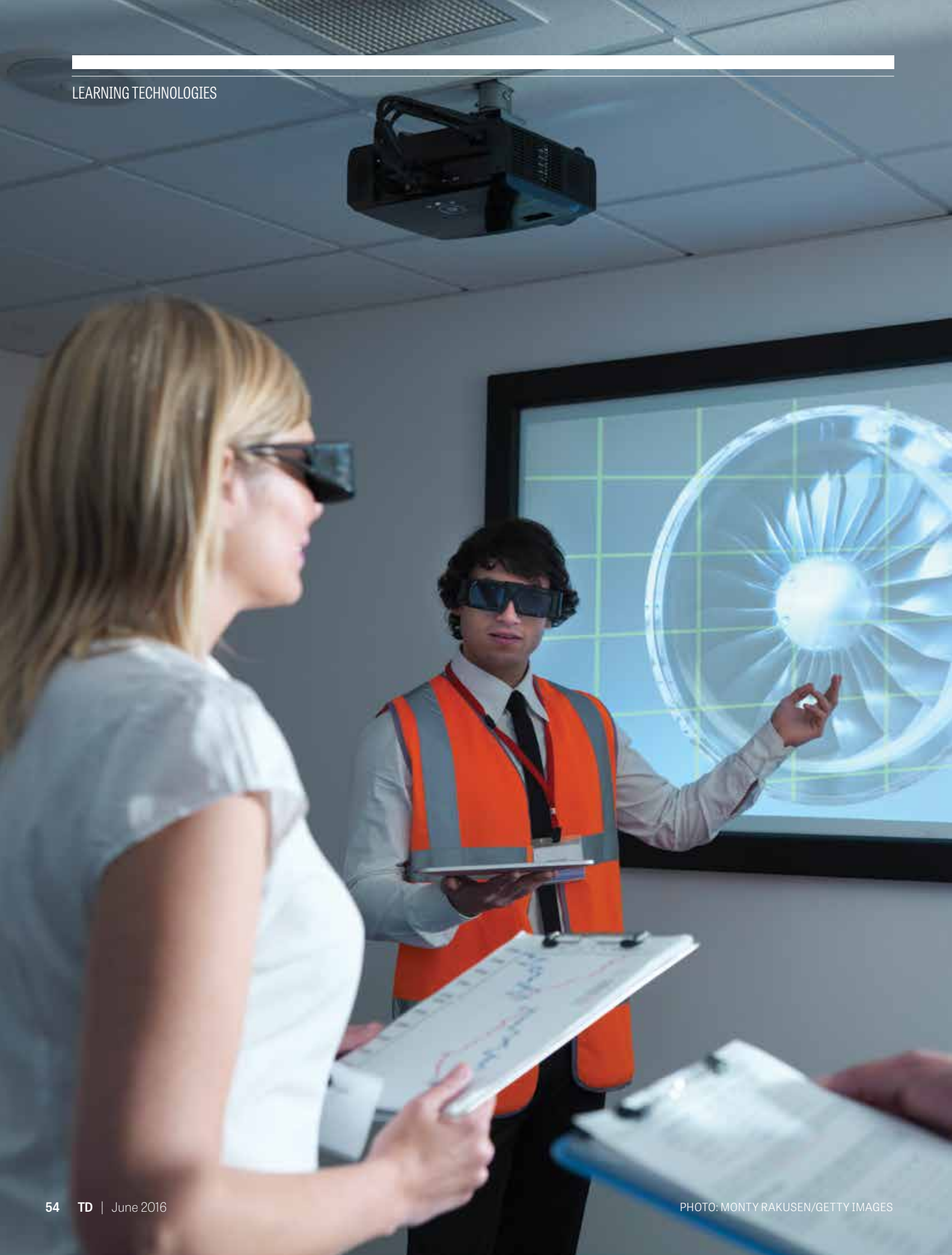

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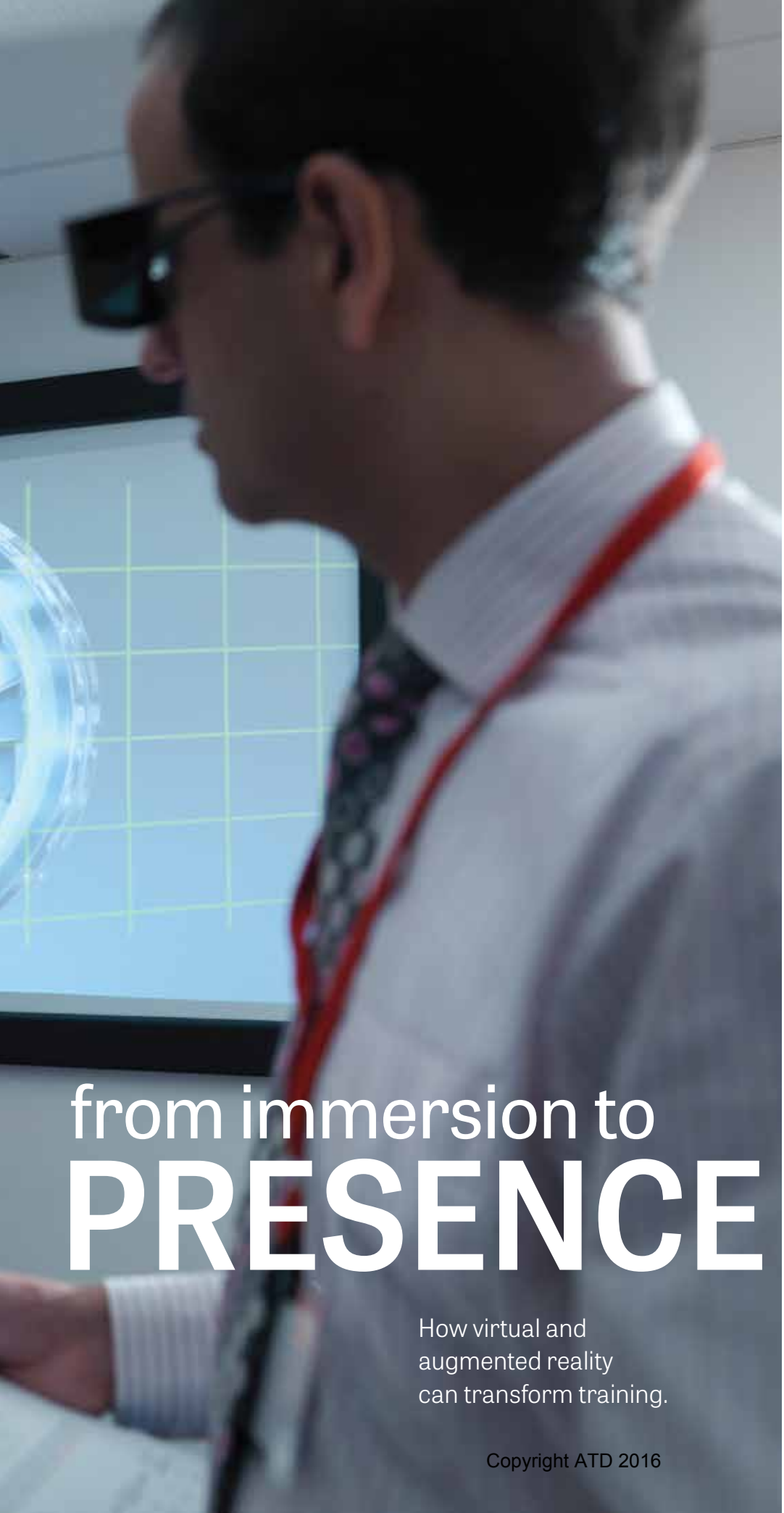

podcast

from immersion to PRESENCE

How virtual and augmented reality can transform training.

BY ANDERS GRONSTEDT

Decision makers at the World Economic Forum in Davos, Switzerland, in January found themselves sitting in a Syrian refugee camp in Jordan. Wearing a digital headset that looks like an oversized scuba mask, they experienced a 360-degree video of 12-year-old Sidra. As they moved their heads, they watched from a different direction, just like in real life. They were watching virtual reality, a digital three-dimensional environment that made them feel like they were really there.

Virtual reality, or VR, adds a new dimension to the learning experience: presence, the feeling of actually being in another place. Imagine police officers practicing how to deal with active shooter situations in a realistic-looking environment, rehearsing different scenarios over and over until those life-saving skills become second nature. Or manufacturing workers practicing emergency response procedures during a fire.

VR promises to be an affordable "flight simulator" for any task that's too dangerous, expensive, or inconvenient to practice in real life. Students get to learn and practice skills in a real-world context. Research by Stanford University Professor Jeremy Bailenson shows that the learning impact of VR is about 33 percent better than watching a video.

VR isn't new; it's been "the next big thing" in tech since the 1980s. However, the technology was expensive, finicky, and uncomfortable to wear, relegating its use to university and government labs. But technical breakthroughs made in the past few years have resulted in high-quality, more comfortable headsets that are now reaching the market at reasonable prices. This new generation of VR headsets and software promises to revolutionize how we learn, work, and play. In fact, Gartner estimates that the combined markets of VR and its cousin augmented reality (AR) will hit $150 billion by 2020.

THE LEARNING IMPACT OF VIRTUAL REALITY IS ABOUT 33 PERCENT BETTER THAN WATCHING A VIDEO.

Mobile vs. PC-based VR

The first high-end PC-based headsets are shipping as you read this. But mobile VR is already here. More than 5 million of Google's Cardboard VR Viewer headsets have shipped. These mobile headsets are cheap and accessible gateways to VR. Training departments can custom print them and hand them out at a cost of just around $12. Samsung's $100 GearVR offers a step up in comfort and quality from Google's headset, although it only works with select Samsung phones.

The current generation of mobile VR devices are limited to head-tracking only, which means you can look in any direction, but they don't track your real-life hands and body in the virtual world. The movements are either "on rails" where the camera moves for you, or there are chose-your-own-adventure style options. User input is limited to a button on the headset or by gaze tracking, where you navigate with your head movements by staring at a menu for a few seconds.

The current crop of mobile headsets can be nausea-inducing because of their lower refresh rate. You turn your head fast and it takes milliseconds to update the screen. These limitations make the mobile headsets better for shorter five- to 10-minute experiences with simple interactions.

At the high end, two headset makers are duking it out: Facebook's Oculus Rift and the HTC Vive. These "tethered" headsets need to be connected to a PC that's optimized to run them. The computer-headset bundle starts around $1,500. Sony will debut a cheaper PlayStation VR later this year. These systems come with laser cameras that detect your position, for example, if you're ducking down or leaning back.

Using the handheld motion controllers included with the Vive, you can reach out and watch your digital arms and hands manipulate virtual objects in the space around you. That's useful for practicing a variety of tasks that require manual skills. The refresh rate of these headsets are so fast that the seasickness problems have been largely solved, as long as the content is well-designed with minimal camera movements.

Cinematic vs. computer-generated VR

The VR learning experience can be either a computer-generated world or a real-life video. Recording live-action video in 360 degrees requires special camera systems. They range from large, expensive rigs with 16 cameras in a circular array to small less-expensive cameras in the shape of a ball with two fisheye lenses. Some of them shoot stereoscopic video, which adds another immersive 3D quality of depth. Others shoot flat 2D monoscopic video, which still has a 3D feeling because it wraps around you in 360 degrees.

Spherical video takes visual storytelling to new heights. The learner is empowered to explore a space or experience a situation from the center of action. It requires an entirely new stage craft because the moviemakers can't control the viewing experience

using standard devices, such as close-ups, or through video editing. Instead, they have to use light, sound, and action to draw the viewer's attention. Just imagine the implications for corporate training: You could introduce a company's different facilities around the world to recruits and new hires, for instance. Or develop customer empathy training for sales and customer service reps.

For all the talk about 360-degree video, the killer app for training might well be 180-degree video. Shooting 180-degree video is a lot easier and more cost effective. The camera crew and lights can be hidden behind the camera, just like traditional video production. Two cameras with 180-degree lenses next to each other pointing in the same direction can accomplish a very immersive stereoscopic effect of depth.

While cinematic VR is gaining in popularity, many learning applications will be computer-generated scenes. Dangerous environments and high-risk activities can be safely and realistically replicated in computer-generated VR. It's easier to blow up an oil rig in a 3D virtual scene. Learners can solve real-world problems via hands-on, learning-by-doing activities. Products and financial data can be visualized in 3D. These simulated environments are typically created with a real-time game engine. Unity is currently the most popular game engine for developing VR experiences; the Unreal Game Engine has a niche for more high-end VR programs.

Virtual reality vs. augmented reality

On the heels of VR is AR, sometimes also referred to as "mixed reality." If virtual worlds are an *Alice in Wonderland* rabbit hole that takes us to magical virtual places, AR glasses provide a lens that superimposes digital graphics over the world around you. A 3D holographic data visualization might appear on the conference table. A PowerPoint presentation might appear on the wall. Imagine a virtual teleprompter in front of a teacher; wherever she looks she can read the script.

Instructions for complex tasks can be unobtrusively superimposed via AR glasses. Team members can be playing a business simulation with a 3D game board in front of them. A mentor can guide a technician remotely through a product installation or repair.

The potential for AR glasses that you can wear everywhere is potentially many times

Adoption and Effectiveness of Virtual Reality

Virtual reality (VR) has been used by the military for some time, but civilian success stories are also emerging as the technology is reaching mass market adoption.

Virtual field trips. Half a million students have been on virtual field trips with Google's Pioneer Expeditions program. Using Google Cardboard viewers and smartphones, students get to experience 360-degree views of such places as Machu Picchu, Antarctica, and outer space. They can scuba dive the Great Barrier Reef or tour Buckingham Palace. The program has expanded internationally and the library of 100 guided journeys is growing every month.

Public speaking. One study found that fear of public speaking can be reduced by nearly 20 percent in just four weeks with VR exercises. The South Korean study had 27 participants practice speaking in front of a virtual audience from the safety of their homes. They were coached through a program that challenged them to present to avatar audiences in job interviews, business meetings, and conferences. The program culminated with VR exercises to present a toast at a wedding and an award presentation. At the end of the program, they were asked to present to a real-life audience. Nine of 10 participants had a reduction in anxiety levels as measured by heart rate, level of eye contact, and a self-reported questionnaire.

Athletic training. Five National Football League teams and nine college football teams are already using VR to train their quarterbacks. A spherical camera on the field records practice sessions. Quarterbacks can review and rehearse the play over and over without the risk of injuries. It has proved particularly helpful to backup quarterbacks who don't get much field practice between games. Quarterbacks who trained in the VR simulator improved decision making by 30 percent, and made decisions about one second faster.

larger than VR. Think of VR as the PC and AR as the mobile device. VR will revolutionize learning in the classroom and office the way the PC revolutionized productivity in our offices. And AR will revolutionize learning on the go, in meetings and out in the field, the way the smartphone revolutionized mobile productivity.

WE MIGHT BE ON THE CUSP OF THE MOST TRANSFORMATIVE LEARNING TECHNOLOGY OF OUR LIFETIME.

AR offers unprecedented opportunities for learning, but it's still a little way off. The first consumer products are expected within the next three years.

How to get started

Here's what to consider before you take the plunge to VR.

Seeing is believing. VR is experiential; you have to try it to believe it. Buy a $12 Google Cardboard headset or get a $99 GearVR if you have a compatible Samsung smartphone. Download a few VR apps to your phone. InMind VR, which takes you on a journey inside your brain, is a good app to start with.

A good place to sample 360-degree video is an app called Vrse, which includes the *Clouds over Sidra* documentary described in this article's opening. For a more immersive experience, get an HTC Vive or Oculus Rift. The Oculus comes with a free demo of short vignettes called "Oculus Dreamdeck," which is a good introduction to the immersive power of VR. The HTC Vive comes with a fun-filled game called Job Simulator that puts you in a virtual cubicle. Don't forget that you must have a PC optimized for these devices.

Identifying a pilot. Once you've sold your decision makers on the concept of VR, it's time to pick a pilot project. Find a performance challenge that will take advantage of VR. You might want to send out custom-printed Google headsets to new employees or potential new hires. Introduce them to your organization with 360-degree videos featuring different company locations around the world. Launch a new product to customers with a 360-degree video of the product in action or send your employees on a virtual field trip to customers.

Developing the pilot. After you've identified your pilot, the next step is finding developers. If your pilot is a stand-alone spherical video, you might have an in-house video team that is up to the task. If you want to add interactivity to the video or produce a computer-generated environment, you'll need game developers.

Whether your development partner is internal or external, your training team needs

to provide guidance throughout the development process to define the performance gaps and what learners need to do differently as a result of the VR pilot. Training professionals need to keep the developers focused by bringing in users for both usability and play tests. And finally, the training department is instrumental in launching the program and measuring results.

The process of developing cinematic VR is different from traditional video production. You can't control the viewing experience with camera movements and framing. Instead, you're capturing everything, up down, in any direction.

The 360-degree camera rig needs to be in the center of the action, so it's important to compose your scene so that there's something to explore in every direction. For example, if the viewer is a participant playing the role of a sales rep in a sales simulation, the camera can be positioned to offer the seated view of the sales rep.

Special editing software is used to stich the video together in post-production into a spherical mosaic. The audio recording is critical. It will let you hear sound from every direction, as if you were really there. The rules of effective storytelling and learning with VR are still being written; the best advice is to bring in learners frequently to test what works best.

Cost of VR

Scripted storytelling video with actors shot in 360 degrees might be as much as two to three times more expensive to produce than traditional video. There are added costs of rehearsal with actors, creating a 360-degree set with natural light, equipment rental, and stitching the video in post-production.

Shooting a 180-degree stereoscopic video, however, can be done with a process similar to regular video production. It will only be marginally more expensive because of the camera equipment and added editing. There are cinematic VR shoots that can be done on the cheap as well. Putting a 360-degree camera on the stage at a town hall meeting with your CEO is not necessarily more expensive than shooting a regular video, for instance.

Training and Recruiting With Virtual Reality

The VR/AR Association has observed how some companies are using virtual reality for talent development and hiring purposes. Writing for the association's blog, The VR/AR Beat, Kris Kolo details two examples.

The first is insurance companies, which are simulating car crashes via virtual reality. According to Kolo, "Insurers have been leaning towards this method as a safe way to understand the nature of car crashes and it has helped with reducing accident claims and increasing driver awareness."

Second, the Commonwealth Bank of Australia is using virtual reality as a recruitment tool. In the bank's virtual innovation lab, participants meet their "colleagues" who explain the bank's desire to create an app that processes invoices. "From there, you are introduced to your team and are asked to make decisions in regards to this application's development," Kolo writes. "The goal of this virtual world is to introduce potential employees to the bank's culture by putting them in a real life work situation that bank employees take on."

Developing a computer-generated scene for VR is a process similar to developing the same 3D environment for a standard computer monitor. Repurposing a 3D experience developed for the computer screen to VR can add 20 percent to 30 percent more time and cost.

The extra cost can be well worth it, though. The user experience of VR is far more visceral than anything you've experienced on a screen. It's like the difference between looking out through a window and actually walking out and moving around in the world.

We might be on the cusp of the most transformative learning technology of our lifetime. A wave of creative destruction promises to finally put an end to the classroom as the dominant metaphor of learning, ushering in an era of VR- and AR-enabled learning that is experiential, engaging, memorable, and ultimately, effective.

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