BRAINXCHANGE

The Definitive Guide to Enterprise Wearable Technology, AR and VR Adoption

PART I

INTRODUCTION

In 2015, the newly-formed BrainXchange took a risk on a category of technology that seemed promising only if you read between the lines of articles about “Glassholes” and fitness trackers; and put together the first-ever event devoted to business and industrial use of wearable technologies. There have now been five Enterprise Wearable Technology Summits, with a sixth scheduled for September 2019.

Over the last four years, BrainXchange and the EWTS community have grown together and witnessed the birth of a fourth industrial revolution that promises to make humans more agile, connected, and mobile than ever before. During that time, we spoke with thousands of enterprise innovators and decision makers about their wearable tech and extended reality efforts; and saw numerous use cases and next-generation devices and platforms influenced by the early adopters who got on the EWTS stage to share their stories. What follows is knowledge resulting from BrainXchange’s experience in the space and specifically with enterprise end users themselves.

PROOF OF CONCEPT/ EVALUATION

THE ROADMAP FOR SUCCESSFUL ADOPTION

POC/EVALUATION STAGE

So, you've discovered smart glasses and see their potential; or, you've been directed to look into wearable technologies to stay competitive—where do you start?

IDENTIFY AN ENTRY POINT

The first step is also the most important and difficult one: **Choosing a use case.**

Early adopters agree that the best practice is to engage with end users.

TIPS:

- Go into the field or onto the factory floor and interview frontline workers, the ones who will actually wear the technology.
- Ask employees outright about their pain points using the guiding questions (right), and even consider setting up a kind of innovation hub where employees can try out different technologies on their own and imagine what they might do with them.
- Let users tell you where they find value for the technology.

QUESTIONS

SAMPLE QUESTIONS FOR *END USERS*

- **What** tools and methods do you use to access task-based information, get help from others, record or verify your work, and interact with customers?
  - **Do** you have any complaints about the tools you currently use on the job or the workflow for a particular task?
  - **Do** you find yourself at times fumbling with devices and manuals when you need both hands to work?
  - **Have** you come up with any makeshift solutions or hacks to speed up your own work, make your job easier, or make yourself more comfort able on the job?
- **When** you encounter a problem, how do you report it? Do you have to leave your work area to tell someone? Do you find yourself communicating the issue multiple times? Do you find yourself waiting around for someone else to look at or fix the issue for you?
- **Do** you have to remember a lot of information for certain tasks? How do you commit that information to memory?
- **Are** there times vital information is not at the ready or delivered to you in an inconvenient manner?
- **Are** there times you feel your safety or performance is at risk due to cognitive stress, physical strain, or other factors in the work environment? Could on-demand information and support, glanceable safety alerts, and real-time biometric and situational awareness help?

QUESTIONS

SAMPLE QUESTIONS FOR *THE BUSINESS*

- **Where** in the business do workers still rely on paper instructions, lists, manuals, or schematics? Could you digitize this information and deliver it to users via wearable?
- **For which** tasks are handheld devices used and does it interfere with hands-on work?
- **Which** tasks require point-of-work instructions? Where is the needed information located, in what format, and how do workers access it? Is information retrieval ergonomically in line with the task? Could the information be made more readily available to the worker?
- **Do** workers have to fill out forms or perform manual data entry for any tasks?

Other tasks to consider:

- Tasks with many simple steps
- Tasks for which no training is provided
- Tasks for which employees need to read instructions while working
- Tasks where small errors have big consequences
- Tasks with a shortage of qualified workers

- **Which** tasks require documentation or record keeping for compliance, proof of service, or quality assurance? How is it done and how much of the worker's time does it consume? Is reporting standardized or is there room for misinterpretation? Are workers limited in any way in recording information?
- **Do** employees need to put down what they're doing or walk away from their work to record data, file a report, or get assistance? When do workers wait on SMEs to solve a problem?
- **What** factors delay repair of equipment and vehicles?
- **Which** jobs involve a high level of customization or variability, with different instructions for every variation? Does this lead to errors?
- **For** which tasks do workers carry heavy loads, work in non-ergonomic positions, or perform repetitive tasks?
- **Which** tasks could be performed remotely to save time and money? (Not just remote guidance but also remote inspections, reviews, customer service, etc.)

POC/EVALUATION STAGE

IN CLOSING

The two **most common and proven points of entry** for enterprise wearables are vision picking and remote support with smart glasses. There are plenty of real-life pilots and rollouts you can use as examples. You can also look at prior years' safety, uptime, quality, etc. data (if you have that information) to pinpoint sources of error, injury, fatigue, paid travel, rework, machine/worker downtime, profit loss, and customer dissatisfaction.

Be realistic! You may only have one chance to prove your case, so make sure you are appropriately matching the wearable to a real business problem and that those closest to the problem have input. The simplest use cases like ditching a handheld scanner for a wearable one can have tremendous impact.

Still need more ammunition? Consider the following questions:

- **Are** you using the best and fastest training methods for a multi-generational, shrinking workforce? Do workers need to train for dangerous situations or anomalies that are hard or undesirable to simulate in real life?
- **How** do you preserve the knowledge of veteran workers near retirement?
- **What** is the onboarding process for new hires? Is employee retention a problem?
- **Where** are your customers and partners based and how do they interact with the business?
- **Do** any aspects of the business suffer from poor planning and communication among stakeholders?
- **Is** there a backlog in any area of the business?

PARTNER AND HARDWARE SELECTION

Some things to remember:

- **The use case** determines your choice of hardware (not the other way around)
- **The device** has to fit the use case, satisfy the end user's needs, meet industry requirements
- **Wearables** aren't right or necessary for every worker, task or area of the business
- **You can test** multiple devices for comparison if the software supports it and it's factored into tracking the results of the overall use case

WHICH DEVICE FOR WHICH APPLICATION?

Hands-free (heads-up) information

From an ERP system (requires system integration) – Smart glasses.
Safety alerts and task prompts – (monocular) Smart glasses, smartwatch.
Documentation and recording – Smart glasses, some smartwatches.
Verification (typically requires object/visual recognition capability) – Smart glasses.

Remote viewing

Remote support (requires front-facing camera and connectivity) – Smart glasses.
Remote collaboration (more interactive) – Augmented Reality glasses, Mixed Reality headset, Virtual Reality headset (for virtual meeting spaces).

Design and asset visualization

XR (AR, VR, MR) headset (requires 3D content) -
Visualization of machine or other complex data
Building/layout planning
Product development

Training – AR glasses, VR headsets

AR glasses for on-the-job learning through step-by-step instructions, digital content overlay, or remote teacher
VR headset for more immersive training simulations.

Sales

Bringing the sales pitch to the customer – MR/VR headset.
Visualizing product or project options – XR headset.
Enabling remote shopping – Smart glasses (worn by sales associate).
Also, marketing (virtual or remote tours) – XR headset.

Service

B2B customer can instantly and remotely connect to an SME at HQ – Smart glasses (worn by customer).
Creating a more personalized customer experience by delivering information to the employee at the point of sale – Smart glasses, smartwatch.
Streaming or recording first-person video on the job for customer's remote observation – Smart glasses.

Safety

Tracking employee biometrics and environmental factors – Body-worn sensors (embedded in a variety of form factors).
Physical behavior modification (monitors user's form and provides alerts, haptic or otherwise) – Body-worn (ergonomic) sensors.
Support for physically-demanding tasks – Partial or full exoskeleton.

PARTNER AND HARDWARE SELECTION

To narrow down the options, ask what device abilities or features are needed for the use case. (*For example, a good camera and connectivity for remote support; lightweight if it must be worn for long shifts*.) Get feedback from users. Consider hosting events for employees to test devices to help demystify the technology. You might also consider starting out with a more familiar consumer wearable if you need immediate buy-in.

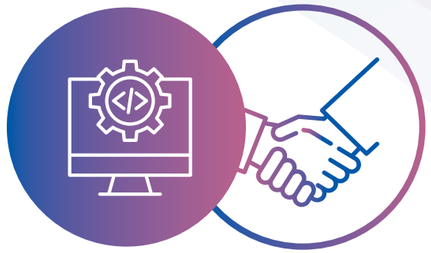
As the wearable technology market is constantly changing, there is a chance that the hardware you choose today will be obsolete two years from now. Ask if the hardware is scalable and make sure multiple platforms are supported on the software side.

!

After you've identified a high-value use case with a low barrier of entry (not overly complex), familiarize yourself with the market.

Talk to vendors. Try out as many different devices as you can. There are many product offerings out there and while each one has a role to play in someone's business, it might not be right for your particular use case.

PARTNER AND HARDWARE SELECTION



DEVELOP INTERNALLY OR PARTNER?

Today, the enterprise wearable technology ecosystem has matured to the point where most hardware companies have multiple software partners and many software solutions work on a variety of devices (including smartphones and tablets). If you have a particular device in mind, check out the companies that vendor has partnered with. You can also benchmark with peers and use resources like the annual Enterprise Wearable Technology Summit and the EnterpriseWear Blog to educate yourself about the space before committing to a solution. It's important to find a software partner who understands your needs and will work with you at every step to overcome challenges.

If you are thinking about developing internally, do not take content for granted. Become familiar with common software engines and don't underestimate the development effort that will be required. If not working with an external partner, make sure it's a turnkey solution and doesn't require building an application from scratch, supports a broad range of hardware and use cases, and has self-service capabilities allowing you to add functionality and update content without relying on the solution provider.

TO LOCATE OR CREATE CONTENT?

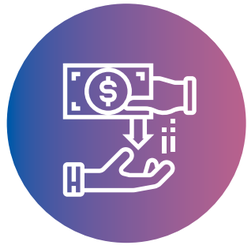
- Content creation is a major hurdle especially for XR (AR, VR, MR) applications in the enterprise. Most non-AEC organizations do not have existing computer-generated content that easily translates into wearable AR/VR applications. Lack of content can rack up costs and delay adoption, even force you back to step one, so before proceeding to the pilot phase determine your content needs.

- The ideal situation is to repurpose existing digital content: Take inventory of the company's existing digital information stores. What ERP information or external data sources could the wearable solution tap into? What 3D digital assets could you obtain from OEMs or engineers in other areas of the business? What information do workers currently rely upon to perform the task in question? Do you have the capacity to digitize this information in-house? If not, who do you need to hire or partner with?

- Most enterprises begin with basic textual overlays or static visualizations of 3D models in a heads-up display. More dynamic, contextual AR experiences and highly immersive VR experiences have to be built from scratch, requiring specialized expertise; while experiences anchored to specific objects or places (ex. pieces of equipment, locations in a warehouse) require a special marker or more advanced object recognition technology.

- The good news is that vendors are trying to make content creation easier for non-programmers. Companies are building drag-and-drop authoring platforms, using 3D scanning, and capturing content with 360-degree video. If you hire a developer, look for someone with a strong foundation in programming (not necessarily someone with XR experience). When selecting a partner, keep systems integration and content maintenance in mind.

GETTING BUY-IN



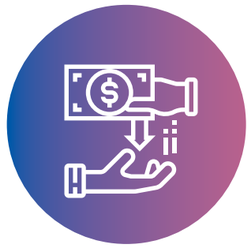
GETTING EMPLOYEE BUY-IN

- You've engaged with end users, chosen a use case, narrowed down a wearable device, and partnered with a software provider. To go any further, you will need the support of IT, EHS, and/or other department(s) in the organization to determine operational factors and work around barriers.
- Turn these business units into stakeholders with a sense of ownership in the project. If you require content owned by an OEM or someone else in the business, tell them why you need the content.
- A lot of **pushback** is rooted in fear of new technologies making our jobs obsolete. Make it personal, explaining the potential benefits of the use case to the business, to their team, and to the individual worker.

GETTING EMPLOYEE BUY-IN (PUSH VS. PULL)

- **Give employees the chance to be hands-on with the technology**. Be mindful that this could be many workers' first contact with wearables/XR.
- Explain the benefits to them: Help workers understand what the technology will do for them. You may need to engage differently with the older workforce than you do with younger employees.
- Manage perceptions: Provide a forum to hear and address employee concerns and misconceptions. Find your champions in respected workers who can help socialize the technology internally. Make champions of opponents by taking the time to find out what they really fear.
- Consider distributing surveys for feedback, bringing in outside experts to assuage fears, making pilot participation voluntary, and anonymizing any user data collected by the technology.
- If your use case involves collecting data on employees (or is perceived to do so), clearly explain how the information will be used, stored, protected, and managed. Also explain how the data will not be used (ex. for punitive purposes), where and for how long it will be stored, and the options for permanently deleting the data.

GETTING BUY-IN



WHAT ABOUT BUSINESS BUY-IN?

- When you have IT and other business units on board along with pull from employees, making your case to management is easier. Of course, pilots don't just happen; they require financing which may be out of your control.

- By now, securing a preliminary budget to evaluate wearable technologies (obtaining devices, attending events) shouldn't be difficult. There are, again, plenty of use cases out there you can share with superiors to bolster your case.

- Wearables are no longer fringe technology. Even AR/VR has come more into the mainstream, and your competitors may already be using the tech.

MAKING THE BUSINESS CASE IS REALLY PRESENTING A HYPOTHESIS.

- Present the use case and how the wearable will improve upon the way the job is currently done. Connect the wearable solution to real business outcomes like productivity, time savings, sales conversions, etc.

- Invite C-level representatives to try out the technology themselves, and to sit in on meetings with vendors and end users.

- Explain how the technology could (hypothetically) pay for itself while also communicating that trials are critical to working out problems and vulnerabilities and may involve lesson-teaching failures.

- Assuage any security and viability concerns: You're working closely with IT and your software partner has a good track record and flexible solution. There are ways to work around potential issues. (Ex. a very common workaround is to deploy a wearables-only wireless network in order to get going without exposing the main network. If you have sensitive, proprietary data, avoid the cloud and keep the solution on-site.)

- If you need a slam-dunk use case, consider choosing one in which the solution is self-contained. Take advantage of the basic features of smart glasses (hands-free, front-facing camera) to make small but significant improvements; go with simple software that doesn't require much maintenance, etc.

THE PILOT PHASE

THE ROADMAP FOR SUCCESSFUL ADOPTION

THE PILOT PHASE (SETUP)

> **!** Given these factors, what needs to be addressed, worked around, created or changed before the pilot begins? If you brought in the right people within the business in Step 3, these factors should not pose roadblocks. You should also benchmark with others in the industry and study pilot programs for similar use cases at other organizations.

DETERMINE PILOT LIMITS AND REQUIREMENTS

Determine all the operational factors that need to be accounted for in a real deployment, **including:**

- SECURITY
- CONNECTIVITY
- SAFETY
- USABILITY
- DEVICE MANAGEMENT
- TRAINING
- CONTENT CREATION
- SYSTEM INTEGRATION

SETTING PILOT PARAMETERS

Pilot size:
How many workers will participate? How will they be selected and grouped? How many devices will be tested? How will these be acquired and paid for?

Pilot location:
Where will the pilot take place? In just one facility or at multiple sites? Are there any aspects of the pilot environment or site that might interfere with use? Have you accounted for industry safety requirements and other regulations? Review with data privacy, security and compliance teams.

Pilot duration:
How long with the pilot be active? (Three to six months is ideal for the actual pilot. Keep in mind that setting up the pilot and working through IT security and other issues can take many months.)

Pilot results:
Prepare to measure results and gather feedback. What KPIs will be tracked? How will results be measured? Work with stakeholders to define pilot objectives and agree on a method of measuring success. (What do you need to prove your hypothesis?)

PILOT BEST PRACTICES

Begin with a small, manageable deployment, a group of voluntary workers of varying levels of experience.

Prepare pilot participants by training them on the solution beforehand and provide lineside support, whether that is from your software partner or a fellow worker who gets the technology.

*__Remember__ that no plan survives first engagement; 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 the learnings to improve over time, and get continuous feedback.

Look out for weak points and vulnerabilities in the use case, hardware issues, and other changes that will need to be worked out before the rollout phase.

MEASURING ROI AND DEFINING SUCCESS

Extracting numbers and percentages from these pilots is difficult, especially when there are a lot of factors to the KPI. Take efficiency: Many variables impact workplace efficiency, so how do you determine the percentage effect of introducing a wearable? How do you measure productivity or retention of knowledge over the short lifespan of a pilot program? In this early stage, there are few long-term studies of wearables in the workplace. We have to adopt the technology for that research to get done.

QUALIFIABLE ROI

- ROI is not the only relevant factor in determining the success of a pilot or justifying further use of wearables. Success shows up in more ways than a dollar return, such as improved employee or customer satisfaction. You should be looking for both quantifiable and qualifiable ROI.

- Workers' comfort and quality of life are important KPIs that you can track in many cases more easily than increased uptime or reduced risk of injury due to wearable technology. Consider less calculable, even emotional indicators, and interview pilot participants to uncover non-numerical improvements like reduced strain and better focus. Do not disregard the impact on non-users who may experience indirect benefits down the line, as well.

- You can have a strong thesis even without a lot of hard evidence. For instance, replacing a bulky handheld barcode scanner with a hands-free wearable is an obvious enhancement. If you require more exact ROI, set up a controlled experiment or situation comparing the wearable solution with the old technology among two groups of similar users performing the same task.

- You can also conduct time trials and review past data to compare travel costs, number of errors, etc.

BRAINXCHANGE

Interested in learning more?

Join us at The Enterprise Wearable Technology Summit - The largest and most innovative conference for enterprise AR/VR and wearable tech.

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OTHER USEFUL LINKS

The EnterpriseWear Blog
Leading educational resource on wearables

EWTS 2019
The 6th annual Enterprise Wearable Technology Summit