

# The Definitive Guide to Enterprise AR/VR/MR (XR) and Wearable Technology Adoption



# INTRODUCTION

In 2015, the newly-formed BrainXchange took a risk on a category of technology then-overshadowed by articles about “Glassholes,” and put together the first-ever conference and exhibition devoted to the business and industrial applications of AR/VR/MR (XR) and related emerging technologies. This became the Augmented Enterprise Summit.

Over 8+ years and nearly 10 events, BrainXchange has enjoyed a front-row seat to a computing and workplace revolution that promises to make organizations and their workforces more agile, connected, and mobile than ever before. During that time, we witnessed the rise of numerous use cases and next-generation XR devices and platforms influenced by the early adopters who shared their stories at our events. What follows is knowledge resulting from our experience and more specifically from **hundreds of discussions with enterprise end users themselves**.



# PROOF OF CONCEPT/EVALUATION

THE ROADMAP TO SUCCESSFUL ADOPTION

## POC/EVALUATION



So, you've discovered extended reality or been directed to look into this thing called the Metaverse on behalf of your company. Here's how to get started.

### IDENTIFY AN ENTRY POINT

The first step on the roadmap to successful XR adoption is also the most difficult and important: **Choosing a use case.** Early adopters agree that the best practice is to engage with end users from the beginning.

### TIPS

Go into the field or warehouse and interview frontline workers, the ones who will actually use the new technology on the job.

Ask employees outright about their biggest pain points and challenges using the guiding questions on the right side of the page.

Consider setting up a kind of innovation hub or monthly workshop where employees can try out devices and imagine what they might do with them. Let users tell you where they see value for the technology.

## SAMPLE QUESTIONS FOR END USERS

**What** tools and methods do you use to access task-based information, get assistance from coworkers, record or verify your work, and interact with customers?

Do you have any complaints about the tools you currently use on the job or a specific workflow?

Do you find yourself at times fumbling with devices or manuals when it would be better to have both hands free to work?

Have you come up with any makeshift solutions or quick hacks to speed up your work, make your job easier, or make yourself more comfortable on the job?

**When** you encounter a problem, how do you report it? Do you have to leave your workstation to inform someone? Do you find yourself communicating the issue multiple times or waiting around for someone to diagnose and/or fix the issue for you?

**Do** you have to recall a lot of information for certain tasks? Are there times when critical information is not at the ready or not delivered to you in a convenient and timely manner?

**Are** there times when you feel your safety or performance is at risk due to cognitive stress, physical strain, inadequate training, lack of information, or other factors in the work environment?

## SAMPLE QUESTIONS FOR THE BUSINESS

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**Where** in your operations do workers still rely on paper instructions, lists, manuals, or schematics? Can this information be digitized?


**Which** tasks require handheld devices? Do these tools interfere with hands-on work?


**Which** tasks require point-of-work instructions? How do workers access/view those instructions? How up-to-date are the instructions?

**Do** employees have to fill out paper forms or perform manual data entry? Can the process(es) be digitized?

**What** jobs require employees to carry heavy loads, work in non-ergonomic positions, and/or perform repetitive motions?

**Which** tasks require record keeping for compliance, proof of service, or quality assurance? How time-consuming is the current method of documentation? Is reporting standardized or is there room for misinterpretation?

 **Look for opportunities to go** hands-free, reduce cognitive load, eliminate travel, enable on-the-job learning, improve communication, reduce risk, and connect teams, clients, and partners remotely.

 **Consider** tasks with many steps, tasks with complex instructions, memorization or reading, tasks where small errors have big consequences, and tasks for which there aren't enough qualified workers.

**Do** workers need to stop what they're doing and/or walk away from the workstation to record data, file a report, or get assistance?

**What** factors delay the repair of critical equipment? Where are your SMEs located and do they have to travel to perform MRO? Are you leveraging real-time machine data?

**Does** training impact productivity? How do you deliver hard and/or soft skills training to employees? Do you rely on shadowing or grounding of expensive assets for learning? How do workers train for situations and anomalies that are difficult, dangerous, or undesirable to simulate in real life?

**Where** is there a high level of customization or variability in your operations? Are there different instructions or lists for each variation? Does this lead to errors?

**How** are you capturing the knowledge of your most experienced employees and transferring it to the next generation of workers?

## IN CLOSING

The most **common and proven points of entry for AR/VR/MR (XR)** today are vision picking and remote support with augmented/mixed reality glasses or headsets followed by virtual reality training. There are plenty of real-life use cases you can bring to your executives. Find examples in BrainXchange's [database](#) of 500+ enterprise XR use cases.

You might also look at prior years' safety, uptime/downtime, quality, etc. data to pinpoint sources of error, injuries, fatigue, production disruptions, unnecessary/expensive travel, waste, rework, profit loss, and customer dissatisfaction.

**Be realistic!** You may only have one chance to prove your business case, so clearly identify the business problem and decide whether the technology is truly needed. Go for measurable, low-hanging fruit and get input from those closest to the problem. **The simplest use cases like ditching a handheld scanner for a pair of smart glasses can have tremendous impact** and pave the way for future use cases.

## STILL NEED MORE AMMUNITION ?

### CONSIDER THE FOLLOWING QUESTIONS

- How do you maintain employee training? Are there opportunities for upskilling?
- Are the learning methods you use appropriate for a multi-generational workforce?
- Do you struggle with employee recruitment and/or retention?
- How distributed is your workforce?
- Where are your customers and partners based and how did COVID impact your ability to deliver products and services to them?
- Is there a backlog in any area of the business?



# HARDWARE/SOFTWARE SELECTION

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## SOME THINGS TO REMEMBER



The use case determines the choice of hardware (not the other way around)

The device has to fit the use case, satisfy end users' needs, and meet industry standards and requirements

Glasses, headsets, and other wearables are not right for every task, worker, or area of the business

You may want to test multiple devices for comparison if the software and budget support it

## WHICH DEVICE FOR WHICH APPLICATION?

### HANDS-FREE, HEADS-UP INFORMATION

- From an ERP system - Assisted or augmented reality glasses (requires system integration)
- Safety alerts and task prompts - Smart glasses or a smartwatch
- Documentation and recording - Smart glasses, some smartwatches
- Verification - Augmented/mixed reality glasses or headsets with image/object recognition

### DESIGN & ASSET VISUALIZATION - MR/VR headset (requires 3D content development, which may involve 3D scanning)

- Product design/prototyping
- Visualization of machine or other complex data
- Layout planning
- Workflow/process simulation and evaluation
- Digital twins

### REMOTE VIEWING

- Remote support or see-what-I-see - Smart glasses with a front-facing camera and connectivity
- Remote collaboration (more interactive) - AR/MR glasses or headset (for guidance); MR/VR headset (for virtual meetings and collaborative workspaces)

### TRAINING - AR/VR/MR (XR) glasses or headset

- On-the-job learning through step-by-step augmented work instructions or other digital content presented at the point of need - AR/MR glasses or headset
- AR-enabled remote guidance - AR/MR glasses or headset
- Immersive training in a virtual environment - Virtual reality headset

### SALES

- Sales pitch - Bring an MR/VR headset to the customer or provide in store (projection and CAVE systems work, too)
- Product configuration - XR headset to visualize customization options; mobile AR for product placement in real space
- New shopping experiences - Mobile AR (virtual try-on within the brand app); VR headset (virtual store or showroom); remote shopping via in-person sales associate wearing AR glasses
- More personalized customer experience - Sales associate wears smart glasses or a smartwatch to access customer info at the point of purchase

### MARKETING

- Wearable or mobile AR (pop-up information or activations in store, in-store navigation, etc.); VR headset (virtual tours, showroom, or other branded immersive experience)

### SERVICE

- Remote expert support - AR glasses or mobile app (shipped to or downloaded by customer) for instant connection to an SME (remote support as a service)
- AR user manuals - AR glasses or mobile device
- Proof of work - Smart glasses to capture first-person video of a completed job

### SAFETY

- Employee tracking - Body-worn sensors in a variety of form factors to measure biometrics and/or environmental factors; wearable or other device for alerts when a threshold is reached
- Behavior modification - Body-worn sensors to monitor ergonomics + wearable alerts (haptic or otherwise) to correct the user's form
- Physical support or augmentation - Partial or full-body, passive or powered exoskeleton or exosuit
- Immersive safety training - MR/VR headset

## SOLUTION SELECTION

You've identified a high-value use case with a low barrier to entry. Now, it's time to evaluate available solutions and **speak with vendors**.

A focused event like the [Augmented Enterprise Summit](#) is a good starting point, providing the opportunity to try out many devices and platforms in one place. Even if you have the budget to purchase different devices for testing, the ability to communicate your needs directly to vendors and benchmark with other enterprises is key.

Most importantly, **know your requirements**. Providers may be willing to work with you to customize a solution meeting your unique business needs.

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## DEVELOP INTERNALLY OR FIND A PARTNER?

The enterprise XR market has come a long way: Most hardware companies now have multiple software partners and many software solutions support a range of devices, including mobile phones and tablets in addition to newer headsets.

When evaluating a potential vendor, check out their partners and any case studies they've published. Above all, it is important to **find a solution provider who understands your needs and will work with you** and your team at every step to overcome implementation challenges.

**Do not take content for granted!** While AEC firms are well-positioned to adopt XR, most industrial organizations are in the process of digitizing information and processes. **Inventory available digital content**, contact OEMs, and begin fostering internal talent for future immersive content development. Avoid initial use cases that require a lot of custom 3D content or frequent content updates.

## NARROWING DOWN YOUR OPTIONS

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Determine **what device capabilities or features are necessary** for the use case and/or specific work environment. (*For example, a good camera and connectivity for remote support; lightweight if the device will be worn for long periods of time; image recognition for AR-enhanced inspections, etc.*)

As the XR market is constantly evolving, there's always the chance that the solution you choose today will become obsolete or a partner company will fold or get acquired. Ask about scalability, interoperability, and multi-platform support.

Another option is to start out with a more familiar consumer device. It may be easier to get buy-in and employee acceptance that way.

# CONTENT SOURCING AND CREATION

While there are no-code and low-code turnkey solutions for building AR apps, interactive immersive content like digital twins and training simulations can be costly and time-consuming to build. The good news is that it's becoming easier to **capture real-world objects and environments** for immersive experiences with just a smartphone.

The ideal situation to quickly get started, of course, is to **repurpose** existing digital information and computer-generated content like data from an ERP or 3D assets from an OEM or other area of the business.

Many enterprises **begin with simple text and image overlays in a heads-up display**. More dynamic, contextual AR experiences and highly realistic immersive experiences may require specialized expertise, while experiences anchored to specific objects or locations require special markers or more advanced object recognition technology.

**Determine what content you need for the use case.** Can you develop or digitize the content in-house? If not, what 3D scanning and drag-and-drop authoring tools are available? Should you invest in upskilling internal developers, hire new talent, or work with an external partner? If you decide to hire, look for applicants with a strong foundation in programming (not necessarily XR experience). And when selecting a partner, keep **systems integration and content management** in mind.



# GETTING BUY-IN

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### IT & OTHER **STAKEHOLDERS**

You've selected a solution. You will now need the support of IT, perhaps legal, and other areas of the business - not to mention employees themselves - in order to determine requirements and work around barriers to execute a pilot study. Identify those with a stake in the outcome and **turn them into stakeholders** with a sense of ownership in the project.

Pushback is often rooted in fear of technology making some jobs obsolete or encroaching on personal privacy. **Make it personal** by explaining the potential benefits to the business and especially to individual workers.

**Give demos!** For many, the “aha moment” of XR occurs when wearing a headset for the first time and playing a game or walking around a virtual space. Allowing employees and even executives to try XR first-hand not only encourages user acceptance but potentially greater funding and ideas for future use cases.

### GETTING EMPLOYEE BUY-IN

**Give employees the opportunity to try the technology.** This may be many many workers' first exposure to extended reality, wearables, and other emerging technologies.

**Explain the benefits:** Help workers understand how the technology helps them. Consider making pilot participation voluntary. You may need to take different approaches for younger and older workers.

**Manage perceptions:** Provide a forum to hear and address employee concerns. Find champions in enthusiastic and respected workers who can socialize the technology amongst his/her colleagues. Make champions of opponents by taking the time to find out what they really fear.

**Get feedback:** Consider distributing surveys for feedback. You will need user feedback to continually refine the use case.

**Privacy:** If the use case involves tracking employees (or is perceived to do so), clearly explain what information is being collected and how it will be used. Also explain how the data will *not* be used (ex. It will not be used for punitive purposes), where and for how long it will be stored, and options for wiping the data. Consider anonymizing user data if the use case allows.

## WHAT ABOUT EXECUTIVE BUY-IN?

Having IT, compliance, and others on board as well as pull from employees definitely helps your business case. **Research helps, too:** 46% of CIOs and CTOs surveyed by PwC “consider the metaverse to be very important to their innovation strategy.” Gartner predicts that 75% of capital equipment-intensive industries will use AR for cost reduction among frontline workers by 2026. And CCS Insight forecasts that businesses will purchase **13 million extended reality devices in 2025**.

Moreover, there are **hundreds of examples** of real companies who are testing or using XR for remote support, design, training, marketing, and more. The ROI is there: Significant reductions in training time, millions of dollars saved, faster issue resolution, etc.

In 2023, getting budget to evaluate XR, including purchasing devices and even attending educational conferences, should not be difficult. XR has come a long way since 2015, **from fringe technology to essential work tool**, and it's highly likely your competitors are already using it.

## MAKING THE BUSINESS CASE **BEST PRACTICES**

First, **what pain point are you solving?** How will the technology improve the way the job is currently done? It helps to put a cost or other number to the challenge you're looking to solve and to connect the solution to real business outcomes like reduced downtime, sales conversions, training time, etc. Show how the technology will ultimately pay for itself.

Invite higher-ups to try the technology for themselves and sit in on meetings with vendors and end users. **Early adopters will tell you to fail fast:** Convey that multiple trials and failures are necessary to work out problems and pave the way for deployment and scaling.

**Assuage security and viability concerns:** You are working closely with IT. Your software partner has a good track record. The solution is flexible. There are proven ways to work around potential issues. (For example, a common workaround is to set up an XR-only wireless network in order to get going without exposing the main network. Another is to avoid the cloud and keep the solution onsite to protect sensitive proprietary data.)

If you need a slam-dunk use case, consider one that's **self-contained:** Take advantage of the basic features of smart glasses - hands-free, front-facing camera - to make small but significant improvements. **Remote support and augmented work instructions** are arguably the most fleshed-out applications of XR today and can be considered low-hanging fruit.



# THE PILOT PHASE

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## DESIGNING A PILOT

Given the factors below, what do you need to address before the pilot? If you brought in the right stakeholders, you should be able to overcome any roadblocks. You might also **study pilot programs** at other organizations with the same use case.

### DETERMINE PILOT LIMITATIONS AND REQUIREMENTS

Identify operational factors that would need to be accounted for in a real deployment, including:

CONNECTIVITY

USABILITY (IN THE CONTEXT OF THE SPECIFIC WORK ENVIRONMENT)

SECURITY

SYSTEMS INTEGRATION

DEVICE MANAGEMENT

SAFETY & COMPLIANCE

TRAINING (ON THE SOLUTION)

DATA ANALYSIS

CONTENT MANAGEMENT

SOFTWARE UPDATES

# DESIGNING A PILOT

## SETTING UP PILOT PARAMETERS



**Pilot size:** How many employees will participate? How will you select and group users? How many devices will you test? Will you assign a control group?

**Pilot location:** Where will the pilot take place? In one facility or at multiple sites? Are there aspects of the pilot site that might interfere with using the technology (ex. Weather, concrete walls, low light, poor connectivity, etc.) Account for industry safety requirements and other relevant regulatory requirements, and review with security and compliance teams.

**Pilot duration:** How long will the pilot be active? Early adopters say three to six months is ideal. Keep in mind that setting up the pilot and working through IT, security, and other issues may take longer.

**Pilot results:** What KPIs will you track? How will you measure results and collect feedback? Work with stakeholders to define pilot objectives. Focus on the data you need to prove your hypothesis (ex. If we introduce AR instructions, then employees will perform the task X times faster than those using paper instructions.)

## PILOT BEST PRACTICES

**Begin** with a small, manageable deployment—a group of employee volunteers of varying ages and with varying levels of experience.

**Prepare** pilot participants by training them on the solution beforehand and provide lineside support from either your solution provider or another worker who understands the technology.

**Remember** that no plan survives first contact. Expect the pilot to change course when something doesn't work the way you planned and be ready to adapt.

**Test** the technology in an iterative fashion, capturing learnings to improve over time and get continuous feedback.

**Look out** for weak points and vulnerabilities in your use case, hardware and user experience issues, and other kinks that will need to be worked out before a larger rollout.

# QUANTIFIABLE VS. QUALIFIABLE ROI

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**ROI is not always easily quantifiable.** Many variables impact things like efficiency and output, making it challenging to calculate the percentage effect of introducing AR or a wearable device. How do you measure knowledge retention over the short lifespan of a pilot program? Can you put a price on employee satisfaction?

There are still few long-term studies of XR and wearables in the workplace, and it may take a decade or more to get usable data. Nevertheless, companies are coming up with numbers as well as identifying more subjective yet equally important improvements.

## DEFINING SUCCESS

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*Something has to save time or money or both to justify business investment.* This is true and in the case of new tech, it has to be shown that the new tool or method is better than the old, but “better” shows up in more ways than a dollar return.

The best way to get numerical data is to run a classic experiment with **variables and controls**. For instance, conducting time trials - two groups of similar users performing the same task - and/or reviewing past data to compare travel costs, number of errors, etc. with and without XR. (Ex. 9 trips saved per month for one expert, which reduces T&L costs by \$X or X fewer hours to assemble the product using AR glasses instead of a tablet.)

You should be looking, however, for **both quantitative and qualitative KPIs**. Do not discount the less calculable, even emotional, indicators of success like employee comfort and quality of life. Interview pilot participants to uncover benefits like reduced strain and improved focus, and consider the impact on non-users who may benefit indirectly down the line.

You can have a strong thesis without a lot of hard evidence, and make a case for XR based largely on logical reasoning, user testimonials, and even workforce and industry trends.

# WANT TO LEARN MORE?

Join us at the [Augmented Enterprise Summit](#), the largest and most comprehensive conference and expo devoted to enterprise XR and related metaverse technologies.

