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USE CASE

Optimising the design process of custom vans using Virtual Reality (VR)

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INTRODUCTION

It can take a lot of back and forth with a customer to convert their desires into a design that they both understand and agree to.

Physical mockups have been used to help with this process for decades. A Doncaster-based traditional vehicle conversion company employing around 100 people had the same approach. However, the iterative process of optimisation with the customer was time, and resource, intensive taking up to 6 weeks to settle on an agreed prototype.

The University of Sheffield Advanced Manufacturing Research Centre (AMRC) worked with a vehicle conversion specialists to reduce that time frame.

Through the use of Virtual Reality (VR) an immersive environment was created where a design concept for the vehicle conversion could be created, collaborated and iterated on, in minutes instead of weeks.

The VR solution allowed for closer collaboration between vehicle conversion experts and the customer, while also automatically making sure goals around cost and weight could be met.

Virtual Design Environment.

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THE CHALLENGE

The South Yorkshire based vehicle conversion company convert stock vehicles to the needs of their customers.

For example, kitting out welfare vehicles or the interior of stock vans to have all the equipment, racking, lighting etc. that a company like National Rail might need for their fleet, in the right layout. Once the requirements for the conversion are understood the team build a physical prototype to show the customer, which can take weeks to create. If the customer isn't happy with the design or wants to make adjustments the Doncaster team have to take on the time consuming, and costly, job of updating the prototype. The vehicle conversion team identified the design and prototyping phase of its process as being a prime candidate for optimisation through immersive tools but didn't have the skill set to optimise it for themselves.

Environment Interaction

Requirements selection in VR.

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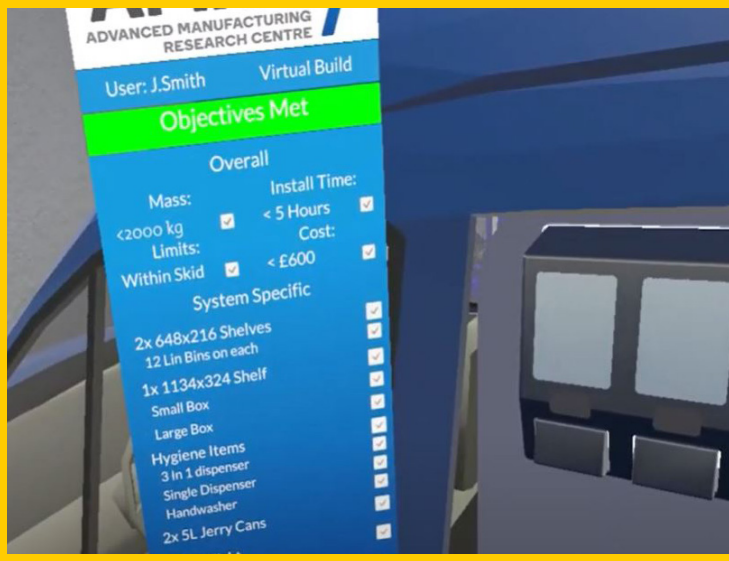
THE SOLUTION

The AMRC worked with the vehicle conversion company to allow it to test out design configurations in a virtual environment without the need for physical prototypes...

..in early design reviews. The AMRC created an immersive Virtual Reality (VR) version of a van during the design phase for the Derbyshire based organisation. The design could be configured using standard components by either the design team or the end customer.

The AMRC used the vehicle conversion organisation's existing CAD models to recreate an empty van in a virtual environment using Unity software. Adding a list of components for example shelving, lights and fire extinguishers that could be moved into an optimised configuration directly by the customer, within the vans virtual environment. Every time the customer adds an item to the van the cost, mass, and installation time for the van updates in real-time. Allowing the customer to immerse themselves in the design of the vehicle and configure it to their exact specifications without any unexpected differences between their requirements and the company's interpretation of them.



Requirements panel..

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THE IMPACT

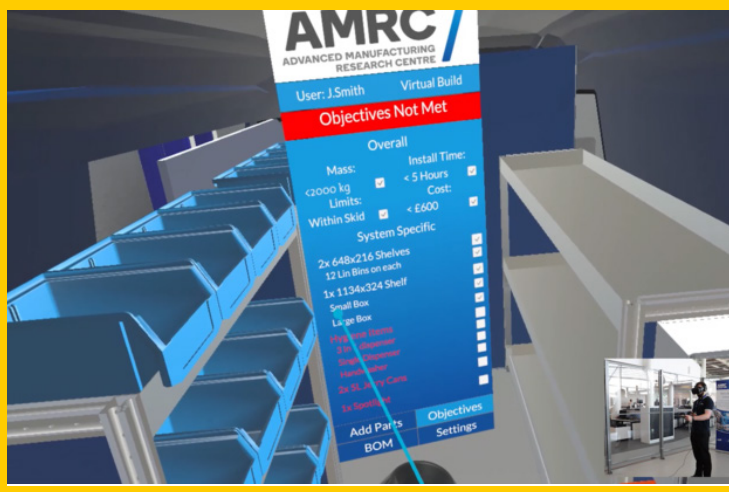
The project focused on demonstrating how an SME in an unfamiliar sector could benefit from adopting immersive technology to massively reduce design lead time.

The company estimated its return on investment.

The current 4-6 week design process could be reduced to less than 1 hour, a significant saving of an estimated 227 hours.

The project enabled the company the ability to bring the protype to the customer instead of the other way around, through a VR headset. This increased the customers ability to make "on-the-fly" adjustments and added convenience.

The ability to optimise and adjust within the virtual environment reduces the skilled labour needed to develop physical prototypes and the cost associated with them.



Criteria Selection

Completed Prototype Design.

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KEY LESSONS LEARNT

The project highlighted how Small to Medium Enterprises (SMEs) could benefit from the introduction of VR into their design processes.

However, it also highlighted the need, and opportunity, for immersive software developers to support SME's on their immersive adoption journey by taking the burden off those organisations to recruit, or develop, specific in house digital skills. The project highlighted a need for improved off the shelf software and availability of software developers to support companies like the vehicle conversion specialists as they aim to move from demonstrations to full deployments

Final Van created by the client.

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THE PROCESS

01 REQUIREMENTS GATHERING

02 SOURCE MODELS

03 IMPORT DATA

04 SCENE REFINEMENT

05 CODING INTERACTIONS

06 UI BUILD

07 VR OPTIMISATION

01 The first step is to refine and gather the requirements.

02 The requirements defined what digital models were needed for things like the racking used in the van, or the van itself. The second step was sourcing the models. Some were freely available online, others were created in Blender, the rest were available as CAD files.

03 The models were imported into a Unity scene, some of the CAD needed optimisation to do this.

04 Material types, textures and lighting were adjusted in the Unity scene to increase realism.

05 C# was used to script interaction in Unity, such as how objects "snap" into place when dropped in the scene, or how the total weight of the build is calculated.

06 The User Interface (UI) was created in the Unity scene to display information and make the VR environment as easy to use as possible. UI items were linked to scripts written in the previous step where appropriate.

07 The scene was optimised to be lightweight enough to run well in VR. As an example the frame rate of the model was reduced and the models rendered less accurately so as to reduce the computing power needed to run it.

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DELIVERED BY

IMMERSE UK ORG

Innovate UK KTN

CATAPULT High Value Manufacturing

WMG THE UNIVERSITY OF WARWICK