

# AUGMENTED REALITY IN INDUSTRIAL APPLICATIONS

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## INTRODUCTION

After a tumultuous 2020, the need for digitization and keeping workers connected became crystal clear for many. This is true in all industries, but especially so for industrial markets where workflow complexity, knowledge retention and share, and financial impact from downtime and other inefficiencies is particularly severe. According to ABI Research, a global technology research and advisory firm providing strategic guidance on the most compelling transformative technologies, the industrial market is expected to quicken adoption of augmented reality in different forms—smart glasses and mobile devices—in an effort to enable workers in any location and minimize those costly inefficiencies.

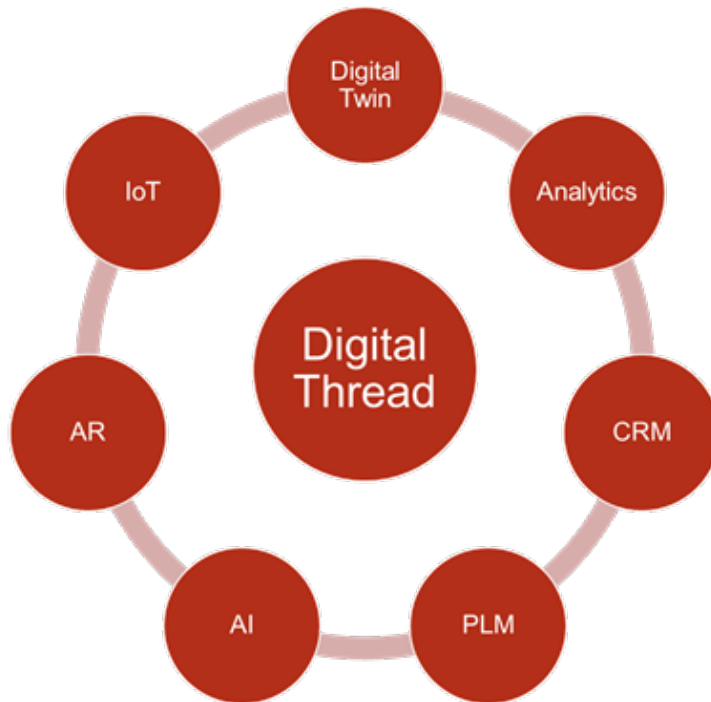
Easy and deep integration with existing systems is becoming table stakes for industrial AR. AR performs best when it can leverage the proper data and connectivity. While some use cases can deliver value siloed from the rest of an organization—one-on-one remote expertise as an example—universally, an AR implementation can be improved and deliver greater value with more connections to other systems.

A combination of prominent enterprise systems—including IoT, CRM, PLM, AI, etc.—into a cohesive implementation is, of course, the best-case scenario, but adding each system increases complexity. When done correctly, a digital thread is created between all systems. Each system benefits from the others: AR can enable a digital twin and IoT interaction and collect data in real time; that data can be fed into an IoT system, where AI is used for things like predictive maintenance and scheduling; and that maintenance or workflow update can be pushed to an AR user, which can pull perfectly up-to-date metrics. If anything falls outside of this ecosystem, automatic data collection and logging, with the help of an AI assistant for metadata tagging, can capture this activity and feed it immediately back into the system.

The KPIs for industrial only further highlight how beneficial AR can be. Downtime is one of the most severe KPIs in terms of lost productivity and revenue. In the automotive industry, \$30,000 per minute of unplanned downtime is possible—large automakers can average one vehicle produced per minute. AR can help reduce unplanned downtime through more efficient maintenance with analytics, error-reducing task guidance and verification, and when necessary remote expertise. It can also reduce planned downtime through similar means. The impact of an aging workforce—a more nebulous but equally important metric—can also be reduced through knowledge capture capabilities of AR.

**Figure 1: Digital Thread Synergies**  
**Each System Can Benefit the Other**

*(Source: ABI Research)*



“Industrial environments create a perfect storm of variables and needs for augmented reality to address and fill. High complexity leads to severe downtime and inefficiency cost, which AR can lessen. Training and knowledge share are critical thanks to that complexity, and AR can enhance training efficacy and retention while also being used to capture, share, and view that knowledge. Integration into important platforms like IoT, PLM, ERP, and WMS enables a two-way benefit, where AR can improve those systems and those systems feed data to improve AR. All components working together can be a challenge, but the return grows exponentially,” states Eric Abbruzzese.

## **HARDWARE DEMANDS**

Regarding hardware form factor, there is one conversation that trumps all others currently: handheld (mobile devices) or hands-free (head-mounted).

For mobile device AR, hands-free is not an element, but there is potential for instant safety notification delivery, and real-time data access can alert of danger before it presents. Mobile devices have increased in capability tremendously over the past few years, with spatial tracking capabilities rivaling devices with dedicated sensor suites, such as HoloLens.

Smart glasses are the future for ubiquitous AR, enabling hands-free data access and knowledge capture. Adding hands-free features to use cases with content access requirements allows for unbroken operations and results in increases in efficiency. Sometimes, this is an intrinsic requirement of a use case for safety or workflow reasons, but even when not the case, accessing content hands-free and unobtrusively is a safety and efficiency boon. Smart glasses naturally keep the worker at the center of the experience; workers can maintain a natural workflow, while accessing necessary and/or value adding data. Rather than requiring physical manuals or digital content on a handheld device, smart glasses can deliver that data not only hands free, but intelligently; step by step instruction, step verification, remote assistance, and more can be integrated into a workflow and delivered at the appropriate moment, avoiding information overload for the worker and again increasing overall efficiency. Glasses are also more versatile in content visualization, with 3D content being possible on binocular devices and head mounted devices intrinsically offering a more natural, heads-up viewing experience.

## LEADING USE CASES

While augmented reality presents flexible and wide reaching value for enterprises, a few specific use cases have continually proven most valuable and as a result most popular. Remote assistance and training are universally applicable, and present fast ROI; other use cases, such as assembly, quality assurance, and post sales support are more focused but equally valuable. Manufacturing and logistics were early adopters of AR, and have shown the strongest interest and uptake; while other verticals are growing as the market expands, environments with complex workflows and applications will continue to feature AR prominently.

- **Remote Assistance:** Remote assistance has been a leading use case in terms of interest and adoption, both before and during COVID-19, and will remain so for the foreseeable future. Remote assistance perhaps has the most easily understood ROI story, with the most flexibility in implementation. The level of complexity for a remote assistance implementation can range from a simple solution independent of existing infrastructure and platforms with faster time-to-market, but sacrificing some value adds, to a more comprehensive solution that can leverage IoT and content management integration.
- **Training:** AR training brings both increased training efficacy and retention, as well as greater overall content type support (e.g., training on 3D models, rather than with manuals/video). As a digital training method, AR training is also flexible with locations and environments. In-situ training is possible and can allow for immersed training content and instant employee ramp-up (training on the job), but it can also be used virtually when on site training is unneeded or not possible.

- **Assembly:** First-time error rate is an incredibly important KPI in industry, and AR can help lower it significantly, even when ignoring any preemptive training. Microsoft worked with the National Aeronautics and Space Administration (NASA) on its Orion spacecraft program, for which assembly was immensely complex and room for error was zero. Thousands of complex components needed perfect assembly to ensure mission success. Using HoloLens, the error rate was zero and assembly efficiency was significantly higher; 90% less time than traditional methods.
- **Quality Assurance:** Using AR for quality assurance has similar benefits to assembly in lowered first-time error rate, but it is more expansive than that. Total inspection time is lowered and can even be automated with verification tools on an AR device, leveraging some combination of machine vision, IoT connectivity, and manual logging.
- **Post-Sales Support:** In industry, post-sales support often overlaps with field service, QA, and assembly; it is more a matter of perspective (seller versus customer), but the usage is similar. Going back to downtime reduction and uninterrupted workflow, AR post-sales support can guarantee both. Time to repair is reduced on sight. Post-sales support for heavy machinery, as an example, can include AR through AR-enabled manuals, checklists, object recognition, real-time checklists and verification, and more. As part of a bundle with the product (machine), content access is not a problem because the AR content and product are from the same source. Training and maintenance guidelines can be bundled with purchase, helping to ensure operations for the product, and customer satisfaction and relationships.

## TEAMVIEWER

TeamViewer is a German company that has been focused on remote access and support, and has an AR app called Pilot for AR remote assistance and support. In 2020, TeamViewer acquired Ubimax, which was a leading enterprise AR platform operator with strengths in industrial and logistics. And more recently, in March 2021, TeamViewer also acquired Upskill, a U.S.-based enterprise AR platform player. Both of these deals help TeamViewer fully embrace the AR market. These acquisitions extended its enterprise AR capability and expertise. Ubimax' operations were met not only with greater footprint and scale capability, but also TeamViewer's other strengths in IIoT with endpoint access, control and management, analytics and predictive maintenance, AI, and other non-AR specific features that could now be AR-enabled or used for AR. Upskill also brings software and engineering expertise similar to Ubimax, the U.S.-based company notably brings TeamViewer comfortably into the North American market.

This acquisition of AR capabilities for a broader enterprise ecosystem create a major player in the space. Before launching Pilot for instant AR remote support and acquiring Ubimax, TeamViewer had the primary remote access and support TeamViewer product, TeamViewer Tensor for highly scalable and high-security remote connectivity, TeamViewer IIoT, Remote Management for holistic IT Management, and Meeting for videoconferencing. Add AR with Pilot, Frontline through the Ubimax acquisition (bringing along with it xPick for logistics, xMake for assembly, xInspect for inspection/maintenance, and xAssist for remote support), Upskill with their expertise in industrial manufacturing, inspection and audit, and TeamViewer's portfolio is significant. AR is increasingly seeing support and integration through these products where not already supported. For a potential industrial customer, the multiple entry points and scalability across use-cases and applications makes TeamViewer compelling.

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