's Vuforia Studio, GSI was able to:

- Replace over 200 training slides with a handful of AR experiences.
- Reduce overall training time by 60%.

AR helped reduce overall training time by **60%**

AR Success Snapshot: BAE Systems

By authoring AR-based work instructions in PTC's Vuforia Studio, and delivering them via Microsoft HoloLens visors, BAE Systems discovered it could dramatically improve training and guidance. Here's how BAE turned augmented reality into a real impact on their skills gap:

10X REDUCTION — in the cost of developing guidance resources.

30% MORE EFFECTIVE — Newer workers were trained 30% more effectively.

50% REDUCTION — Battery assembly time was reduced by 50%.

Building Your Own AR-Driven Solutions

Industrial organizations are acutely aware of the growing skills crisis; market leaders are increasingly embracing AR as a way of preserving skills and staying ahead of the competition. If you're interested in learning more about the role that AR can play at your organization, or how to get started building your own low-risk, high-reward AR solution, you'll find these resources useful.

ARC Advisory Group: Transforming Skilled Workforces with Augmented Reality

ARC explores how AR is empowering manufacturing workers with faster skills development and hands-free guidance. Download the report to learn how AR improves efficiencies, reduces costs and unlocks business value

Aberdeen Group: How Best-in-Class Service Companies are Using AR

Aberdeen's survey of service leaders reveals a robust investment in AR as key to unlocking service expertise. Engaging and highly effective—AR is amplifying the capabilities of technicians across all experience levels.

Connecting Augmented Reality to Business Value

Watch this replay to learn how to connect AR to business value. Discover real-life examples from companies already leveraging AR—and learn what steps to take to incorporate AR into your business strategy.