Snapshot Report

Mixed Reality Technology Training Pilot

Pilot Program – Comparison between conventional training methods and Mixed Reality Technology methods for Maintenance Departments to improve safety – Stage 1

Project Code
2021-1024

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Project Description

In the context of global skills shortages and increasing demands on maintenance teams due to rapid and ongoing introduction of new equipment, the Mixed Reality (MR) Technology Training Pilot Project sought to identify new mechanisms to support continued capability of team members.

It was anticipated that alternatives to traditional training methods (paper-based and e-learn) such as augmented reality (AR) and virtual reality (VR) would overcome existing capability challenges by providing detailed instructions at the right place, at the right time, with reduced dependency on subject matter experts (SMEs). The intention was for this to be achieved through development and evaluation of a Mixed Reality Technology Training Pilot Program focused on risk mitigation activities.

The scope of the project was altered following learnings in relation to the suitability of AR technology for training purposes and due to difficulties completing evaluation in the context of travel restrictions.

Project Content

The final Project incorporated the following activities:

- Investigation of available technologies and determination of suitable vendors.
- Identification of a pilot site and tasks to be the subject of training.
- Development of immersive reality (XR) training environments.
- Overlay of critical task information, safe work method statements (SWMS), workplace health and safety (WHS) information, quality assurance (QA) information and relevant checklists onto training environment.
- Capture of informal feedback and reactions to training material and the technology in general (e.g. headsets).
- Literature review of current theory and practical use of MR technology for training purposes.

The review of available technologies identified AR as the most promising technology to be used for pilot purposes and The Design Technology Company (DTCo) was selected as a vendor due to their strong industrial background and a focus on mechanical 3D modelling and drafting in industrial plants.

During the project, it became evident there were considerable limitations with AR technology and it was determined that a combination of AR and VR technology would be more effective. AR was identified as being effective in supporting detailed tasks, whereas VR provided more potential as an overarching training tool. Subsequently, the project scope was modified to incorporate VR technology in addition to AR for training purposes.

A Matterport Scan was completed to form the foundation of the MR training environment, creating a replica of the Brooklyn engine room, and an AR experience was created, aligning augmentations with real environment (for fixed objects such as machinery). The scan was also used to create a completely virtual model of the engine room.

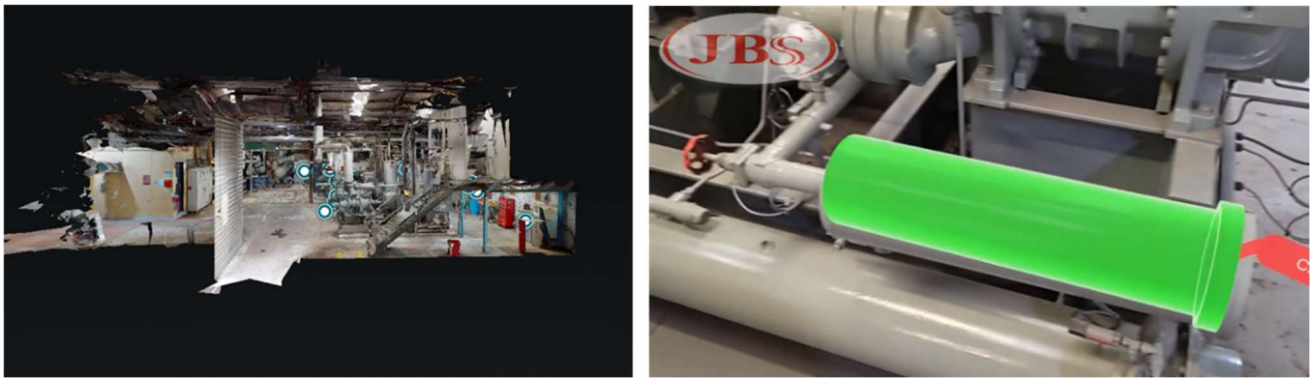

Figure 1 - Matterport scan & AR environment

Figure 2 - VR environment

Significant learnings were gained during the development and piloting of the AR and VR training programs, such as:

- The importance of design in light of the narrow field of view (FoV) available with current headsets, the need to provide multi-modal cues and potential for motion sickness.
- The need for non-MR based introduction to the technology prior to entering the immersive environment.
- Understanding fit-for-purpose application of technologies such as AR for demonstration and practice of complex technical tasks and VR for more general training activities that would benefit from an immersive experience.

Additional learnings from the project related to the benefits and limitations of the technology, the importance of access to expertise and enterprise considerations such as hardware and deployment platforms.

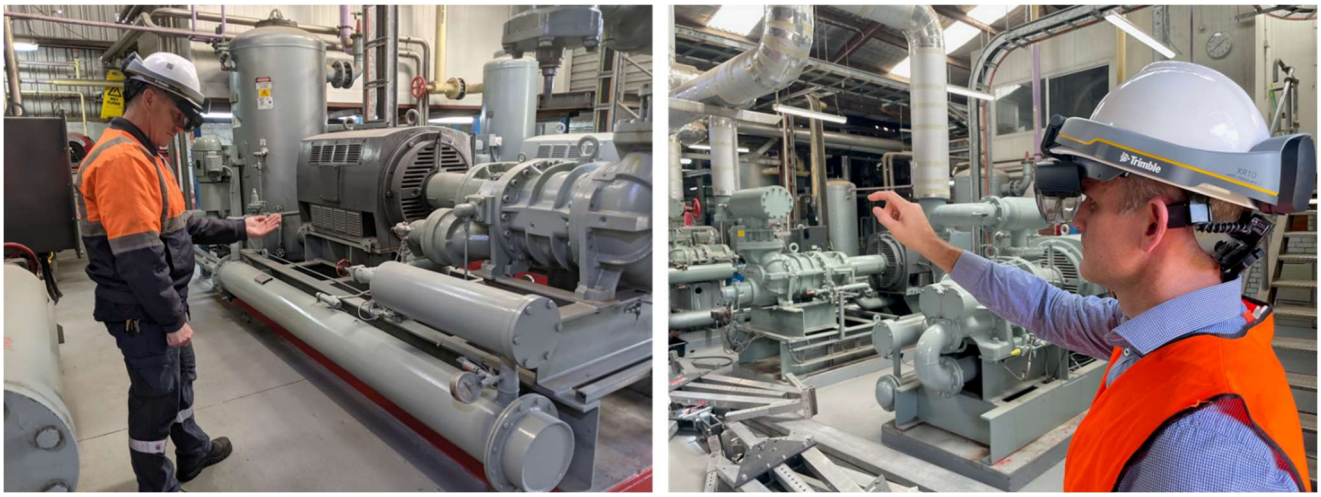

Figure 3 - Use of MR technology

Project Outcomes

Whilst not following the anticipated path laid out at the start of the project, the results are nonetheless incredibly valuable, perhaps more so for the change in direction and depth of learnings. A summary of findings is listed below, whilst the final report incorporates specific recommendations for the AMPC and the industry at large.

- **Powerful technology**: MR technology present significant potential to improve organisational learning outcomes and deliver training in scenarios that would otherwise be inaccessible (e.g. dangerous, costly). Far from a fad, the technology, in its ever-changing form, is no doubt here to stay.
- **Considered use**: The potential benefits of MR to improve learning outcomes are only likely to be realised with considered use of the technology. Headsets alone will not deliver effective training.

- **Industry growth and maturity**: The MR technology industry is relatively immature with regards to application in a training context, yet is growing at a rapid rate.
- **Internal collaboration**: MR technology is a cost-effective training mechanism if delivered at scale and with integrated approaches to technology choices and procurement.
- **Foundational frameworks**: Likely due to the immaturity of the industry, there is a significant lack of foundational frameworks to guide the development of training materials for use in a MR environment.
- **Procedural significance**: Any training program is only as good as the content it is designed to deliver. MR is an unforgiving technology that magnifies any perceived errors.
- **New skills sets**: With the anticipated uptake of MR technology training in a workplace context, organisations need new skills, or at least access to new skills, to design and deliver required content effectively.

Benefit for Industry

This Project has provided significant benefits to the industry through:

- Highlighting the need for the industry and its individual organisations to consider not if, but when and how they will integrate MR training technologies into their learning and development offerings.
- Providing significant insights regarding fit-for-purpose application of MR technology, including an overview of important design considerations.
- Outlining the need for design and evaluation frameworks to guide MR technology training development that would significantly enhance the effectiveness of MR technology training in the industry.
- Providing guidance in relation to how organisations should approach adoption of MR technology training.
- Drawing attention to the need for new skills sets, or at least access to these skills, including the potential role for AMPC in facilitating this access.

Useful resources

The Final Report for this project incorporates articles and papers accessed as part of the literature review.