

FUTURE OF WORK FOR THE FRONTLINE

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THE TECH INTELLIGENCE EXPERTS

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realwear

Global workforces are often in a state of continual change and advancement, but this has never been truer than in the past few years. While a global pandemic played a role, it was not the sole source of accelerated change. Many trends that have been evolving for years were simply exacerbated, with a perfect storm of needs looking for solutions.

Within this, the story of the frontline worker has been top of mind for many—many were picturing nurses and teachers, but this also includes factory and field service workers. Keeping all frontline workers safe often meant a complete halting of work for onsite operations. That has become less of a requirement today, but many companies were compelled to understand the potential of a remote connected worker as a result. Collaboration tools like Zoom and Microsoft Teams quickly became the norm and stuck around; however, frontline workers often sit outside of the traditional office-oriented productivity and collaboration tools like Teams.

This has created a unique dynamic for companies to support; frontline workers are best equipped when tools integrate through all parts of a workflow. At the same time, frontline work presents unique challenges that are not suited to those tools by default. Additionally, there are not always consistent tools needed for the frontline: sometimes, hands-free data access and communication tools are needed, and sometimes not. Enabling workers across all these variables is a challenge, but a necessary one as hybrid workforces become the norm.

This dynamic is heightened by some critical macroeconomic shifts. The labor force is changing, with

skilled labor shortages a well understood trend—in the United States, 8 million skilled labor positions were lost during the COVID-19 pandemic, with only half refilled (according to the U.S. Bureau of Labor Statistics. On top of that, economic headwinds continue. The Purchasing Manager's Index (PMI), a broad measure of economic potential, is declining worldwide. While it has not reached the record lows that followed early COVID-19 peaks, a gradual decline over the next few years can be expected. This suggests potential investment hesitation in the future as companies face unsure markets.

After seeing operations take a severe hit with COVID-19 restrictions, companies invested in keeping workers—both frontline and otherwise—connected and empowered with valuable tools, such as Augmented Reality (AR). Thankfully, much of this investment remains valuable within these uncertain market dynamics and can, in fact, grow in value as costs amortize and Return on Investment (ROI) continues.

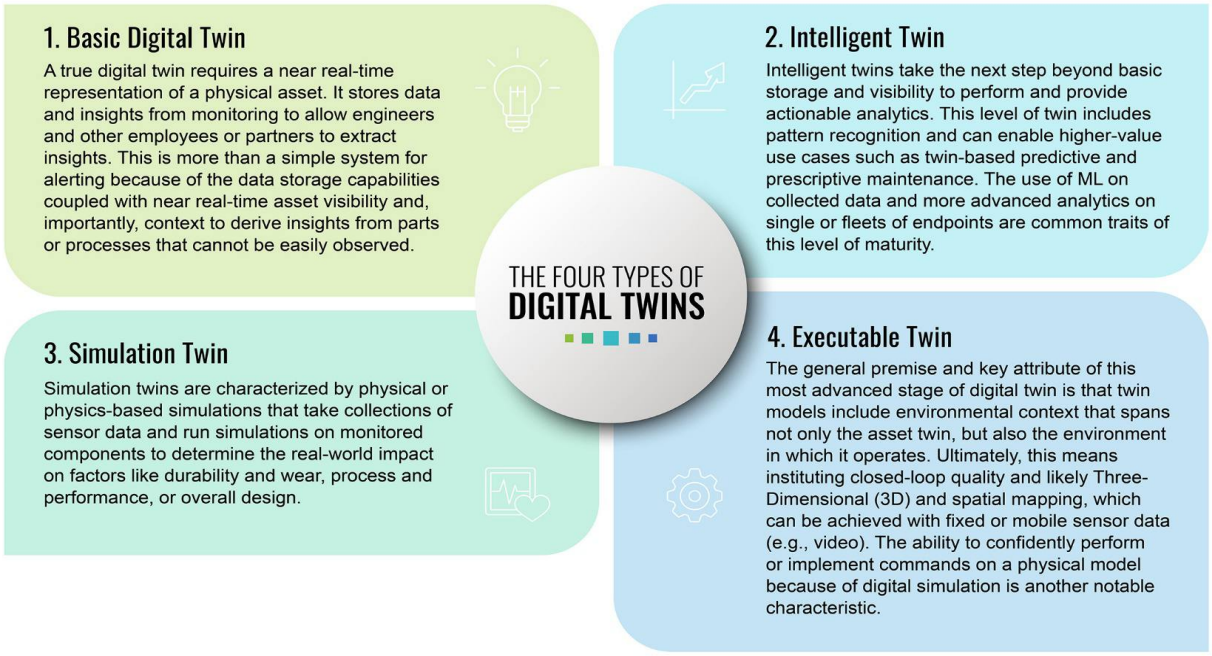
As these trends continue, a clear picture of the future of work for the frontline worker takes shape. Workers equipped with wearable devices like AR Head-Mounted Devices (HMDs) can both access and capture data easily—these data and the use cases enabled become critical, rather than optional, as companies see the potential of a connected frontline workforce.

IMPORTANT TRENDS AND ENABLING TECHNOLOGIES

Digitization has been a cornerstone in the industrial space, as well as within wider enterprise segments. Industry 4.0 continues to see adoption, with integrations of the Internet of Things (IoT), Artificial Intelligence (AI) and Machine Learning (ML), AR digital twins, cloud and edge compute, and more becoming commonplace. For a frontline worker, these technologies create opportunity to stay connected across different environments and work scenarios with minimal interruption.

Digital twins are incredibly helpful in allowing workers access to a constant data source. There are many levels of a digital twin as well, with increasing levels of capability, but also complexity. They are often visual as well, making AR and Virtual Reality (VR) powerful tools for twin visualization, interaction, and modification.

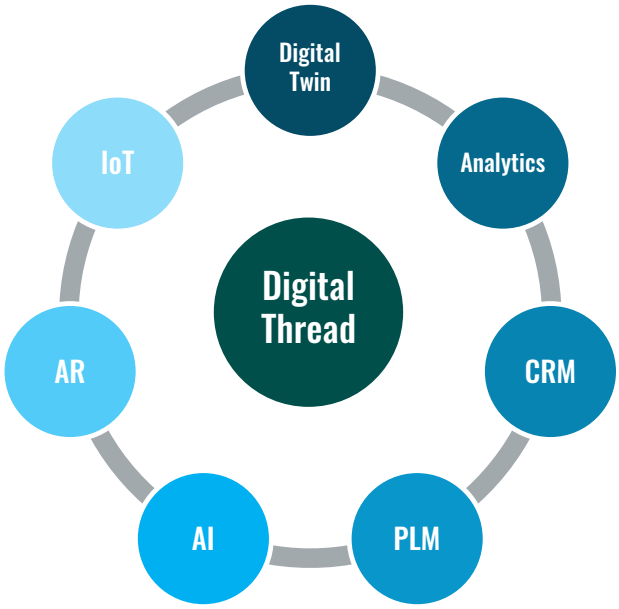
LEVELS OF DIGITAL TWINS:



With more advanced digital content available to more users, how to process these data can come into question. Frontline workers rarely have access to a workstation for something like stress simulation, but they could benefit from those data. Virtualization and cloud/edge compute can fill that gap. A virtualized workstation with the right software and required processing power is accessible anywhere. If a worker cannot interact with a workstation, physical or virtual, something like an AR HMD can be used to interact with and visualize content. Should that content be compute and latency intensive, such as in collaboration with real-time simulation, that compute can be done in the cloud and/or at the edge.

Making these systems not only available to all users, but seamlessly interoperable, is an important goal toward which to work. Many companies have a group of systems that may or may not work together. Having an unbroken connection between every relevant system is ideal, and this has become known as the digital thread. For a frontline worker, the digital thread offers assurance that data being used are accurate and up to date: Three-Dimensional (3D) models, workflow instructions, machine data, and more.

THE DIGITAL THREAD:



AUGMENTED REALITY AS A CRITICAL ELEMENT

AR serves as a worker-facing touchpoint, with a powerful two-way relationship between the AR-enabled worker and a broader connected ecosystem. As an access point for the frontline worker, AR can push relevant data, while also allowing users to log and update data themselves. These data can be pushed back into the system and used for analytics, content creation, and more. Real-time verification, for example, can leverage an AR device both to guide workers through a workflow and to enable step verification.

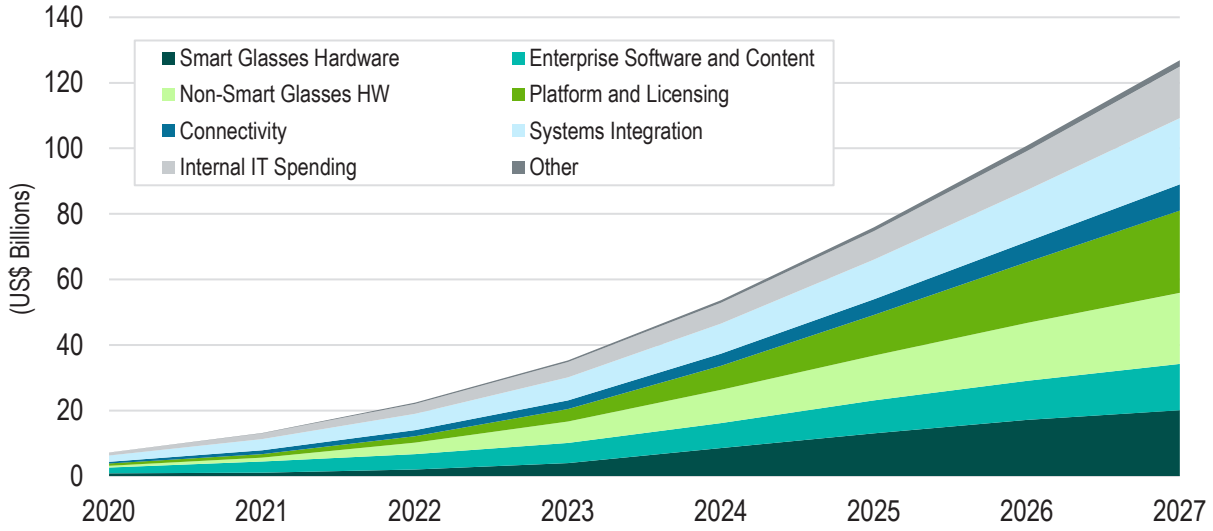
From a wider digitization perspective, this two-way relationship becomes many-faceted, with content feeding into and pushed out of all connected platforms: Customer Relationship Management (CRM), Product Lifecycle Management (PLM), IoT, digital twins, etc. AR platform players and hardware vendors play a critical role. Enterprise AR enablement platforms from companies like AMA, Atheer, Librestream, PTC, and TeamViewer are all seeing promising Year-over-Year (YoY) growth both in users and revenue. Devices like the RealWear HMT-1 and the RealWear Navigator 500 create a narrow, but highly-capable AR HMD space to deliver on promising ROI in use cases like remote assistance, training, and knowledge capture.

OUTLOOK AND RECOMMENDATIONS

With AR HMDs front and center for enterprises in the coming years, growth is strong and steady. Revenue segments tend to grow at similar rates, though they make up differing portions of the total revenue flow.

Head-worn hardware includes assisted reality and mixed reality devices. In the enterprise space, assisted reality devices maintain the majority of usage through the forecast, although mixed reality grows more quickly in adoption in later years. Use cases remain very different between assisted and mixed reality, though, so they coexist easily. Momentum from the consumer market empowers mixed reality growth, but core value with assisted reality remains significant in enterprise.

AUGMENTED REALITY MARKET REVENUES: KEY ENTERPRISE SEGMENTS



Integration can be one of the most significant challenges for getting AR off the ground, apparent when examining value chain segments that deal with integration. Systems integration, internal Information Technology (IT) spending, and connectivity all play a role. To keep frontline workers supported, and enable key use cases, these are essential investment areas. Platform vendors and integrators that specialize in cross-compatibility among components play an increasingly critical role for frontline enablement. Keeping workers connected is equally critical, so investment in connectivity infrastructure will support these efforts. The end goal is fully connecting and supporting a frontline worker with a cohesive ecosystem of hardware, software, and services.

RECOMMENDATIONS:

- **Partner, partner, partner.** Keeping frontline and backend ecosystems cooperating can be a challenge, but one that is reduced with capable partners throughout the pipeline. AR hardware for frontline workers is a first point of contact, built on by other integrated systems. Building everything in-house is impossible for all but the largest corporations, and even then, integration without help is a challenge.
- **Identify the actual needs for frontline worker use cases.** When it comes to AR, hands-free will likely be the first critical feature of an implementation to understand and will dictate much of the discussion afterward. If hands-free data access is needed, then an AR HMD is the solution of choice.

If the target user is in a complex environment, assisted reality devices like the RealWear Navigator 500 may be the best choice to ensure situational awareness. If immersive visual content and spatial data are important, then mixed reality devices like Microsoft HoloLens will win out, assuming the usage environment supports it.

- **Invest in AI and expand the AI footprint.** AI and analytics will be a primary differentiator for enterprise AR platforms over the next few years. The amount of data captured through AR-enabled frontline workers will be significant, with AI adding value both at capture and in later analysis. AI can improve accuracy of capture (e.g., voice, processes) and/or automate metadata tagging. The data lake created with AR can be made actionable with AI. Frontline benefits can span from quality of life improvements like Natural Language Processing (NLP), to predictive shift changes and maintenance schedules enhancing frontline efficiency. Early investment and maturation of these elements will attract more innovative customers and improve market standing as it becomes commonplace.
- **Think about where content is stored, and where it is processed for frontline workers.** Flexibility in usage is critical for frontline enablement, with numerous integration points and usage scenarios. Locally stored content (e.g., work instructions on an AR device) is the least flexible, but most reliable. If complex digital documentation or content is required, edge stored and streamed content may be preferable to maximize device performance in the field. For business models, cloud-hosted capabilities are becoming the norm; edge compute and Software-as-a-Service (SaaS) are forward-looking. Position offerings in line with this, with flexibility for the cloud, on-premises, and hybrid when possible. Business models spanning traditional, SaaS, and otherwise will help cover most sides of the AR market today and going forward.
- **Security should be embedded deep into the fabric of every solution.** Frontline workers often interface with sensitive information, increasingly with camera-equipped AR devices. Security is the foundation for current and future value-generating use cases, especially those that rely on remote operation and real-time data access (digital twins, digital thread, AR). A strong device management solution can help in those cases, especially one that natively supports AR devices.
- **Do not completely ignore the metaverse noise.** Metaverse conversation concerning AR is inescapable, and for good reason. The cross-market potential, the companies involved, and the significant spending flowing through the metaverse all touch AR in some form and often have significant overlap, even in the enterprise space. Enterprises are already investing in the idea, but in the enterprise sector, it is called digital thread, AR cloud, or something similar. These solutions can be used to support the frontline worker and streamline hybrid workforces—interoperability is the end goal no matter what the solution is called.

The past 5 years have shown the value of AR for enterprises. Remote assistance, training, knowledge capture, and more have proven returns. Integrating these capabilities for frontline workers has showcased this powerfully and, as a result, companies are moving to increase adoption of HMDs. Going forward, AR sits as a natural component of frontline work and digital-native platforms for companies. A digital thread between AR, cloud, IoT, digital twins, and other critical platforms enables this, with AR both a worker tool and a method of data capture. Maturing hardware and platform vendors, increased capability of enabling technologies, and cohesive digital go-to-markets make AR and frontline enablement a natural fit.

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