Final Report

AMPC
AUSTRALIAN MEAT PROCESSOR CORPORATION

Washroom Immersive Training

Immersive Reality - Equipment Training - Washroom

Project Code
2021 - 1258

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Published by
AMPC

Date Submitted
14/11/2022

Date Published
14/11/2022

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1.0 Executive Summary

The meat processing industry is facing significant challenges in terms of labour. One side effect of this is that workers are often transient with many having English as a second language. The ongoing training of staff is time consuming and therefore presents an ideal opportunity for innovation. AMPC identified an opportunity to develop immersive training on critical biosecurity processes and procedures and Think Digital have developed these.

Challenges and questions addressed in this research:

- How do we convey the training with minimal written instructions in case the trainees first language isn't English?
- How do we make this memorable and engaging for the user?

Following filming onsite at a processing facility, accurate 3D CGI (computer generated imagery) environments and items were created. Four individual VR experiences with multiple training steps were then designed, built and tested. These take the user through the biosecurity procedures involved in entering the facility - steps taken in the locker room and washroom; and when leaving the facility at the end of a shift.

VR experiences created:

1. Locker room - Entering the facility
2. Washroom - Preparing to enter the processing floor
3. Washroom - Upon leaving the processing floor
4. Locker room - Leaving the facility

Key learnings, outcomes and observations as a result of this work include:

- There is a thirst from the industry to adopt and utilise VR technology to complement and enhance their existing training.
- Using a generic VR experience to train on washroom biosecurity procedures presents challenges as each facility has different washroom set ups and procedures. Tailored training solutions may offer more value to the processor.
- From a trainers perspective the one-at-a-time VR headset delivery of procedural training is less efficient than a washroom tour for a large group, however there is an opportunity for this to be complementary training or used as an assessment method.

The future opportunities section (in section 7.0 Conclusions / Recommendations) includes actions to address many of the learnings above, and for enhancements which could be applied across VR training modules.

2.0 Introduction

All processors must have stringent procedures for washrooms, sanitisation, entry and exit points, and due to high staff turnover, there is an ongoing need for training. These are critical biosecurity risk areas and procedures must be followed with every entry and exit from the processing floor.

One current challenge is that training delivered via written applications or verbal presentations may not have the reach to staff with English as a second language or literacy challenges. In addition much of the workforce is transient and/or low skilled so practical training is likely to be more impactful and successful. Practical training requires a safe environment and expert guidance so VR immersive training is ideal.

The purpose of this research project was to develop an immersive training tool that could assist in training processing staff in the areas of biosecurity, specifically for locker room and washroom entry and exit procedures. The intention was to create an animated, hyper-realistic representation of the required areas within a meat processor facility with interactive training elements.

The opportunities offered by an immersive training tool include:

- It feels real - when immersed in a virtual reality experience the person feels as though they are really in the environment and doing the activities. The situations they are presented with and decisions they make feel more realistic.
- Memorable - practical experience of undertaking the biosecurity procedures in a simulated environment is more likely to lead to better retention of the procedures to be followed when they start work.
- Safety - staff can explore and make decisions using VR with no potential for risk or harm to themselves; often referred to as “failing safely”.
- Responsive - environments in VR can be programmed to be responsive to the trainee behaviour and choices - consequences can be programmed in response to specific decisions.
- Value - once built the training is relatively inexpensive, with multiple people able to access and interact with it over and over again, without the need for a trainer to run dedicated sessions.

3.0 Project Objectives

The project objective as specified in the research agreement:

“Using a blend of photography and computer generated environments (CGI), we will build a realistic environment for users to access either in VR (headsets) or via the web. Combining photography and CGI will provide a realistic platform for the user to experience, while incorporating a high level of interactivity.

Once in the environment, the user will be guided through a series of decision points and activities. Some of these will be multiple choice style questions (why is this sign here), and others can be physical activities (wash your hands here for 20 seconds).”

4.0 Methodology

The methodology/ flow we followed to deliver this project was as follows:

<u>Stage 1 - Planning & Preparation</u>

- Refining the scope with the AMPC team.
- Creating a matrix of actions and intended responses will ensure the desired learning outcomes are achieved within the environment.

- Spending time onsite and with SME collating information and capturing 360 and 2D content.
- Storyboarding to design the training flow and proposed interactions for review.

Stage 2- Development & Testing

- Development of the two VR environments (locker room and washroom) including hyper-real 3D models of items to be interacted with in each environment - lockers, boot wash, hand wash station and dryers, equipment sterilisation areas, equipment to be sterilised etc.
- Development of activities and interactions required to educate users on key aspects of the procedures.
- Internal testing of the technology, training interactions and flow.

Stage 3 - Deployment & Testing

- Deployment and user testing of experiences

This platform was designed to be hosted in the Oculus Quest environment and include the ability to deliver an experience on different types of hardware e.g. the HTC Vive.

5.0 Project Outcomes

The project activities and associated outcomes from each stage are as follows:

Stage 1 - Planning & Preparation

Activities:

- Filming on location at a processing facility with the local training team. Filming included capturing 360 and 2D footage of the locker room and washroom environments and the associated biosecurity processes.
- Gathering of various procedural documents to understand the common themes.
- Creation of detailed experience storyboards for review.
- Development of the technical infrastructure to support the hosting and delivery of the experiences.

Outcomes from Stage 1:

1. We were able to capture footage in the washroom of all the cleaning equipment and some examples of it in use, plus images of staff putting on equipment such as knife belts and steel protective suits. This information was used to build the 3D models of the washroom and its contents.

2. The scoping/ storyboard document was developed describing each experience in terms of:
    a. Scene - where the experience takes place e.g. Locked room ‘Entry’

b. What is covered in this scene (learning inventions) e.g. Removing jewellry and watches; collecting and putting on clean whites etc
c. How it looks - description of the look and feel of the environment and the tough points within it
d. What happens in this scene - description of the activities that the user undertakes.

Stage 2 - Development & Testing

Activities:

- Using the reference materials from stage 1, design and build the two 3D environments and all the 3D assets required (3D models of equipment such as boot wash area, knife belt etc).
- Design, develop and test the multiple training interactions taking place in the virtual environments.
- Multiple rounds of changes and improvements to each experience to improve the 3D imagery, environment, functionality and quality.

Outcomes from Stage 2:

1. Four experiences with associated 3D assets developed across two 3D environments, plus all training steps/ tasks - ready to deploy for user testing:

Experience 1 - Locker room - Entering the facility

3D environment: Locker Room <Entry>
Activity: Removing items and putting in a locker, putting on correct equipment e.g. Whites, PPE
3D models required: Avatar dressed in normal clothes and shoes, watch, lockers, whites, white boots, helmet, padlock.
User tasks in this experience: 8

Experience 2 - Washroom - Preparing to enter the processing floor

3D environment: Wash Room <Entry>
Activity: Gathering tools required for work, preparing them in the correct way (washing tools, washing hands etc)
3D models required: Person dressed in whites, white boots, helmet, washing facilities - handwashing facility, boot washing stations, hot water bath, bin, aprons, mesh vest, mesh glove, knife and belt.
User tasks in this experience: 14

Experience 3 - Washroom - Upon leaving the processing floor

3D environment: Wash Room <Exit>
Activity: Cleaning yourself and your tools after work in the correct way (washing tools, washing hands etc)
3D models required: Person dressed in whites, white boots, helmet, washing facilities - handwashing

facility, boot washing stations, hot water bath, bin, aprons, mesh vest, mesh glove, knife and belt.
User tasks in this experience: 12

Experience 4 - Locker room - Leaving the facility

3D environment: Locker Room <Exit>
Activity: Storing your equipment correctly at the end of a shift.
3D models required: Avatar dressed in whites and white boots, helmet, lockers, padlock, outdoor clothes and shoes.
User tasks in this experience: 7

2. AMPC face to face testing session to validate models and flow plus design options for training prompts and guidance used during the experience.

3. We experimented with delivering the experience in AR but the initial results showed that VR was the preferred delivery channel for this experience. This is expanded upon in the Discussion section of this report.

Stage 3 - Deployment & Testing

Activities:

- Deployment of the experiences on Oculus Quest 2 and HTC Focus 3 Headsets.
- Two rounds of onsite user testing of the finalised experiences with processor training managers and floor staff at processing facilities.
- Final round of updates developed and deployed in response to the feedback from user testing.
- Demonstration of the training experiences at the AMPC Innovation Conference 2022.

Outcomes from Stage 3:

1. Four bespoke and tested immersive virtual reality biosecurity training experiences have been created and are ready for distribution to meat processors.

2. They are available for download for the Oculus Quest and HTC Focus 3 headsets.

3. The feedback from floor staff, trainers and AMPC conference attendees has been overwhelmingly positive and excited at seeing the potential for VR training in their workplace environments.

General project observations:

- The onsite visits to processing facilities were crucial, and filming the activities taking place in a real environment meant the final virtual environments are as close to reality as possible.

- The user testing was very popular with the front line workers – as it was fun, different, engaging and educational at the same time.
- The experiences were designed to be intuitive and as a result most users did not require help (in the form of direct trainer guidance) to complete them.

6.0 Discussion

As with the Whizard Trimmer project, one of the key observations made during the course of this work is the thirst from industry to adopt immersive training into their operations. The training teams at the processors we visited were overwhelmingly positive about the opportunities and benefits that immersive training could offer to complement their existing face to face training and they see a real potential to integrate VR into their classrooms in some way.

Efficiency

During the user testing sessions at the processor sites there were questions about time efficiency with this training experience. One trainer commented that they would have to watch individuals step through the tasks one at a time in VR compared to normally having 10 people in a group training session in the washroom itself. This was a concern for them.

Augmented reality experience

Our discovery that VR environments and the interactivity within those environments do not port seamlessly to an AR experience, was a significant one. Our key learnings here included:

- AR does not have controllers but rather uses hand gestures to interact with the digital assets and environment. As a result this limits the user's haptic feedback within experiences e.g. when grabbing and sterilising a knife and belt, thereby reducing the quality of the user experience when ported to AR.
- AR is best suited when digital content can be overlayed on real world objects. An example would be instructional cues on a piece of physical machinery.
- Creating content once and deploying on many channels (web, mobile, VR and AR) does not deliver the quality of experience we wanted to deliver. Each channel has specific user interaction requirements and as a result the content needs to be altered and tweaked for each channel delivery in order to achieve a high quality training experience.

Generic vs Tailored Experiences

The experiences developed here were heavily informed by the processing facility site where the filming took place, and by the written processes provided. On visiting other sites to undertake testing, we discovered that individual meat processors have different washroom facilities and procedures and one size does not fit all. Therefore for these training experiences to be most valuable to the processor, they would need to be tailored for different processors facilities and procedures.

Complimentary training experience

During the user testing we noted that those who were already familiar with the physical environment were far more efficient at undertaking the VR experience. VR appeared to reinforce the learning that had already taken place and so proved to be a good complimentary tool. Linking this to the observation on time efficiency above, could this be an opportunity for a collaborative environment? It could also be used as an assessment tool.

7.0 Conclusions / Recommendations

The conclusions and recommendations we can draw from this project are:

Using VR/XR to train users in the meat industry:

- Immersive training has a potential place in industry - it complements existing training and we had positive engagement and feedback from front line workers – this type of training would be well received.
- In VR training users can fail safely - this increases confidence, and they can drop valuable equipment without damage.
- The principle behind the washroom biosecurity training can be applied to other procedures to reinforce learning.
- Training ‘bundles’ work well to give variety – and variety of experiences is important to maintain interest & engagement.
- Replicating the real environment (as far as possible) is key to the immersive experience.
- Users can develop muscle memory through rote learning and repetitive use.
- Data insights into specific user performance are required to realise maximum value and to enable an action plan following training.
- If the experience is designed well, it should be intuitive and end users should not require help to complete it.
- A VR introductory tutorial is required -showing how to use controllers, teleport etc.
- The concept of training in a universal environment provides inspiration, however feedback from processors is that bespoke training environments would be preferable.

Immersive VR for washroom biosecurity training:

- This generic training experience would need to be tailored to add value to individual meat processors as the facilities and procedures are different in each.
- It proved to be a good complimentary training tool for those with some level of familiarity. Perhaps this could be used as an assessment tool for recent new starters.
- To address the time efficiency challenge, a collaborative environment could be developed.

The project approach and methodology:

- Though filming on-site was critical to being able to replicate the 3D images, it is difficult to create ‘generic’ experience this way - and as testing proved, a generic experience would probably not add the value to a processor due to the difference in washroom facilities and procedures.

- Not all learning experiences deliver enhanced value by being delivered in AR. It is worth spending time on developing differentiated experiences designed for each channel to get the best user experience. By using the tools provided by the different channels e.g. using hand held controllers in VR when simulating the holding of a physical tool, versus finger movements in AR for activities which do not involve a tool - provide a more intuitive learner experience than trying to create a one size fits all approach to increase efficiency.

Future opportunities - enhancements to the current experiences

There are some enhancements to the training we have identified which could be addressed as future work:

- Integrate 2D videos of the tasks being performed into the CGI environment to link the training to the real world.
- Add non-player characters (NPC's) into the experiences to simulate busy shift changes.
- Add a timer to the experiences.
- Consider using this as an assessment tool.
- Explore developed this as a collaborative experience to address the time efficiency challenge.
- Add a questionnaire to the end of each section to check the user's learning.
- Create a dashboard of user results from each experience to track training.
- Add the ability to restart each training step so the user can repeat the step until they are comfortable with it.
- Publish the VR experiences separately (instead of bundled) to suit AMPC proposed Marketplace
- Publish the VR experiences for PICO ecosystem
- Licencing opportunities with end-users
- Customisation of VR experiences for end-users
- A&B split testing with end-users
- Integration with LMS's eg. Canvas to push user analytics into central user management system
- Web / desktop / tablet delivery, not just in VR Headsets
- Introduce other complementary biosecurity or procedural training
- Integrate the ability to provide assessment in environment
- Integrate multi linguistic cues, overlays and audio

8.0 Bibliography

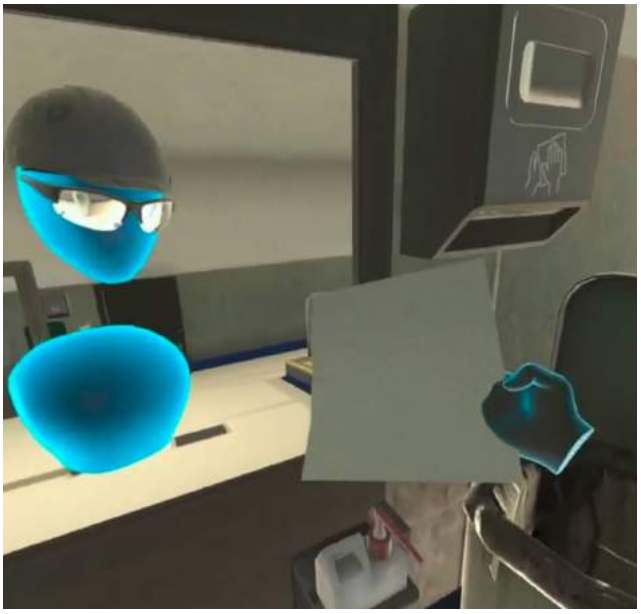
None

9.0 Appendices

9.1 Appendix 1 – User testing (photos)

User testing of the washroom and locker room experiences with trainers and front line workers – Sept 2022

Users point-of-view during the Washroom Entry experience



9.2 Appendix 2 – AMPC Innovation Conference (photos)

Presentation and attendees trying the experience at AMPC Innovation conference, Oct 2022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