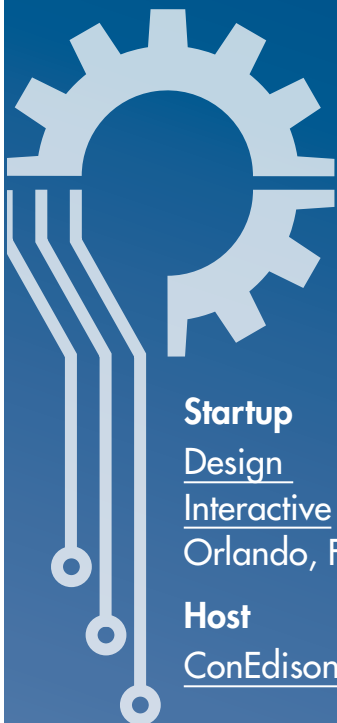# Instructor-Led, Live-Streamed Augmented Reality Training for Remote Workers

Startup
Design
Interactive
Orlando, FL

Host
ConEdison

conEdison, inc.

Technology Solution

Today's utilities have large and distributed workforces, and many face increasing attrition and challenges maintaining institutional knowledge. Worker training and development are essential, especially when job functions are added and specifications revised. Conventional face-to-face training at centralized facilities requires travel time, can be expensive, and introduces risks in a time of pandemic. Online learning has limited applicability for numerous utility field worker roles and skills. The ability to provide live-streamed, hands-on training to remote workers would help utilities transfer knowledge safely, effectively, and at scale with less disruption to productive activities in the field.

Augmented reality technology gives expert instructors the ability to provide remote trainees with a live, hands-on view of tasks as they are performed.

This pilot project was established to test an instructor-led augmented reality (AR) training system developed by Design Interactive (DI) for use in delivering live training to remote utility workers. XRMentor™ is a cloud-based authoring tool that helps instructors create AR training modules that feature live interaction and incorporate existing training content and resources, such as video, schematics, and 3D CAD models. ClassroomXR™ delivers the instructor-led modules using an off-the shelf AR headset, the Microsoft HoloLens 2. Following the "See One, Do One, Teach One" method, the expert first demonstrates a task in a live-streamed training session while attendees watch and interact. After, attendees can perform the task themselves using how-to guides and other resources and use video collaboration features to connect with the instructor to confirm task completion or make corrections.

Project Overview

In this project, a team involving DI, Con Edison, and EPRI focused on demonstrating the ClassroomXR feature and addressing the following questions:

1. Can ClassroomXR be evaluated in a practical, representative training scenario, and is it an asset that makes the hands-on learning experience a positive activity?

2. What is the marginal cost of ClassroomXR over traditional training technologies, and does the technology hold value for utility training operations?

3. Does ClassroomXR support a positive, quality training experience from the perspective of instructors and trainees?

DI conducted a 2-day, in-person train-the-trainer session at Con Edison facilities, including a demonstration of the HoloLens 2 and lessons on creating training modules using XRMentor and deploying training content using ClassroomXR. Con Edison operations and training staff selected an underground distribution task for the training pilot—installation of a cold-shrink "hammerhead" cable termination, a newly enhanced process for completing an otherwise familiar task. Providing attendees in a live classroom with a clear view of what the instructor is doing would be difficult. In addition, due to the hands-on nature of the task, traditional online e-learning would be insufficient.

DI and Con Edison collaborated in developing an instructor-led training procedure. This included creating a 3D hologram of the hammerhead, as well as additional images and instructional content. Con Edison team members developed the instructor script and practiced its delivery while receiving feedback from remote DI staff and other project participants, with the goal of performing a live ClassroomXR session using Con Edison's information technology network.

Results & Learnings

Generally, about 40 to 60 hours of development time are required to create 1 hour of instructor-led training. Two expert utility cable splicers from Con Edison—with no prior experience teaching or with using AR technology or e-learning training development software—were able to learn to use the XR-Mentor software and the HoloLens 2 such that they were confident enough to schedule and conduct a live-stream ClassroomXR training session after 40 to 80 hours of investment. Considering the need to use a new training technology and novel hardware device, the marginal cost of using DI's system to develop and

Expert instructors live-stream training from the HoloLens 2 through ClassroomXR.

deploy an expert-led training module was modest with respect to traditional methods.

Technical issues beyond the control of the project team precluded the live ClassroomXR session from being conducted on Con Edison's internal network. The demonstration was thus conducted using a hotspot device. Remote Con Edison, DI, and EPRI team members joined the ClassroomXR event from Windows-based computers at a secure website. The Con Edison instructor, wearing a HoloLens 2, then initiated the live stream, enabling remote attendees to view a first-person perspective from the AR headset.

While performing the live, hands-on demonstration of the cold-shrink hammerhead process, the instructor was able to stop at different points to ask questions and interact with the trainees. Remote attendees could watch and hear the instructor as the procedure was performed, see all the visual content added to the AR training module, communicate verbally just as if they were in the room with the expert, and use the chat feature in the ClassroomXR interface.

DI's virtual learning and AR technology solution allowed a Con Edison expert with no experience in worker training to develop and deliver a live-streamed, hands-on training session to remote workers on a new field installation task that has clear safety implications for field personnel.

Implications & Next Steps

This pilot demonstrated that applying XRMentor and ClassroomXR with the HoloLens 2 provides a unique, user-directed, hands-free platform for increasing the efficiency and efficacy of training remote workers. With a small investment in "train the trainer" time

focused on best practices for content creation and live delivery, XRMentor enabled an inexperienced instructor to capture and deliver technical expertise and facilitated the use of existing resources as content. Remote attendees graded the learning experience positively, suggesting that the live, first-person perspective offered by the HoloLens 2 had particular value for the chosen training application.

While a full test on Con Edison's corporate intranet was challenged by cyber security hurdles and connectivity issues, this project demonstrated that utility employees can quickly learn to use DI's technology, and that AR-based training has potential to deliver value above that of traditional training technologies with marginal additional investment of resources. The project team is planning a full demonstration.

DI also plans to apply experiences from this project in helping ensure seamless onboarding and integration processes for additional utilities and other customers. Additionally, EPRI will investigate specific utility industry training scenarios that may be particularly amenable to use of the XRMentor tool and ClassroomXR features.

Resources

Matt Johnston, *Director, Design Interactive,*
matthew@designinteractive.net

Frank Doherty, *R&D Project Manager, Con Edison,*
dohertyf@coned.com

Tom Reddoch, *Principal Technical Executive, EPRI,*
treddoch@epri.com

TESTIMONIAL: Design Interactive

This engagement provided great insight into the value of augmented reality and live-streamed training for the utility industry. Project participants quickly learned to use our technology and responded positively to the experience—both utility instructors and trainees. We come away with a better understanding of the needs of the utility community and collaborative ideas on how to improve our product moving forward.

TESTIMONIAL: Con Edison

XRMentor and ClassroomXR give Con Edison the ability to empower our experienced and expert workers to create training modules and share their exceptional knowledge with co-workers. Instead of bringing personnel to our corporate learning center, these technologies can be used to deliver knowledge to field workers. We look forward to demonstration of their full capabilities.

TESTIMONIAL: EPRI

This engagement with Design Interactive showed a practical way to effectively use augmented reality in the utility training environment. As partnerships develop and lead to demonstrations, EPRI plans to monitor progress and publish results to facilitate broader industry adoption.

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