





APPLIED VISUALISATION CREATING INDUSTRIAL VALUE

2018 FORUM REVIEW

Exploring the opportunities for VR, AR and Advanced Visualisation across industry sectors

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Published by the Institution of Engineering and Technology (IET) this is a report from the *2018 Applied Visualisation Forum*, a collaboration between the IET, the High Value Manufacturing Catapult and Immerse UK.

Immerse UK is a special interest group for immersive technologies set up in 2016 by Innovate UK's Knowledge Transfer Network. It brings together 1,700 leading businesses, researchers, activists, thinkers and investors to position the UK as a global leader in immersive technology.

The High Value Manufacturing (HVM) Catapult is the catalyst for the future growth and success of advanced manufacturing in the UK. Its seven Technology and Innovation Centres work with companies of all sizes to bridge the gap in – and accelerate the activity between – technology concept and commercialisation. These centres offer access to leading-edge equipment, expertise and an environment of company collaboration.



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INTRODUCTION

In early 2018 the IET, along with the High Value Manufacturing Catapult and Immerse UK hosted the second annual Applied Visualisation Forum at the British Motor Museum in Gaydon.

The event brought together engineers, practitioners, researchers and technology providers from across various industry sectors to share expertise and best practice, as well as their knowledge and understanding of hardware and software advances and how applying virtual reality (VR), augmented reality (AR), data capture and analytics can be beneficial for business.





Attendees were able to find out how a range of companies from medical and construction firms to manufacturing and automotive specialists have been making effective use of advanced visualisation technologies to drive innovation, identify potential new opportunities and solve real-world challenges, creating both impact and value.

The format of the Forum consisted of case study presentations, interactive roundtables, exhibitor demonstrations and cross-sector networking. The aim of this report is to bring together the key highlights from the day, and show why applied visualisation is becoming a growing area of focus across industry.

WHAT IS APPLIED VISUALISATION?

Applied visualisation is the catch-all term used to describe an array of visualisation techniques applied in an industrial setting. The term incorporates all display mediums including mobile, wearable and projected technologies, and covers a range of use cases including virtual reality, augmented reality, mixed reality and data dashboarding.

Industrial environments are becoming ever richer in data, thus presenting challenges to the operators tasked with extracting knowledge (and value) from enterprise-grade applications. As part of a suite of technologies, applied visualisation techniques, when harnessed with enterprise IoT and informatics, can provide the operator with a more intuitive method for Human Machine Interfacing (HMI).



Source: 'Immersive Economy in the UK Report' from Immerse UK

"An excellent event. Highly relevant and very informative."

Tom Egan, Leonardo

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KEYNOTE

PAUL HETHERINGTON, JAGUAR LAND ROVER

In his keynote address, Paul Hetherington, Group Leader of Visualisation and Immersive Development at Jaguar Land Rover (JLR), outlined the role that VR and other advanced visualisation formats have played in the product engineering process at the vehicle manufacturer, and why they are helping companies across the sector realise their technological goals.

He began by telling the story of JLR's VR and Virtual Innovation Centre (VIC) – now ten years old – and how it has since been expanded and bolstered with fresh resources, with the most recent example being the creation of a new Visualisation and Immersive Development (VID) team in 2017. VID's workstreams span immersive engineering solutions, attribute/product data visualisation and a virtual customer experience platform. Hetherington explained how the original aim of the VIC was to reduce the number of physical prototypes, which it has succeeded in doing; however it has also gone on to provide additional tools for cross-functional, collaborative decision making.

According to Hetherington, the automotive industry is being tasked with delivering more data sharing and collaboration. The increasing complexity of products is putting the engineering workforce under more pressure, late design changes and reliance on physical design methods can lead to cost increases and time constraints means there is little or no room for error.





For JLR, VR technology provides essential business value as an integrated process, promoting enhanced decision-making, collaboration and cost/time benefits.

CASE STUDIES

1. POLAR MEDIA AND LLOYD'S REGISTER

Presenting the first of four case study sessions showcasing how modern visualisation technology is already being applied across industry, Lewis Young and Peter Richards of Polar Media and Lloyd's Register (LR), respectively, revealed how the two companies have utilised VR tools to create an engaging and interactive safety training solution for the oil and gas sector.

With LR's new training simulator, users can immerse themselves in a virtual offshore oil rig environment, where they're tasked with identifying and fixing potential safety hazards, and also shown what would happen if those hazards were ignored. By using virtual reality, trainers can teach trainees about the dangers they would need to be aware of on the job, but in a risk-free way.

Young and Richards' presentation also encouraged audience participation; AV Forum delegates were invited to try out the virtual environment for themselves.



good combination of demonstrations and presentations."

"This was one of the best AV VR events I have attended,

Stacey Thoburn, BAE Systems

2. HOSOKAWA

The second Case Study was presented by Adam Harper, product/projects manager at Hosokawa Micron Ltd, a provider of process solutions for the powder and materials processing sector. Harper explained how the company has identified AR and VR as being potentially beneficial for the design of its isolator and glovebox products for object handling and substance manipulation. Possible advantages include the facilitation of design reviews, enabling customers and engineers to visualise the proposed equipment and assembly procedures, immersive operator and maintenance training and augmented reality for remote systems.

With VR, Harper said Hosokawa could use wooden mockups of an isolator or glovebox and combine with a virtual version to create a hybrid model, which would reduce costs and lead to speedier design changes. This may involve attaching tracking devices to objects placed within the physical model, which Harper then introduced the audience to the manufacturer's digital twin processing plant - a virtual model that provides real-time data captured by sensors installed in the physical plant, and also displays faults and alarms, predictive maintenance information and more.



Hosokawa's Digital Twin, a virtual model that displays real-time data captured by sensors installed in the plant, as well as faults and alarms, predictive maintenance information and more.

would then make identical movements in the real and virtual worlds.





3. SENTIREAL

Further demonstrating the cross-sectorial nature of the event, the next presentation saw Fergus Wallace of Sentireal Ltd show attendees how mixed reality technology – combining the real and virtual worlds can be applied for healthcare training purposes and add value.

In partnership with Andor Technology, Sentireal has been able to accurately visualise data of samples taken from hi-res microscopes, using the Microsoft Hololens headset and an innovative Microscopy App. Mixed reality allows the user to physically manipulate data, as well as isolate, analyse and experiment with models of cell structures, for example, either individually or as part of a collaborative group – another clear advantage when applied to training. Wallace said that Hololens was chosen for its visual quality, hands-free gesture-based user interface, spatial mapping and tracking quality and computing power that allows for larger data sets and models. He also outlined some of the issues that team were expecting beforehand such as, the limited field of view, users finding the headsets uncomfortable and struggling to master control gestures, as well as a lack of computing power for the larger models.

"Very productive and timeefficient way to understand the state-of-the-art in this rapidly developing field."

Nick Avis, University of Chester



Case studies

4. SUBLIME SHARED IMMERSION

The final Case Study session came from Alan Grant, Digital Reality Consultant at Sublime Shared Immersion, who talked about 'The Augmented Worker', an AR platform that it has been working on with a consortium and steering group that also includes the AMRC, Laing O' Rourke and Microsoft Hololens among others.

The aim of the venture that initially came out of an Innovate UKfunded competition was to take augmented reality technology and apply it to a major piece of infrastructure in a real-world environment, which turned out to be the Crossrail project.

By combining the Hololens digital eyewear with a Daqri smart helmet, the consortium has come up with a solution that allows the user to visualise and capture key data from the site within their eye line, hands-free and in real time. Other potential benefits include better communication between workers and with remote experts that can provide digital job guidance, accelerated timelines and process monitoring, reduced costs, enhanced safety and an improved way of implementing Building Information Modelling (BIM).





ROUNDTABLES

After lunch, attendees were invited to take part in four roundtables based on key Applied Visualisation topics: Skills, Business Barriers, Content Generation and Use of Immersive in Manufacturing. The sessions spawned a number of engaging debates on the challenges and opportunities that AV presents. The following is a summary of these discussions.



1. SKILLS

Participants were asked: What skills will future engineers need and how can we ensure these skills are developed? What skill sets are you missing now, and which ones are vital for the future?

This session focused on the skills that future engineers will need in the AV sector, and what can be done to ensure these skills are developed and taught – at school, college, university and beyond.

Topics that were discussed included when would be the ideal entry point for young people to start specialising in these skills; how would the required computer science-related skills become embedded within traditional engineering education, what needs to be done at different levels of education and how to facilitate a workplace where people with completely different expertise would be required to work together. The general consensus was that AV skills should become part of school learning, and that introducing it at university would be in most cases too late. The younger the person, the more enthusiastic and willing to learn they're more likely to be.

Some believe that degrees would not necessarily be essential, and that the attitude to learn and ability to learn quickly would be desirable strengths, especially when the technology is likely to be extremely fast moving.

Then there are the challenges involved with reskilling the existing workforce. It was felt that many of the new skills that will be needed could be picked up by experienced engineers that already have a long history of boosting their knowledge when needed – particularly learning new software programs, although trying to master a programming language could be a step too far for most.

The danger of potentially losing workers skilled in AV to industries such as gaming, and what needs to be done to entice them into engineering was also discussed.

2. BUSINESS BARRIERS

Participants were asked: Looking at the ways that data is shared across the supply chain, how do we account for the effects of cyber security, trust in data and intellectual property?

The roundtable topic that really got people talking was the session on business barriers – what is currently preventing a lot of companies from starting their Applied Visualisation journey.

Many questioned the user-friendliness of the technology, arguing that not everyone sees the equipment as easy to pick up and use - particularly more senior engineers – and that the tech is still 'finding its feet.' Others also felt that from what they've seen so far, it wouldn't apply to a lot of sectors as things stand.

The subject of standards was brought up on multiple tables as well. Many liked the idea of an 'open source' framework across different platforms and solid interoperability, where content creators control their own IP with confidence of fair and safe integration, but that would only work with proper standards in place, alongside rules to ensure the reliability and security of data.

Arguably the biggest barrier of all, however, centred around measuring and proving ROI (return on investment). Businesses will have their own methods of calculating ROI when they start considering a new way of working or upgrading their equipment, but it can be difficult to predict the potential financial gains that could result from a move into AV. The technology is still very new and fast-moving, relevant use cases can be scarce, it remains expensive for some (although costs have come down quite sharply in recent years) and many decision makers remain unconvinced that VR headsets, for example, are anything more than a gimmick that's more suited to immersive gaming.

As well as the reliability of data, the reliability of the content was also discussed. How can we be sure that what we're seeing in a digital twin is an accurate portrayal of what it's simulating in the real world, especially when any errors could be potentially disastrous to a project? Digital twins require vast amounts of details as well in order to be effective. Errors could also be hazardous, for example if a physical object in the 'real world' fails to appear in VR when the user encounters it.



3. CONTENT GENERATION

Participants were asked: What are the biggest issues around interoperability, data classification and trust in data? How do we ensure data stays accurate or deal with version management?

The majority of the comments made in these sessions were around data. Some talked about the need for design best practice, particularly when there are numerous programs available that are not of a high enough quality, and there is a great deal of variation in the standards of user interfaces.

The availability of data in order to make VR content also has to be considered. If a collaborative and sharing approach is most desirable, then some data might not be shareable because of regulatory reasons, or secrecy. When this isn't an issue though, sharing content could be beneficial.

Reliability and accuracy of data came up again in these sessions, as did the topic of interoperability and standards. When you're generating your content, does it conform across all formats? People felt that there has to be a level of interoperability and that standards would help achieve this,



while also facilitating the creation of workflows. Industry professionals also like to use programs that they're used to rather than regularly having to learn new ways of doing things. A suggestion was made that other sectors adopt processes similar Building Information Modelling (BIM), which is becoming more commonly used in construction.

One person suggested that if we want these experiences to be truly immersive then focusing primarily on the visuals is not enough. 3D audio and particularly haptics (adding the sense of touch) would offer clear benefits in many engineering applications.

"Excellent opportunity to engage with industrial and technology providers in a collaborative environment."

Henry Chow, Holovis

4. USE OF IMMERSIVE IN MANUFACTURING

Participants were asked: How are you seeing the value of AV in your organisation?

All of these sessions featured at least one representative from a company that has already adopted advanced visualisation, and the majority of the rest were considering doing the same in the future.

Those that have already invested spoke about how they approached specialists or went in search of collaborative partnerships to get the right knowledge. They also revealed how VR has allowed them to save time, for example by reducing the amount of travelling that would need to be done carrying out the task in the 'real world', and eliminate the need for high-cost physical mock-up tools.

In terms of funding, internal budget was acquired by starting small with a demonstration and then building an effective business case that argues the justification of the investment and the benefits it would bring. One person recommended dividing the process into stages so at each step progress is checked and evaluated before moving further forward.

Others yet to properly implement the technology were at different stages financially – some had budget earmarked for it but were struggling to make progress with their business plan, whereas others were still at the scoping stage.

Many of those taking part in the discussions saw VR's best use as a learning tool, and others envisaged using it for safety and remote expert applications, data visualisation, mapping a process or simply as an engaging method of user interaction.



On the topic of skills, most felt that generally outsourcing was a better option than in-house, even if the company would probably have more overall control with the latter option and costs would likely be lower. Some simpler tasks could potentially be done in house, however. The consensus was that using already available solutions would probably be more reliable and risk-free, and would be worth any extra outlay.

"A refreshing mix of people from different sectors who can learn from each other in surprising ways to get better at what we do."

Ned Crowe, Arup

EXHIBITORS

The event also featured two exhibition spaces that enabled AV technology providers to showcase and demonstrate their solutions.

The 2018 exhibitor line-up included:



CONCLUSION

As with any event covering visualisation topics including VR and AR, interest in the event was always going to be high, however following the success of the previous year's event, the organisers wanted to capitalise on the continued interest and awareness of the technology to provide the attending parties with greater insight into its use and adoption. The format of the day, including a blend of speakers, from OEMs and SMEs, through to policy makers and funders, gave the audience genuine vision and insight into the size and diversity of the applied visualisation ecosystem in the UK.

The roundtables promoted keen discussion. Attendees were encouraged to share their thoughts with fellow delegates and contribute to the activities, rather than simply to listen. This was an acknowledgment that when dealing with technology at a relative formative point in its adoption, everyone's insight is valuable and potentially compelling as part of wider narrative around the challenges faced such as barriers to adoption.

The output of this event is also being incorporated into a wider programme of work looking at the use and adoption of immersive technologies in manufacturing, which forms part of an InnovateUK-funded pipeline project: Business Engagement within the Immersive Sector (BEil).



The high-level ambition of the BEil project is to help the UK become a global leader in the development and commercial exploitation of immersive technologies and content (predominantly Augmented and Virtual - AR/VR technologies). To contribute to this goal, the BEil project was made up of a portfolio of activities to help a fragmented, but potentially worldleading, set of industries to understand the opportunity, scale and capacity of the research, development and innovation base for immersive technologies and content in the United Kingdom. As part of this activity, the immersive manufacturing report will be published during the summer of 2018.



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