Innovation Insight for Immersive Technologies in Frontline Working

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Initiatives: Digital Workplace Infrastructure and Operations

> Organizations with a large number of frontline workers can realize significant business benefits by leveraging AR/VR/MR for specific use cases. This research helps I&O leaders determine how to realize business value from immersive tech and explains typical risks and challenges.

Overview

Key Findings

- The profitable use cases of AR/VR/MR for frontline workers as well as desk-based workers are increasing.
- The top five frontline worker use cases for AR/VR/MR are training, remote expert guidance, remote inspection, remote collaboration and immersive workflows.
- AR/VR/MR have different applicable use cases, but there is still confusion in the market. With recently increasing remote work, VR is the technology for those who can't get to the site, and AR is the technology for those who can't leave the site.
- Many organizations are already piloting immersive technologies, but they are not always successful putting it into production and scaling it.
- Many organizations don't realize that immersive technologies require a different way of thinking and new processes.

Recommendations

I&O leaders focused on digital workplace infrastructure and operations must:

- Create a team of cross-organizational experts (COE) for immersive technologies.

- Pilot immersive technologies and leverage experience from other companies in their vertical as well as adjacent industries.
- Identify and prioritize three to five use cases that are likely to be effective based on their business challenges.
- Evaluate business benefits, risks and costs, and then set realistic targets.
- Start out with a lot of ideas and begin a selection process before going into the pilot phase and developing prototypes. Expect some, but not all of them, to go into production.

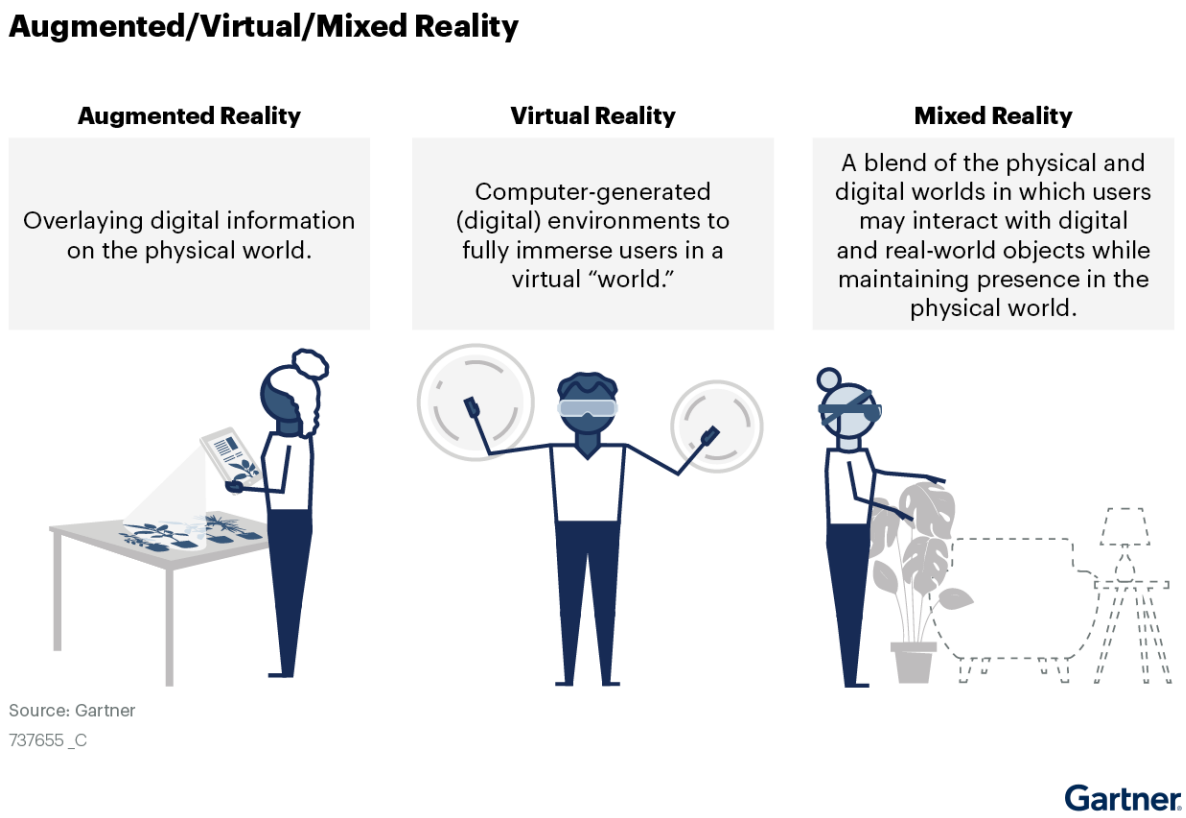
Strategic Planning Assumption

By 2024, 60% of companies will demonstrate immersive technologies for customers or internal use, but only 25% will realize value in production.

Introduction

Improvements in wearable device technology have focused attention on the potential of technologies such as augmented reality (AR), virtual reality (VR) and mixed reality (MR), collectively termed immersive technologies (see Figure 1), to create business value and transform businesses, particularly in use cases for frontline workers.

Figure 1: Immersive Technologies



Factors driving the development of these technologies include:

- Advancement of the AR cloud (see Note 1)
- Availability of authoring tools
- Enhancement of basic technologies such as ARKit and ARCore
- Availability of content creation and distribution tools
- Collaboration with AI and IoT systems

This research provides I&O leaders with select use cases for immersive technologies and describes how the technology can generate business benefits in each use case.

Description

Immersive technologies are composed of three categories — AR, VR and MR — with different levels of maturity (see Figure 1 above and Hype Cycle for Frontline Worker Technologies, 2021):

- Augmented reality is the real-time use of information in the form of text, graphics, audio and other virtual enhancements integrated with real-world objects and presented using a mobile, head-mounted-type display or projected graphics overlays. It is this "real world" element that differentiates AR from virtual reality. AR aims to enhance users' interaction with the environment, rather than separating them from it.
- Mixed reality is the merging of real and virtual worlds, where physical and graphical objects appear to interact and integrate naturally. Mixed reality, in concept, is a single technology. However, mixed reality includes an underlying group of technologies encompassing the spectrum of immersive displays and interactive systems that spans from the digitization of real environments to augmented reality and virtual reality.
- Virtual reality provides a computer-generated 3D environment (including both computer graphics and 360-degree video) that surrounds a user and responds to an individual's actions in a natural way, usually through immersive head-mounted displays (HMDs). Gesture recognition or handheld controllers provide hand and body tracking, and haptic (or touch-sensitive) feedback may be incorporated. Room-based systems provide a 3D experience while moving around large areas, or they can be used with multiple participants.

Benefits and Uses

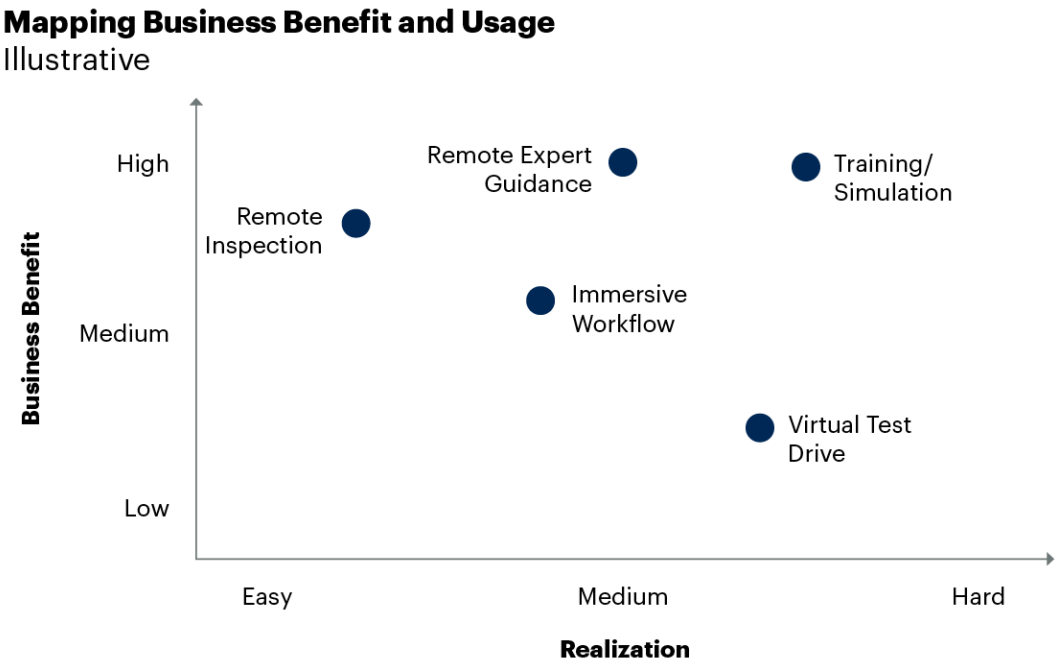
Benefits of Immersive Technology

Organizations adopt immersive technology for the following reasons (see Figure 2):

- **Talent development.** Immersive technology can reduce the cost and complexity of training frontline workers. (Avoid building expensive training facilities/mock-ups or downtime of production equipment for training.) It also delivers a training experience that more closely resembles real situations and develops empathy and decision-making skills.

- **Increased productivity where a limited number of remote experts can support a large number of geographically distributed frontline workers.** Immersive technology enables organizations to deploy remote expert guidance (REG) efficiently, creating a business advantage when the need for experts outpaces supply, making hiring and retaining experts difficult.
- **Improved collaboration and quality of work.** By delivering information to frontline workers in a form they can use immediately, immersive technology improves the quality of work, enabling workers to solve problems and make repairs during their first visit to the work site and confirm that the job is complete before leaving the site. This reduces the time required to complete tasks, improving productivity and the customer experience.

Figure 2: Mapping Business Benefit and Usage



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Talent Development

VR Training

VR training provides the user with a virtual visual image. This realistic experience enables the user to experience the images as if the objects were actually there. Space-based systems can provide a 3D experience while moving around a large area or with multiple participants. Training for frontline workers is more about coaching than teaching. This type of experiential training helps people experience the “frontline” first hand.

Key benefits:

- A training experience that more closely resembles real situations frontline workers will encounter in the field
- Easy-to-develop skills that are difficult to explain orally
- Accelerates quick/fast learning
- High levels of trainee engagement
- Learning contents are reusable over time and across sites
- Anywhere training (including socially distanced training)
- Doesn’t require expensive “mock-ups” of facilities like control rooms

Use Case

Construction and utility companies are using VR technology for the safety training of frontline workers. The workers in these industries are frequently in high-risk situations and the importance of training is often lifesaving. However, training can be very expensive. VR technology simulates real-life experiences that cannot be gained through classroom learning and raising the awareness of safety. VR training is also being used to train workers in other types of dangerous jobs, such as firefighters, military and police officers. A company in the air transport industry uses VR to train aircraft pilots in real-life situations. VR training also is being used in the medical field (for example, to simulate surgeries).

Most Likely Industry

The industries most likely to employ VR are:

- Construction
- Utilities

- Transportation
- Healthcare
- Field service

Increased Expert Productivity

Remote Expert Guidance

Remote expert guidance (REG) involves workers in the field using wearable technology to share information and receive direction from experts in a location other than the site of the field work, such as a corporate office. The expert sees the worker's task and surroundings via the device camera and can use voice or instructional images to advise and/or guide the worker.

Key benefits:

- Addresses the staff and expertise shortage
- Supports people in real time
- Limits operational errors
- Improves problem identification
- Efficient support for new staff
- One expert can support multiple frontline workers
- Increases first-call resolution
- Improves customer satisfaction
- Improves employee satisfaction when not having to leave a task unfinished
- Ensures the safety of experts and facilitating business processes in restricted areas

Use Case

For a manufacturing organization with a limited number of skilled technicians, immersive technology enables REG, allowing one senior technician/expert to support many sites and check-in on sites in real time. Video conferencing can do the same thing, but it isn't hands-free. Immersive technology can be useful where a skilled person can see and support the situation in real time, such as in maintenance/repair. By using this technology to present the correct position, assess the situation and comment on it to field personnel. It is possible to make decisions, provide support and reduce mistakes. In a special use case for an oil company, REG can be used to carry out remote inspections of oil rigs, where it is difficult to send experts due to social distancing and various restrictions, such as travel bans.

Most Likely Industry

The industries most likely to employ REG are:

- Field service workers
- Maintenance personnel
- Utility line workers
- Emergency responders
- Healthcare providers

Improve Collaboration and Quality of Work

Field Service, Manufacturing and Remote Inspection

Capturing worker knowledge as images and video, annotated with audio and symbols/arrows, helps organizations create how-to documentation and perform quality assurance. This method of knowledge capture also allows organizations to:

- Reduce misunderstandings and mistakes by sharing the visual process
- Minimize send back/rework
- Improve the accuracy of inspections and enable inspection by remote experts
- Improve the quality of the product
- Record for compliance

Use Case

A shipbuilding company is using MR technology in the manufacturing process and in the postoperational inspection of its ships. In the assembly of components, it uses digital, step-by-step instructions and animations to clarify the work process, ensuring accuracy and preventing errors. In the past, this kind of information was shared on paper, but paper-based procedures were difficult to understand and reporting changes was time-consuming for workers. MR technology reduces misunderstandings and mistakes between workers, improving the quality of work and postoperational inspections, cutting back on rework and avoiding potentially disastrous problems.

Most Likely Vertical Area

The industries most likely to employ MR are:

- Manufacturing
- Aerospace
- Shipbuilding
- Construction

Risks

The Risks and Challenges of Immersive Technology

In addition to the benefits detailed above, immersive technologies present the following potential risks:

- **Multiple, rapid failure.** Failing fast is the basis of success with emerging technologies and approaches. The organization must anticipate and be willing to accept these failures as the price of eventual success with immersive technologies.

- **Nascent market.** The market for immersive technology includes many emerging vendors and the technology is immature, meaning that software quality and stability could be lower than anticipated and that standards are evolving. The risks that accompany deploying these new technologies will change over time due to factors such as regulation, compliance, vendor viability and shifting societal attitudes regarding the technologies. When dealing with these vendors, launching large projects that take many months to complete involves risk. Using agile methodologies with short sprints can reduce this risk. Also, by working with your internal IT department rather than leaving everything to the vendor, you will be able to deal more quickly with any issues that arise. Plan for device change/swap and ensure the back-end system supports multiple device form factors (for example, HMDs as well as tablets).
- **Develop with non-IT staff.** Immersive technology is used in frontline work and is frequently not the sole responsibility of the IT department. Deploying immersive technology requires collaboration with the line of business. I&O leaders must collaborate effectively with business leaders (for example, by creating prototypes early on to showcase what the finished product could look like).
- **Security and privacy.** Technologies such as AR raise concerns about photographing sensitive areas and invading personal privacy. I&O leaders must work with the security, HR and legal teams to address security and privacy concerns.

Recommendations

- Create a team of cross-organizational experts (COE) for immersive technologies.
- Pilot immersive technologies and examine three major technologies: AR, VR and MR.
- Identify and prioritize use cases that are likely to be effective based on your business challenges.
- For each initiative identified, evaluate the business benefits and associated risks and costs. Prioritize these among all the identified initiatives.
- Start piloting using agile development methodologies.
- Ensure back-end systems support multiple form factors of devices, not just immersive technologies.

Evidence

Gartner engaged in nearly 3,700 client inquiries on the subject of immersive technology during the first eight months of 2021, up slightly from the same period in 2020.

Recommended by the Authors

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