



# Augmented Reality Comes to the Workplace

Once the province of science fiction, augmented reality—which overlays virtual features on a real-world view—is finding its way into the workplace.

By Natalie Kroc | Sep 20, 2017

In the year 2054, Tom Cruise’s police chief in “Minority Report (<http://www.imdb.com/title/tt0181689/>)” does his work standing before a large screen, using hand gestures to investigate murders before the homicides even happen. While tech advancements don’t yet allow for crimes to be foreseen, the way that Cruise’s character uses simple movements to interact with images on a screen now exists—with augmented reality (AR). The technology is showing up in headsets and smartglasses and is even being tested in a contact lens, which would make AR invisible and could render it as ubiquitous as the smartphone. Experts say AR is poised to bring dramatic changes to everyday life, including in the workplace, with the potential to significantly improve workers’ productivity, enhance employee training and make worksites safer. It might even offer a solution to one of the most pressing HR challenges of these times: closing the skills gap.

Anyone acquainted with the 2016 gaming craze Pokémon Go (<http://www.pokemongo.com/>) already understands how AR works. When players aim their smartphone camera at their surroundings, cartoon images of colorful characters unpredictably pop into view, waiting to be “caught” among the real-world landscape.

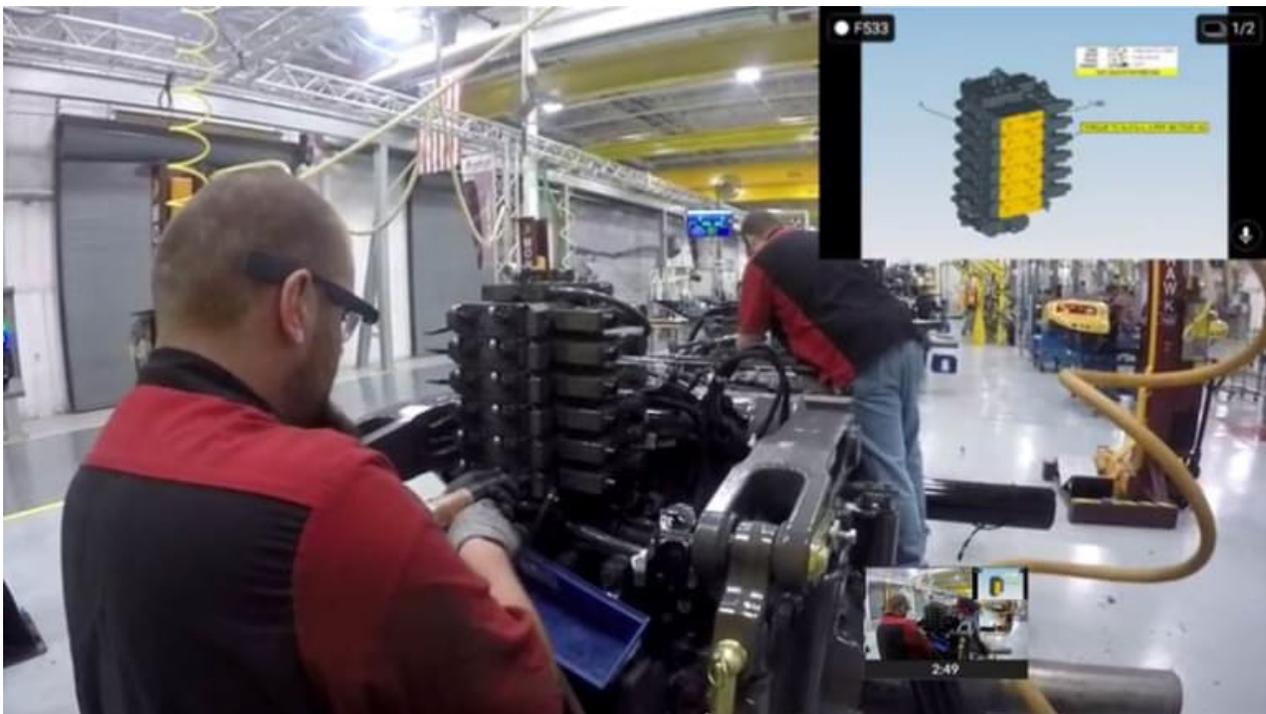
But AR isn’t just for fun and games. “In the last couple of years, there has definitely been a shift toward developing AR devices and applications for the workplace,” says Tony Liao, an assistant professor of communication at the University of Cincinnati who researches AR.

Though the technology dates back to the mid-1990s, there weren’t many practical uses for it for decades. “What’s different now is it’s no longer just a lot of AR evangelists,” says Jay Kim, chief strategy officer of Upskill, which makes industrial AR apps. “There’s real market presence by the most innovative companies

in the world: Apple, Microsoft, Intel, Google.”

For those who fear a takeover of the workplace by machines, know that AR is intended to be an ally, not a threat. By strapping on an AR headset or wielding an AR-outfitted tablet or phone, workers can unveil new powers, like super speed, heat-sensing, X-ray vision and the ability to beam up experts instantly. Rather than replacing workers, AR expands on human potential, allowing people and machines to function better together than either could alone.

In addition, AR is “dramatically speeding up the design process, reducing the need for physical prototypes and shortening time to market,” says Ryan Pamplin, vice president of Meta, a Silicon Valley startup that makes AR headsets. As the technology becomes more and more commonplace, he says, it could even help save lives. “And I can’t think of better ROI [return on investment] than that.”



An Agco employee uses AR to view an instructional image of a task that needs to be performed on a tractor’s hydraulic valve stack.

## Dual Realities

AR is often confused with virtual reality (VR). To distinguish one from the other, consider their root words. *Virtual*: something that doesn't exist; a simulation. *Augment*: to make something bigger or greater by adding to it, to increase. With VR, the user straps on an opaque headset and is immersed in an entirely separate world. AR, on the other hand, blends the real with the digital: Users see the physical world around them, but the view is overlaid with virtual media. If AR users are wearing the technology (in the form of glasses or a helmet), the eye piece will be see-through, allowing for complete awareness of real surroundings as 2-D and 3-D images and messages are projected in their direct line of sight. With both AR and VR headsets, users make gestures with their hands and head or use voice commands to direct the technology. Alternatively, AR can be used on a smartphone or tablet.

### Names to Know

These are the emerging players in the virtual reality and augmented reality headset market:

**Google Cardboard:** AR, for consumer use, priced at about \$15, works with a smartphone, owned by Google.

**Google Glass:** AR, for commercial use, priced at about \$1,500, owned by Google.

**HoloLens:** AR and VR combined (mixed reality), for commercial use, priced at about \$3,000, owned by Microsoft.

**HTC Vive:** VR, for consumer use, priced at about \$799, owned by Microsoft.

**Magic Leap:** AR and VR combined (mixed reality), for consumer use, price unknown (not yet released), owned by the startup Magic Leap.

**Oculus Rift:** VR, for consumer use, priced at about \$499, owned by Facebook.

**Samsung Gear VR:** VR, for consumer use, priced at about \$129, works with a smartphone, owned by Samsung.

**Sony PlayStation VR:** VR, for consumer use, priced at about \$399, owned by Sony.

## AR Goes to Work

The worldwide slowdown in labor productivity since the Great Recession has proven difficult to overcome. While productivity rose 2.7 percent annually from 2001 to 2007, the growth rate was only 1.1 percent between 2008 and 2016, the U.S. Bureau of Labor Statistics found. AR may have the potential to boost that significantly by increasing workers' speed and accuracy. Test programs where workers use AR headsets to view step-by-step instructions for complicated assembly work—instead of referring to a desktop computer or paper manual—routinely show productivity gains of between 20 percent and 35 percent.

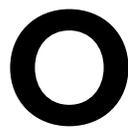
At Boeing, workers who assemble intricate wire harnesses that transmit signals and electrical power in planes are using AR headsets with software developed by Upskill. Instead of having to constantly check a computer, workers see each step appear in their field of vision. This has cut assembly time by 25 percent and reduced the error rate to nearly zero. Upskill's studies regularly show that AR improves efficiency by double-digit percentages, confirms Kim of the Herndon, Va.-based company. "This affects thousands of employees, and represents millions of dollars in savings."

By wearing the AR technology instead of using it on a smartphone or tablet, workers can get the information they need at the exact moment they need it. If they leave their workspace to find a part, for example, AR goes along to help identify the correct piece. If a machine breaks down, employees can use AR to identify the problem and fix it quickly. Service technicians can plot out their process in advance but still can make spur-of-the-moment adjustments in the field. An employee with a question can be connected to a subject matter expert, who can view a live stream of the situation or look at photos taken from the worker's perspective.

At the office, AR headsets could one day replace desktops and laptops entirely. Many of Meta's 130 employees are already trying the technology out: Currently, workers who do computer-based work wear AR headsets—and check their e-mail and complete other tasks by using hand gestures instead of typing on a keyboard or clicking a mouse. Maggie Elkin, SHRM-CP, the company's HR director, is an AR convert. "I have always struggled with organizational charts because they were a two-dimensional map of a complex, very three-dimensional idea," she says. "I can now visually represent not only direct reporting structures but also cross-functional teams and workflows using space instead of a flat plane. I can even walk around it."

## Keeping Workplaces Safe

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One of the first companies to speak out about a successful experiment with AR was Agco (<http://www.agcocorp.com/>), an agricultural equipment manufacturer based in suburban Atlanta with almost 20,000 employees and more than 150 locations worldwide. Employees at the company's Jackson, Minn., facility build custom tractors and other farming equipment. Buyers choose from hundreds of designs, with countless add-on options. Each tractor that comes off the assembly line is as unique as a snowflake, says Peggy Gulick, Agco's business process improvement director.

The AR pilot program began in 2014 in Jackson's quality assurance department. Workers were using tablets to complete checklists during the inspection process. However, as workers climbed onto the machines to make assessments, inevitably some would drop—and shatter—their tablets. After exploring

options, the company decided to purchase smartglasses that use what Agco refers to as “informed reality,” a form of AR in which users see digitally overlaid components only when they want to. By looking upward and to the right or by issuing a vocal command, users can call up information whenever they need it, but at other times their smartglasses are just like any other pair of safety goggles. In this way, a worker’s view is never unexpectedly obstructed.

The program was expanded to include assembly-line workers in early 2017. Smartglasses are now used by more than 100 employees at the Jackson site. Since the pilot began, Jackson has reduced its inspection times by 30 percent, and its tractor production times by 25 percent, according to Gulick. Agco plans to expand AR to five more worksites within the next 12-14 months, in Kansas, Illinois, Maryland, Brazil and Italy.

The employees love their smartglasses, Gulick says. When workers who have used AR are transferred to another department they ask her when their new area will be getting smartglasses, too.

AR can also provide invaluable safety training, particularly where there is heightened potential for danger. For instance, it can simulate a live wire on the ground, a jet engine failure or an oil well blowout so workers can safely practice what to do until the proper protocols become second nature. With AR, workers can practice identifying potential hazards and rehearse different ways to handle emergencies.



Upskill’s Skylight augmented reality software is used across a wide variety of industrial applications to increase efficiencies, reduce errors and improve worker safety.

# Reducing the Skills Gap

**A** lack of qualified applicants to fill available jobs is a problem for HR professionals in many industries. Using AR, individuals with little or no formal training can be taught to do high-skilled tasks—fast. In fact, AR works best for nonrepetitive complex activities—which is the kind of work inherent in many unfilled positions. And, unlike traditional training where learning often stops once a class or video ends, a worker who uses AR has the potential to learn more every day. For example, if a machine part malfunctions, AR can help a worker to make the necessary repair. Because AR training is interactive, it can also be more engaging.

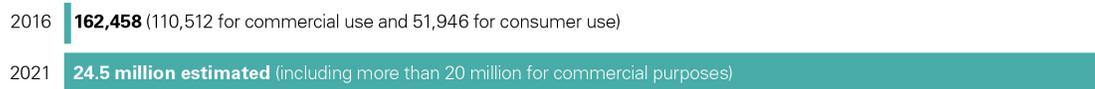
Between 2015 and 2025, almost 3.5 million manufacturing jobs will become available—and by 2025, 2 million jobs will be unfilled, according to a study by the Manufacturing Institute and Deloitte. More than increasing productivity, bridging the skills gap is “the bigger market opportunity that is in front of the entire [AR] industry,” Upskill’s Kim says.

Agco follows what the company refers to as a 3x3 cross-training model, meaning that each employee knows how to perform three jobs, and each position has at least three people who can do it. Before using AR for training, “we were taking between 50-90 days to train a new hire in one operation. Now it’s 30-45 days for multiple operations,” says Bradley Quinn, Agco’s manager of training and development. In addition to cutting training time almost in half, he says, the quality of new hires’ work has improved.

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## The Business of Augmented Reality

### AR Headsets Shipped



### Analysts’ Predicted Worldwide Revenues for AR and VR



Source: International Data Corporation.

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# Barriers to Adoption

**B**efore AR can be used on a wider scale, though, some potential challenges need to be addressed.

**Cost.** Right now, AR is mostly used by large to medium-sized businesses that can afford the investment of between \$1,000 and \$3,000 per employee for commercial use and have needs where it can make an impact, Liao says. But that could change. A 2016 Goldman Sachs Global Investment Research study found that in the last 20 years, hardware devices like laptops and smartphones have dropped in price by 5 percent to 10 percent a year on average. If AR follows this trend, it could become a justifiable technology for many workplaces.

**Usability.** Wearable AR should be wireless and comfortable to allow for easy and safe movement, and all forms of the technology need a sufficiently bright display—especially for outdoor work. AR programs use a lot of power, so the battery must be long-lasting.

**Motion sickness/headaches.** While this is a bigger problem for VR, AR users can experience nausea, dizziness and other symptoms.

**Employee reluctance.** Some employees may be skeptical of AR—or fearful that use of it could lead to their jobs being eliminated. That's why HR should make sure workers "understand the tangible benefits that [AR] will bring to both the employees themselves and the company as a whole," Elkin says.

### Where AR Is Making Inroads

Industries that are using or experimenting with AR technology include:

**Manufacturing.** On the factory floor, AR headsets can deliver hands-free, real-time data. Workers can view live feeds, instructions, diagrams and video recordings of their colleagues' work. By relying on overlaid images and instructions, new workers can become productive faster. Checklists and manuals can be accessed at any time.

**Construction.** AR allows all parties—architects, builders and specialists in the trades—to visualize what is being built. Blueprints are in 3-D, and 3-D images can be superimposed over worksites, giving workers data to spot potential problems early. Designers and others can collaborate remotely.

**Maintenance and repairs.** AR overlays the inner workings of cars, airplanes, elevators and other machines, allowing for fast diagnosis of problems (broken part, snapped wire, overheating). By using an AR headset, workers can access checklists and manuals without interrupting their work.

**Warehouse operations.** Workers wearing AR can be directed safely and quickly to stocked products. AR can help workers more efficiently load carts and docks and can also track inventory.

**Oil and gas.** AR's ability to provide 3-D maps helps with planning and preventing mistakes. Because many work situations in this field have the potential for danger, AR can be used to train workers on what to do in potentially dangerous scenarios.

**Architecture and design.** Blueprints and models can be manipulated in 3-D and superimposed over worksites. Changes can be made to the 3-D images by any member of the team, from any location. Problems can be discovered early in the process.

**Medicine.** AR can guide surgeons as they operate, and medical students can practice high-stakes procedures without any risk to patients. The technology can help nurses identify the most viable vein when drawing blood. AR makes it possible to interact with a specialist from anywhere, allowing for worldwide access to advanced medical care.

**Retail.** Customers can see what that couch would look like in their living room or how they would look wearing a new suit without having to try it on.

**Tourism.** Travelers can see diagrams projected over ancient ruins and immediately get information about the site. Arrows can guide tourists who are lost, and signs and even conversations can be translated instantly.

## AR for All

**J**ust because information can be put into an AR format doesn't mean that it should be. "If you don't have a problem to solve," Gulick says, "you're not going to find value in the tool [of AR]." Yet, for Agco, AR is invaluable for training—and is even a money-saver. Each pair of smartglasses costs the company \$1,500, and none have broken so far. The tablets workers previously used cost \$3,000, and one broke about every 10 days.

The real-world applications of this technology are just being discovered and, as the price declines, more leaders will be curious about what it can do for their workforces. Twenty years from now, AR may be seamlessly integrated into all jobs and across industries, or it might just make sense for specific, highly technical uses. It's the beginning for this sci-fi-like tech—and while its position in the workplace of the future is still unknown, its potential is very real.

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