



CLOSE THE SKILLS GAP AND USHER-IN INDUSTRY 4.0 WITH AUGMENTED REALITY AND REAL-TIME DATA

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Manufacturing and service organizations have been plagued by the skills gap for decades as older workers continue to retire and the skills required to operate new technology become more complex. Augmented reality (AR) can alleviate the effects of the skills gap by enhancing training, providing on-the-job assistance, and enabling on-demand access to up-to-date work instructions. AR helps companies achieve greater improvements in employee proficiency, safety, and productivity, to better prepare the workforce for the future of Industry 4.0.

Why Manufacturers are Turning to Augmented Reality

As we enter 2022, the pace at which experienced workers in the baby boomer generation (born 1946–1964; current ages 72–58) transition out of the workforce continues to accelerate. Manufacturers, in particular, struggle to manage the effects of the skills gap this transition creates. The retiring group of technicians, mechanics, and engineers with a wealth of knowledge and skills are difficult to replace with newer, inexperienced workers. Aberdeen's research shows that the most common challenges for HR professionals in the manufacturing industry all revolve around the level of skills required and inability to fill positions (see sidebar).

Manufacturing organizations are pursuing a variety of strategies and technologies to retain the domain knowledge these experienced workers possess and pass it on to newer employees through training, work instructions, and on-the-job assistance. Augmented reality can make an impact in all of these areas. Aberdeen defines **augmented reality (AR)** as technology that superimposes content on a user's view of the real world, thus creating an interactive experience to enhance real-world objects with contextual information. AR is most commonly implemented on smart phones, tablets, smart glasses, and other AR-enabled wearable and mobile devices.

Engineering professionals across industries can benefit from the use of AR. The top product innovation challenge for engineers in industrial, high tech, and automotive is the attrition of skilled workers (see sidebar), and AR can help speed up time-to-proficiency for new employees and provide visual work instructions or access to help from an experienced technician via remote

Challenges Controlling Labor Costs

1. Lack of skills-based view of workers and skills gaps, **37%**
 2. Inability to fill positions quickly enough, **31%**
 3. Inability to deploy and re-deploy workers, **29%**
- % of HR pros in manufacturing*

#1 Product Innovation Challenge by Industry

- **Industrial:** Attrition of skilled workers, **37%**
- **High Tech:** Attrition of skilled workers, **46%**
- **Automotive:** Attrition of skilled workers, **36%**
- **Aerospace & Defense:** Management/validation of constraints for performance and manufacturability, **44%**
- **Pharma:** Too much time spent searching for information, **39%**

assistance capabilities. AR can also help with training for engineers in the aerospace and defense sector, as well as aid in assembly and quality inspection during manufacturing to boost performance and manufacturability. Standardized work instructions with AR provide even more value for engineers in the pharmaceutical industry who spend too much time searching for information, because AR can help them visualize step-by-step instructions complete with tools and materials required for manufacturing and maintenance.

Manufacturers anticipate a range of benefits from the use of AR, mainly related to greater efficiency, accuracy, and safety (see sidebar). AR technology enables employees with the right information on-demand and in the context of their work environment. AR delivers value at every stage of the product lifecycle from design to production to the field. The addition of real-time Internet of Things (IoT) data increases understanding and extends the value of AR. This knowledge brief will review the business impact of AR and the building blocks for manufacturers to achieve such levels of productivity and profitability.

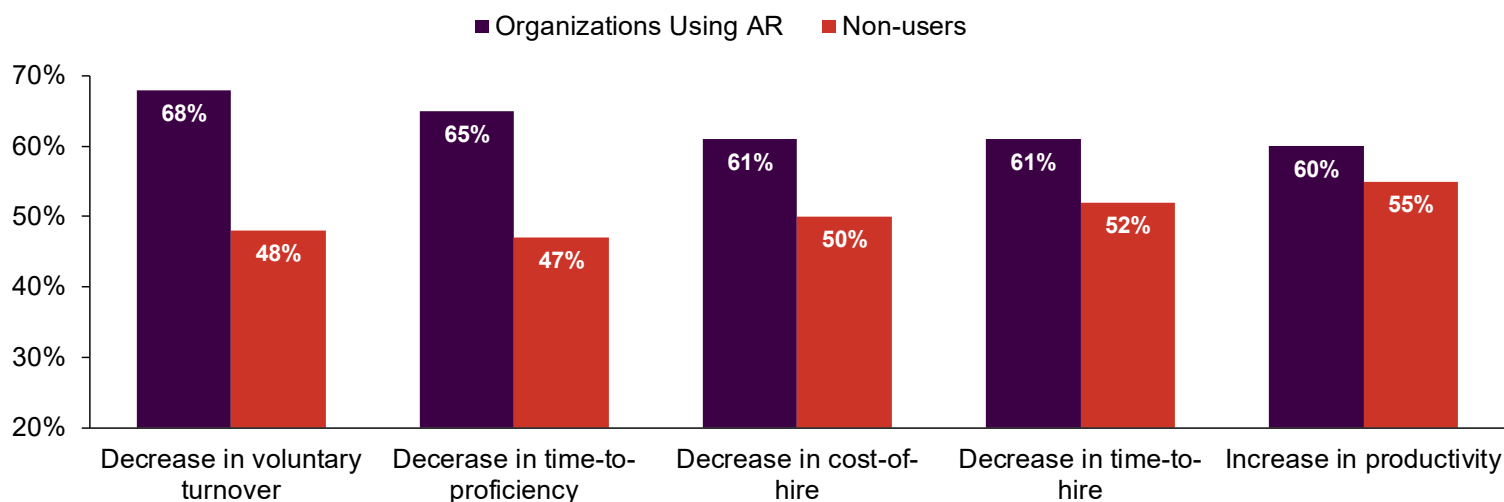
Anticipated Benefits of AR in Manufacturing

- ▶ Faster service times: **51%**
- ▶ Greater data accessibility and management: **46%**
- ▶ Faster training times: **36%**
- ▶ Faster onboarding: **35%**
- ▶ Improvements in employee productivity: **35%**

The ROI of AR for Workforce Management and Productivity

The anticipated benefits of AR are not just theoretical. Aberdeen's research shows that organizations using AR are more likely to see year-over-year improvements in metrics such as the retention of skilled workers, the time it takes for new hires to get up to speed, and the cost of hiring (Figure 1).

Figure 1. AR Users Are More Likely to See Annual Improvements in Workforce Management KPIs








Percent of respondents that saw an improvement over the past year, n=500
Source: Aberdeen, December 2021

The remote assistance capabilities of AR allow the technician or even the customer on site to call an experienced technician working at the office or at home, and the experienced technician can view what the on-site individual is seeing and guide them through the proper steps for set up or maintenance. This allows experienced technicians who might otherwise leave the workforce to continue offering their skills without the need to be on-site every day, which results in a 42% greater likelihood for organizations using AR to see an annual decrease in voluntary turnover (68% vs. 48%).

Organizations using AR are also 38% more likely to see a decrease in time-to-proficiency (65% vs. 47%). AR allows companies to conduct training for new technicians in a highly visual way, which improves engagement and retention. This immersive experience helps technicians to better understand critical information and instructions when performing tasks in the factory and in the field, thus enabling them to be more successful. With the ability to train technicians faster and easily access those with experienced skill sets when needed, organizations who implement AR don't have to hire for comprehensive skill sets, which helps decrease their cost-of-hire and time-to-hire. Getting new workers up to speed as quickly as possible and improving first-time fix rates by improving on-site success helps to increase overall productivity.

AR helps address the skills gap and improves workforce efficiency, which positively impacts the operational side as well. Organizations using AR are seeing greater year-over-year (YoY) advantages in production downtime and maintenance costs compared to those who are not using AR (Table 1).

Table 1. AR Minimizes Production Downtime and Boosts Profitability

Compared to non-users, organizations using AR are seeing:	
	42% greater YoY increase in profitability
	36% greater YoY decrease in manufacturing cycle time
	36% greater YoY decrease in maintenance costs
	34% greater YoY decrease in production downtime
	20% greater YoY decrease in time-to-decision

Technicians enabled with AR can have the visual work instructions before their eyes, making it easier and faster to solve maintenance issues in the

Manufacturers using
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factory. Keeping the factory running smoothly helps to reduce production downtime, increase manufacturing cycle time, and cut maintenance costs. Safety programs that involve training with AR allow employees to practice new skills and experience hazardous work environments virtually before being placed in a real-life situation. Virtual safety education helps employees retain information better, ultimately increasing Hands-on-Tool-Time (HoTT), productivity, and safety. Aberdeen's recent study around environment, health, and safety programs in high risk industries shows that organizations using AR for safety training are experiencing 17% greater HoTT and 10% lower Total Recordable Incident Rates (TRIR) on average than non-users.

Organizations can also reduce maintenance costs by utilizing real-time data to identify potential issues and perform predictive maintenance before issues arise, minimizing downtime from bigger problems and the amount of time and money spent addressing more complex operational challenges. With machines functioning properly, organizations can churn out more products, thus influencing profitability. Predictive maintenance in the field can also impact profitability long-term by boosting customer loyalty and retention.

Real-time data and AR also help improve time-to-decision. Leaders can use AR to visualize the factory floor and make adjustments to increase efficiency and streamline workflows, and technicians can have more information to make decisions on-the-job. The ability to capture data during the execution of a procedure provides critical insights into process and workforce efficiency. These insights can be leveraged by decision makers to improve process efficiency, product quality, and safety to drive continuous improvement. These advantages in key workforce management and manufacturing KPIs demonstrate the power of AR, but there are several building blocks to effectively leverage AR and real-time data that can help organizations maximize the value of their investments in these technologies.

Building Blocks to Effectively Leverage AR and Real-Time Data in Manufacturing

While investing in AR is a primary step into Industry 4.0, manufacturers need to incorporate key use cases and capabilities to support AR technology to ensure they are getting the most out of their investment. Real-time data can boost the benefits of AR. Incorporating IoT data into AR experiences provides critical insights into product and performance data. Organizations that implement an AR strategy and want to incorporate IoT data need to understand what capabilities are required (Figure 2).

Compared to non-users, manufacturers using AR are experiencing

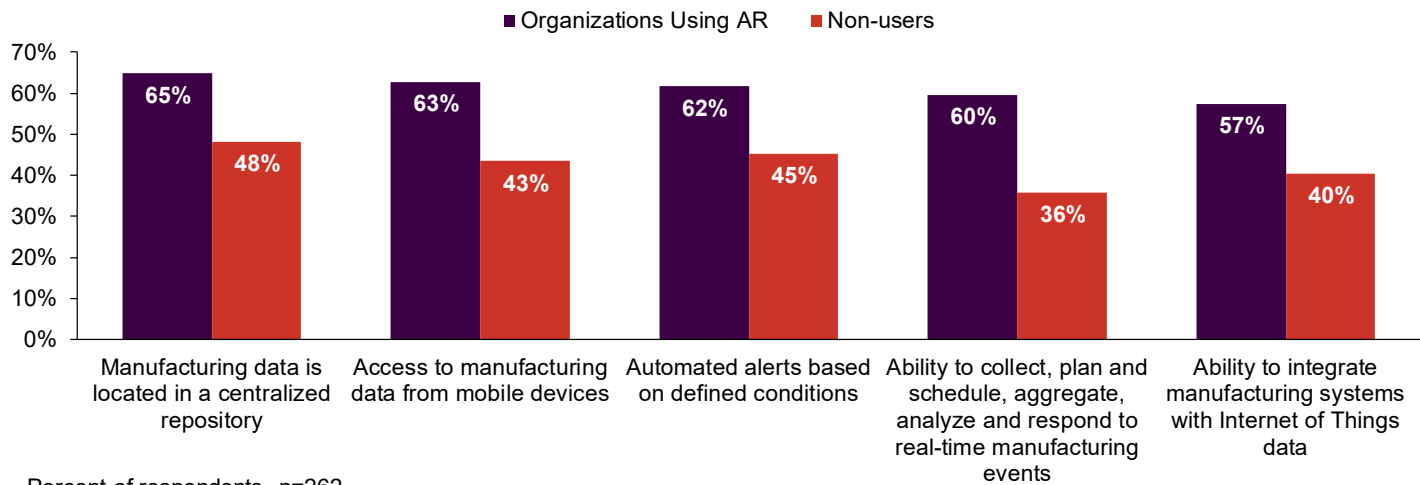
17%

greater Hands-on-Tool-Time (HoTT) and

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lower Total Recordable Incident Rates (TRIR) on average.

Figure 2. Capabilities to Support AR and Real-Time Data Usage



Percent of respondents, n=262
Source: Aberdeen, December 2021

When manufacturing data is located in a centralized repository, the AR system only needs to look in one place to access all the required information and provide technicians with insights. A centralized repository acts as a single source of truth, which eliminates time spent on reconciliation and errors from manual integration processes. Access to manufacturing data from mobile devices is also important for AR users because many AR solutions run through phones and tablets, allowing technicians to view necessary information while in the field.

Automated alerts enable predictive maintenance by notifying the company when certain parts need to be changed or if certain environmental factors are influencing product performance. Technicians can then use the information included in these alerts to prepare for the service visit and increase their likelihood of solving or preventing any issues on the first truck roll. Integration with IoT and processes to respond to real-time manufacturing events also benefit AR by allowing technicians to see what is going on inside the product or machine in real-time and how they can intervene to solve any problems.

An example of how all these processes work together to support AR would be if an automated alert is triggered due to a malfunction with a water pressure valve in the factory. The alert workflow could pull any necessary data about the malfunctioning part from the centralized database, allowing the technician to properly prepare to make any adjustments. The technician could go to the area of the malfunction and then use AR on a mobile or wearable device to identify the exact valve that is broken, and it could walk them through the steps to fix it.

These capabilities are made possible through the use of additional technology enablers that maximize the value of AR and real-time data. Organizations using AR are more likely than non-users to implement prescriptive maintenance, cloud solutions, machine learning, IoT, and work instruction software (see sidebar). Prescriptive maintenance and machine learning take predictive maintenance a step further by allowing technicians to arrive with a plan of action rather than just predicting when maintenance is going to be needed. Cloud solutions help connect AR to other service, manufacturing, and engineering solutions by bringing all solutions together on a single platform as well as reduce operating costs by offering scalable pricing options. Work instruction software helps retain the domain knowledge from experts and pass it on to new employees through training and on-the-job procedural guidance. Leveraging these capabilities and enablers contributes to the greater success manufacturers using AR are experiencing and demonstrates the importance of AR for closing the skills gap.

Summary & Key Takeaways

AR is critical not only for increasing operational efficiency and productivity—it is an innovative technology that enriches the employee experience and supports the employee lifecycle. It can make an impact on everyone in the organization at all stages of their careers, including:

- ▶ Enhancing training for new employees
- ▶ Providing on-the-job assistance for active technicians
- ▶ Enabling on-demand access to up-to-date work instructions

Even business leaders can benefit from AR's visualization capabilities for decision-making. Whatever the role—new, experienced, young, old, leader, manager, entry-level—AR and real-time data can help narrow the gap in skills and knowledge to ensure all employees have the tools they need to succeed. Organizations looking to implement AR to enable their employees to address challenges and excel in today's digital age of Industry 4.0 may consider incorporating real-time data to gain additional business benefits.

Technology Enablers to Maximize the Value of AR and Real-Time Data

Prescriptive Maintenance

- ▶ Using AR: **67%**
- ▶ Non-users: **43%**

Cloud Solutions

- ▶ Using AR: **66%**
- ▶ Non-users: **55%**

Machine Learning

- ▶ Using AR: **64%**
- ▶ Non-users: **41%**

Internet of Things (IoT)

- ▶ Using AR: **64%**
- ▶ Non-users: **46%**

Work Instruction Software

- ▶ Using AR: **61%**
 - ▶ Non-users: **50%**
-

About Aberdeen Group

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