



VR/XR Training Guide

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Virtual Reality is Saving Companies Millions

How a new age of education technology is having a major impact on training procedures.



Employee education is vital to a company's success, so when new technology makes training more effective and cost-efficient, industries take notice. In recent years, improvements in computing power and virtual reality software have culminated in more immersive environments with better interactive capabilities. The outcome is an industry that's moving far beyond the gaming it's known for. Today, many companies are utilizing virtual reality to train their employees in everything from customer relations to automobile manufacturing.

Benefits of Virtual Reality Training

Lower Costs

Virtual reality training is popular for a number of reasons, but the most glaring is cost efficiency. According to the Association for Talent Development's 2014 State of the Industry Report, organizations spend an average of \$1,208 per employee on training and development. For companies with fewer than 500 workers, that number is even higher, coming in at \$1,888 per employee.

In short, most companies are spending over half a million dollars to train their workers each year. For companies that require physical simulators this cost is far higher. Physical training equipment (think flight simulators) can cost a company north of \$5 million. These fixed training

devices (FTDs) are difficult to update as technology continues to evolve, and in many cases the entire FTD must be replaced.

This is where VR can have a meaningful and immediate impact on industry. When compared to physical options, virtual reality simulations can achieve the same level of education at a **tenth of the cost**. Additionally, virtual environments are inherently easier and less expensive to update or replace, and the equipment used for VR training is commercially available and relatively inexpensive. VR systems also require minimal storage and upkeep compared to FTDs.

Furthermore, VR has the potential to decrease training time. Some studies suggest companies are spending at least 30 hours per year training employees, which is time that could be spent on the job. Major factors for the long training time is travel time and equipment shortages; however, VR reduces the need for travel by virtually connecting people anywhere in the globe and replaces physical equipment with immersive digital ones.

Risk-minimization

In certain professions, like construction or areas of the energy industry, there is immense risk involved in hands-on training. In order to operate a crane or work on an oil rig, workers must go through extensive safety and situational training on this equipment. When it comes to this kind of training, there is a tradeoff between the safety of the training and the time it takes to train someone. Moving a subject at a slower rate decreases the likelihood of dangerous accidents, but increases the cost of the training.

Virtual reality, however, can offer similar hands-on training in a 100% risk-free environment. This keeps the workers safe while allowing them to make mistakes that would be harmful in the real world—a process that enables students to train faster by learning from their errors.

Additionally, better initial training prevents workplace accidents and injuries beyond that of the training field. According to [InjuryFacts.Org](https://injuryfacts.org), in 2017 the total cost of workplace injuries was \$161.5 billion dollars and aggregate lost time was 104,000,000 days in the United States. Implementing VR could lower this rate of injury, boosting worker productivity and saving millions.



Better Retention

Company training programs fail for several reasons:

- Lack of time—*Training programs may be too time-consuming for employees to complete and stay on top of their work.*
- Incomplete training materials—*Companies may not have a full understanding of what objectives need to be taught to employees.*
- Undefined or poorly defined expectations—*Companies may know what they want to teach but they may not have a clear understanding of what constitutes an employee successfully learning the material.*
- Boring materials—*The materials don't encourage participation or are overly generic.*

Virtual reality provides a solution to all of these barriers to success. The technology helps companies increase employees' familiarization with and awareness in the work environment, while also identifying any areas of concern. VR can also improve efficiency by achieving more training in the same amount of time. For participants discouraged by boring materials, VR still remains a new and exciting experience for most people. The opportunity to enjoy new technology generally gets people excited regardless of the context, and the nature of VR means most training software feels more like playing a game than taking a safety course.

VR can also prove useful in helping companies establish complete objectives and well-defined expectations. The solution here is inherent to the development process of the software. In order to build a VR training environment, a company must first establish what they want an employee to learn while in the environment. Additionally, the environment can be programmed to measure how well the employees are learning these objectives, and by using the software in this way, companies can establish benchmarks and expectations for what they expect from their employees.

Drawbacks

It is important to note that virtual reality is not a direct substitute for all physical training procedures and equipment. While the technology is quickly advancing, there are still certain tasks that VR has trouble simulating—specifically, tasks that rely on a wide range of sensory feedback beyond sight and sound.

For example, engine work, which can often require a tremendous amount of touch feedback, would be hard to develop in a VR environment. However, the system could still be used to teach by letting someone pull the engine apart—similar to a 3D blueprint. While they may not be able to complete operations as though they are in a real shop, they can gain familiarity and better understanding of how the engine works.



Virtual reality is still a new and exciting area of technology, but don't let that fool you, its capabilities are ready for real-world applications. The use-cases for VR are expanding, and the case of employee training is a significant sign of the impact this technology can have on our society.

How VR is Changing The Ways Businesses Handle Training

VR is bringing powerful and progressive changes to how training is being done in the workplace.



In the last decade, Virtual Reality has become more accessible and powerful, and its impact on businesses is only increasing. VR has been applied to many fields of business with varying use cases such as data visualization, design and modeling, quality control/assessment, and training. Training in particular has shown quick advancement in VR usage as VR provides the realism needed for full immersion and understanding.

While VR training tools vary from industry to industry, the overall purpose of VR is to increase worker awareness and familiarization in the environment, develop stronger procedural knowledge, and identify the trainee's problems during training. The following below examines specific types of training that can benefit from using VR.

Familiarization Training

Familiarization training arguably benefits the most as work environments can be replicated near-perfectly with high resolution 3D models. These immersive work environments allow employees to be visually and spatially familiar with their workplace, tackling resource constraints many companies face such as space or equipment. This increased awareness can

lead to safer and speedier operations from workers and shorten the lead time for facility or equipment familiarization.

Scenario/Situation Training

Scenario and situation training is a more complex offshoot of familiarization training, as it works with the same purpose of familiarizing workers or students to an environment but with added tasks and interactions. For example, familiarization training for an airplane mechanic would be to walk around an airplane in VR, look into parts of an engine, etc. In scenario training, more complex tasks and tools can be programmed into the environment such as requiring the mechanic to fix an engine or undergo preflight checklist procedures. The benefits of scenario training are more readily seen as this directly prepares workers in a risk-free environment before being placed in a dangerous real environment.

Assessment Training

Assessment training is lesser seen in the world of VR training when compared to the other two types, but it certainly has its place and will only grow as VR training technology matures. Assessment training is creating a VR environment to assess the workers' abilities while integrating relevant metrics for feedback. Because this assessment takes place in a digital world, a myriad more metrics can be available to the developers who create the world. Through these extra dimensions, a worker can be assessed more accurately and strategically.

Real-Life Examples

Walmart

Walmart was one of the earlier large enterprises to use VR extensively in employee training. More specifically, they have been using VR to create training scenarios to help employees learn about new technologies and improve customer service and compliance. By using VR, employees were more eager to learn and felt that the experience is more exciting and immersive than 2D training videos and PowerPoints. This led not only to a 10-15% increase in test scores, but also higher retention rates after work began.

UPS

Similar to Walmart, UPS is another F500 company that recently implemented VR training solutions. Their program seeks to help drivers become familiar with the verbiage of the trade

quicker by exposure in VR, and learn to spot potential hazards when driving in a virtual road. According to a CNBC article, UPS drivers over a five day period are taught in classrooms, given demonstrations, then put into a VR environment. Since adding the VR module to the course, retention rate during the training period has climbed up to 75%.

ExxonMobil

In ExxonMobil's "Digital Garage" (workspaces owned by ExxonMobil equipped with cutting edge technology to develop solutions for today's energy workers) a VR training solution for oil and gas operators was recently introduced. The VR system is loaded with different immersive scenarios from mundane to complex that operators need to react and assess to. Doing so hones their instincts, improves their ability to make instant decisions, and catch their mistakes in the process so that they're better equipped to work smarter and safer. And if they make a mistake, there are no catastrophic consequences; the safety net of training digitally rather than on-the-job means they can afford to make these mistakes and learn from them to become a better operator.

Types and Application of XR Technologies

XR, or extended tech, will transform how humans interact with the physical and digital world.



Virtual Reality, Augmented Reality, and Mixed Reality are the different branches of the digital revolution of XR. XR stands for extended reality and the X is simply an algebraic plugin for expressing the different technologies. The new generation of XR technologies has enabled immersive capabilities to interact with digital environments never afforded before. But despite

the similar naming scheme, there are substantial differences between each technology and what they can offer.

Augmented Reality (AR)

AR adds digital elements to a live view often by using the camera on a smartphone. Examples of augmented reality experiences include Snapchat lenses and the game Pokemon Go. This means that AR is often used to enhance the connection between the user and their surroundings in a digitized way. Important to note: all information displayed is **not** anchored to the real world.

Mixed Reality (MR)

MR experience combines elements of both AR and VR, where real-world and digital objects interact. Mixed technology is considered the newest of the 3 XR techs, with Microsoft's HoloLens leading the industry in the field of MR. Information from the real and digital world blends, allowing users to interact with the physical world with digital feedback.

Virtual Reality (VR)

VR is a completely immersive experience that places users into a new digital world. Using VR devices such as HTC Vive, Oculus Rift S or Steam's Valve Index, users can be transported into a number of real-world simulations and imagined environments. VR is best used for storytelling, conveying experiences, or simulations.

Applications of XR Technologies

AR

AR is best for adding a digital overlay over a camera interface or directly over the human eye through eyewear. Because of AR's ability to display information over real-life objects or locations, it's best used to enhance the information users see about their surroundings. There are some use cases on the consumer level for gaming, like the famous game Pokemon Go that took the world by a storm in 2016, but because of the current limitations of AR, it's used mostly as a professional tool.

AR can often be found in industries that require detailed information at a moments notice that cannot be shown through other conventional displays or require the user to see information directly over their project. For example, the medical field has begun extensive testing using AR

to visualize human bodies for medical students to see on an operating table for a 3D visual approach in learning anatomy. In the future, if AR gets cleared for surgical use cases, surgeons could use it to see information about patients on an overlay display while operating, leading to higher success rates. Other fields that AR has begun to see usage in include warehouse management, manufacturing, retail storefront management, business logistics, and education.

MR

MR is a combination of VR and AR elements, with users being able to interact with digital objects grounded in reality in real-time. In simpler terms, there are now overlays displayed in reality (like in AR) but is interactable (like in VR). MR is the most difficult to program and design for the three XR technologies, but it's blending of real and virtual worlds holds immense promise. At the forefront of MR development is Microsoft, who released their 2nd generation of their HoloLens MR earlier this year. Microsoft has realized the potential of the HoloLens and is maximizing the impact of its initial introduction by focusing heavily on industrial and enterprise-level development for this 2nd iteration.

Auto Desk has been collaborating with Microsoft to develop platforms where 3D models can be viewed and edited in MR before finalizing or printing a 3D model. The ability to be able to see a model on a 1:1 scale in 3D as it's being edited will help all aspects of constructing 3D models immensely. Once there is a more wide-scale implementation across industries and use cases, MR is positioned to transform the digital world.

VR

VR excels in transporting the user into a different world and experience as it shuts out the physical world, thus its best for applications where users need to experience the world or simulation in an isolated environment. This means the user can be transported into any realistic and fantastical world. This makes it an excellent device for gaming purposes, which is reflected in Viar360's report that in 2018, 42% of all VR software revenue was accounted by gaming development alone and more than 700,000 Playstation VR headset were sold in Q4 2018.

Businesses have also begun to consider VR as a viable solution to their needs whether its in fields of design, communication, training or more. According to Business Insider Intelligence, "enterprise VR hardware and software revenue to jump 587% to \$5.5 billion in 2023, up from an estimated \$800 million in 2018". Enterprises like Walmart and UPS have begun using VR to train employees on customer service, while companies like Virtualitics uses VR to virtually display AI integrated BigData in creative ways.

Case Study: Aircraft Maintenance VR

Client: United States Air Force (USAF)

About USAF: The United States Air Force commands the air power of the US military and is the world's largest air force.

The Problem: Air Education Training Command (AETC) is USAF's division responsible for training hundreds of thousands of airmen for jobs in operational forces. An integral job is aircraft maintenance; in order to maintain a high flying tempo, USAF aircraft must be maintained at all times to peak conditions. Due to the high volume of students and the cost of acquiring instructional aircraft or physical simulators, AETC struggles with ensuring the training airmen receive is up to date. While operational units are utilizing state of the art aircraft, AETC is stuck with technology dating back to the 1970s.



VINCI's Solution: VINCI developed a VR simulation of USAF aircraft utilizing the low cost HTC Vive headset. These simulations enabled airmen to undergo familiarization training with highly realistic and immersive renderings of their aircraft even without real aircraft on base. AETC can now ensure airmen train for the operational aircraft they will see in the field without the cost of acquiring said aircraft; thus, ensuring better prepared airmen while reducing training costs.

See our Walkthrough Video Here: <https://youtu.be/VEawz9mbabM>

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