Accenture Extended Reality (XR)

IMMERSIVE LEARNING FOR THE FUTURE WORKFORCE

With the Industry 4.0 revolution and the uptake of increased digitization, there is a shift in skill requirements for the future workforce. Research from World Economic Forum estimates that by 2020, nearly **35 percent** of the top skills needed across all job families will change;[1] hence, there is a burgeoning need to focus on corporate training. According to Statista in 2017, corporations estimated spending **$362.2 billion US**[2] on corporate training initiatives worldwide. However, these sessions are largely delivered in traditional formats like classroom-based seminars or online training modules. While passive learning and memorization has been the past model, today's workforce requires a more active and ongoing approach to training in which employees learn through practical experience.

In addition, it is important for companies to create a realistic version of dangerous scenarios to test safety and compliance protocols–such as what to do if a fire occurs in the workplace or how to work safely onsite in a hazardous area.

Experiential learning has long been argued as the most effective way to learn, and studies have shown that learning through experience increases learning quality and improves retention by up to **75 percent.**[3]

The demand for and investment in learning is increasing

10%
CAGR expected for Corporate Training growth from 2017—2020.[4]

~50%
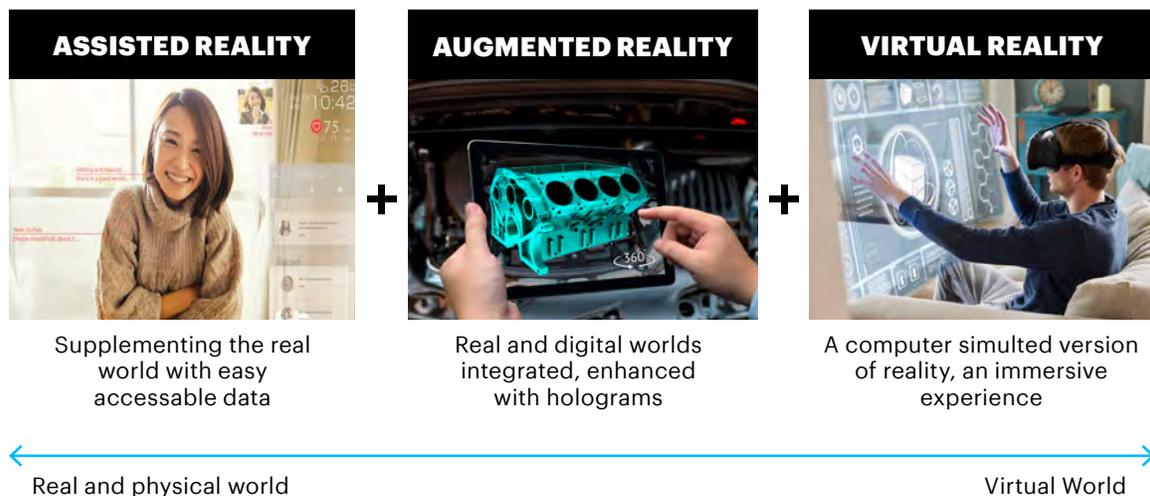of business leaders identify skill shortages as a key workforce challenge.[5]

85%
of people believe they need new skills to stay relevant at work.[6]

Extended Reality (XR), which refers to all real and virtual combined environments and human-machine interactions generated by computer technology and wearables, can be an effective mechanism for experiential learning to address today's learning needs.

Research from Stanford University and Technical University Denmark found learners recall more when using virtual teaching methods than with traditional methods, resulting in a **76 percent**[7] increase in learning effectiveness. According to ABI Research, the enterprise Virtual Reality (VR) training market will generate US$216 million in 2018 and grow to US$6.3 billion in 2022.[8] As just one example, XR education-focused firm zSpace saw a 128 percent CAGR during 2014 to 2016.[9]

Extended Reality (XR)

ASSISTED REALITY

Supplementing the real world with easy accessable data

+

AUGMENTED REALITY

Real and digital worlds integrated, enhanced with holograms

+

VIRTUAL REALITY

A computer simulted version of reality, an immersive experience

Real and physical world ← → Virtual World

BENEFITS OF IMMERSIVE LEARNING

1.

MIRROR REAL-LIFE SITUATIONS

Immersive learning is effective in emphasizing things through visualization. By providing environments that more closely mimic real-life situations, employees can reach greater levels of expertise in less time.

2.

END OF DISTANCE

Results from the Accenture Technology Vision 2018 survey[9] indicate 36 percent of executives identify removing distance barriers between people and information as a driver in their adoption of XR solutions. Through immersive experiences, businesses can tap expertise in thousands of skills from anywhere in the world. XR can also provide remote guided tours and remote collaboration.

3.

REDUCED OPERATIONAL COSTS

Organizations that adopt immersive learning can cut costs on employee travel and transporting equipment to training locations and even save space on real estate. The trainers themselves can also be part of the XR programming so companies can reduce faculty costs.

4.

LEARNING THROUGH MISTAKES

One of the most compelling advantages of immersive learning is people do not have to worry about making mistakes, which can be costly in the real— both in terms of machinery and safety. Training for hazardous environments, as well as simulations that allow individuals to practice presentations, reduce behaviors that do not support inclusion or that could negatively impact a client deal can all be achieved through XR.

5.

INCREASED ENGAGEMENT

With the ability to build-in gamification, immersive learning can be fun. When trainees are engaged and interested, it leads to better retention.

6.

BETTER ANALYTICS

XR captures enriched user data—behavioral, eye tracking, heat maps and gesture tracking. Management can review immersive learning experiences and test results through automated reports that help position employees for future growth.

Enterprise adoption of immersive learning

Industries with high-risk working environments such as energy, industrial, manufacturing or construction are already experiencing the benefits of immersive learning. Now other industries are exploring the space, including:

MEDICAL TRAINING FOR SURGEONS

University School of Medicine in Atlanta uses VR for training surgeons.

Benefits

40%
fewer mistakes than surgeons who are conventionally trained[10]

RETAIL TRAINING

Walmart uses VR to prepare store managers for Black Friday, America's biggest shopping day. Walmart is planning to deploy the technology across 200 training centers.

Potential Benefits

80%
savings in training time[11]

OUTSIDE SALES REPS (OSR) TRAINING

United Rentals uses immersive learning for OSRs to bring construction sites into the classroom.
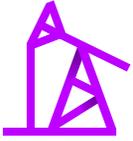
Benefits

40%
reduction in training time[12]

Other applications of immersive learning include:

AIRPLANE TRAFFIC CONTROL
Train ground staff for airplane docking to significantly cut costs on fuel,
logistics and machinery while offering a safe environment for employees.

OIL & GAS EXPLORATION
Give corporate staff or new workers a tour of oil exploration work and
provide on-site safety lessons for both offshore and onshore oil drilling work.

MEDICAL TRAINING
Use immersive learning with clinical personnel for medical care.

VR for Vocational Training— Accenture Study

Accenture conducted an internal experiment on the task of toilet replacement to study the
effectiveness of immersive learning.

Test participants were divided into two groups: one group watched an instructional video
while the other group participated in an interactive VR training. Then participants were asked
to assemble a real toilet and were measured on overall accuracy and time to complete the
task. Leveraging the Cognitive 3D analytics platform, the VR group participants demonstrated
on average **12 percent higher accuracy** and **17 percent faster time to completion** than
instructional video participants. Insights from the post-exercise survey, powered by Cognitive
3D analytics, also indicated a higher perceived usefulness of training for the VR group.

OVERALL ACCURACY

TIME
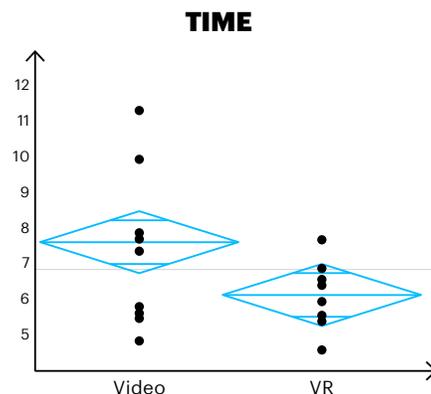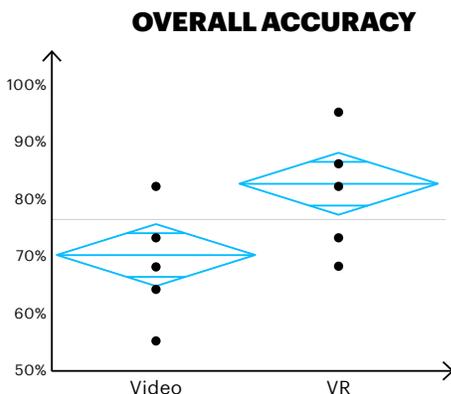
Important Considerations for Enterprise Immersive learning

| IDENTIFY MEANINGFUL IMMERSIVE USE CASES | DESIGN A COMPELLING USER EXPERIENCE | BUILD ANALYTICS FROM THE START | CHOOSE APPROPRIATE TECHNOLOGY | ESTABLISH GOVERNANCE BOARD |

1. IDENTIFY MEANINGFUL IMMERSIVE USE CASES:

To make the best use of a corporate training budget, it is important for enterprises to choose the right areas for XR-based learning. Immersive learning is more successful in use cases that require a first-person perspective and interactive practice and test response. This is because Presence—the emotional and cognitive effect that can be achieved by creating true immersion—leads to more effective comprehension and retention rates. However, some use cases can be appropriately effective by creating focus-based engagement and allowing participants to simply look around. It is also important to conduct a preliminary business value/cost benefit analysis of the use cases and to determine the minimum viable product required.

2. DESIGN A COMPELLING USER EXPERIENCE

Interface/interaction design: Building complex user interfaces (UI) that have a steep learning curve will be counterproductive; instead design UI that is simple and fun. If interactivity is required, it will be important to employ the proper design expertise as poorly designed use of controllers quickly destroys the positive effects of Presence and can frustrate learners.

Fidelity level: The use case should define the level of visual fidelity the experience requires, often relayed in terms of polygon counts and head-mounted display (HMD) resolution. The tradeoff on size/fidelity of the 3D assets include cost, effort and size of the content. In terms of HMDs, premium devices such as StarVR, with its higher resolution and bigger field of view, offer rich experience for use cases that require very high resolution. On the other end of the spectrum are the new all-in-one devices that have lower resolution and processing power.

Multi-participant: Certain learning scenarios will be more impactful through the support of multiple participants being in the same virtual environment. This is

most often done in a teacher-student mode where the teacher is helping guide a group of students through the experience, potentially handing over "control" to a student at certain points so they can interact with certain entities. The participants may be co-located (which involves additional considerations around movement and technical selections for tracking) or may be in multiple locations (which involves network speed considerations and technology that supports this kind of user behavior synchronization).

Physical environment: For learning experiences that require movement, it is important to consider the physical layout and configuration of the setup. Complex setups with tracking sensors on the wall may be fine for a central location but could prove difficult to manage in a larger number of locations (i.e., national network of retail stores). In this case, a more simplistic three degrees of freedom (DoF) experience may make more sense.

In the future, integrate touch: For specific use cases, learners should be able to feel an object via haptic devices when they touch the object in VR. Haptic technology can deliver a higher sense of Presence and can be applied to anything from training surgeons to developing more accurate and immersive virtual games. Current touch controllers provide relatively simple haptic feedback like vibration. Devices such as HaptX, however, are rapidly improving, leading toward a future when true haptics will cover the entire body.

3.

BUILD ANALYTICS FROM THE START:

With VR analytics and automated reports, companies can train, manage and evaluate the hard- and soft-skillsets of employees to improve training effectiveness. Employee actions, as well as emotional and behavioral responses to different situations, can be captured and measured by integrating VR with other technologies for eye tracking, gesture tracking and voice recognition.

4.

CHOOSE APPROPRIATE TECHNOLOGY:

The most important technology decisions center on what type of XR medium is most appropriate (AR or VR) for the use case, the device/HMD selection and use of controllers, integration requirements, and platform manageability.

• For formal learning, VR is generally the preferred medium given the level of immersion it creates. For learning in areas like police force de-escalation or empathy training, creating Presence is critical to having the desired impact. AR is better suited for scenarios that require interactions with people or objects in the real world. AR is also a good option when there are safety or security concerns about participants wearing full VR HMDs during training.

• For simple training where focus-based engagement suffices, companies can use a less expensive and more easily managed three DoF mobile VR solution such as

Oculus Go. Training that requires full interactivity and movement to create the desired effect (e.g., maintenance on complex machinery) requires a PC-driven device such as HTC Vive or Oculus Rift. However, with new advances in all-in-one devices appearing in the market as early as 2019, it may be possible to deliver experiences that are currently only available on PC-driven devices. As noted above, certain premium VR HMDs may be appropriate if the visual fidelity quality level must be extremely high. Currently, the majority of AR experiences run on smart phones or HoloLens. In the next several years, AR smart glasses from companies such as Magic Leap and Apple, along with advancements in HoloLens expected in 2019, will unlock more AR immersive learning opportunities.

- The choice to integrate with other technologies such as artificial intelligence and internet of things depends on the kind of end-user experience required, and is dictated by the use case and cost/benefit considerations. If appropriate, it is also important to consider and design for integrations with other corporate applications such as learning management systems and user identification/authorization platforms.

- As enterprises expand their use of immersive learning, they will need to consider other technology decisions around how to best scale and manage the program. Examples include cloud-based rendering infrastructures, device management solutions, security management and network design. Network bandwidth and speed are particularly important if the use case includes multi-participant requirements. Working with an experienced enterprise architect with expertise in XR technologies will be critical as these decisions are made.

5. ESTABLISH GOVERNANCE BOARD:

Immersive learning initiatives will be more successful if guided by a strong governance board that is tasked with key responsibilities including:

- Identify success metrics.
- Identify and prioritize additional learning modules and scale successful ones across the organization.
- Maintain overall technology architecture vision, incorporating new technologies as appropriate.
- Ensure third-party content governance.
- Make 3D content and apps easy to access via an enterprise store or repository to promote reuse.
- Define deployment standards that detail standard physical environment configurations, use of multi-participant models, etc.
- Define and enforce ethical standards around using XR given the power effect of Presence.
- Collect data and establish measurement techniques for success metrics.
- Measure employee effectiveness on the job and identify areas of training improvements.

HOW ACCENTURE CAN HELP

XR STRATEGY

Identify relevant learning areas which can be solved using immersive learning. Conduct a cost-benefit analysis of areas identified

SOLUTION ARCHITECTURE

Leveraging Accenture's XR reference architecture and expertise, create detailed immersive learning technical solutions, performance analysis on which tools, devices and hardware to be used and create a roadmap and cost estimates for an immersive learning implementation

RUN OPERATIONS

Execute operational processes, monitor and maintain immersive training solutions that meet the success metrics and improve employee job performance

CONTENT FACTORY

Provide creation and conversion of 3D assets at scale to continuously evolve and update training experiences

EXPERIENCE DEVELOPMENT

Design and develop the complete immersive learning experience including 3D asset creation/ conversion, animation, game-engine development, application development and integrate with backend LMS systems and Cloud or on-premise infrastructure
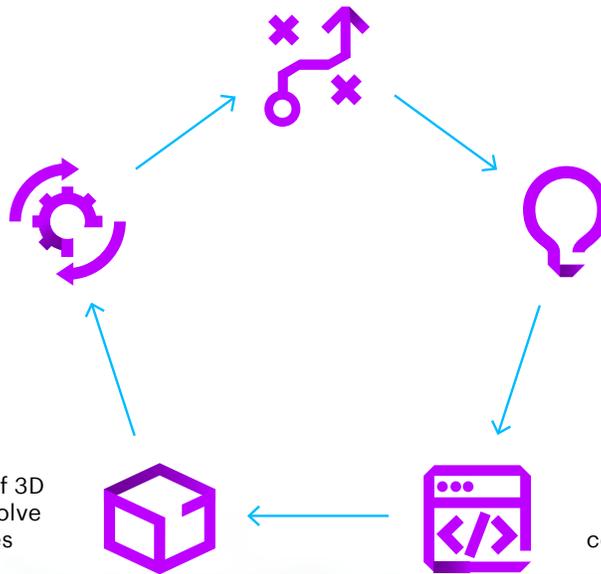
Source: Accenture analysis

Putting It All Together

The field of immersive learning is still emerging, but with such a broad range of employee-training applications, XR technology will be important to the enterprise of the future. However, companies should not use XR just for the sake of trying out the latest flashy technology. It may draw employees to training, but if they do not have a good experience, it will hurt more than it will help.

As today's technical limitations are addressed and it swiftly becomes more economical than traditional mechanisms, immersive learning will grow in capability and impact.

By making well-planned forays into immersive learning now, innovative companies can significantly improve the skills, experiential learning and retention rates of their future workforces while reducing costs.

About Accenture

Accenture is a leading global professional services company, providing a broad range of services and solutions in strategy, consulting, digital, technology and operations. Combining unmatched experience and specialized skills across more than 40 industries and all business functions – underpinned by the world's largest delivery network – Accenture works at the intersection of business and technology to help clients improve their performance and create sustainable value for their stakeholders. With 449,000 people serving clients in more than 120 countries, Accenture drives innovation to improve the way the world works and lives. Visit us at www.accenture.com.

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