

A user tries out Oculus VR's headset Oculus Rift Development Kit 2 at the Tokyo Game Show 2014

REALITY CHECK



Virtual reality is back in the spotlight but this time not just for games developers. What is driving it this time?

By **Andrew Williams**

INTEREST IN VIRTUAL reality (VR) technology has surged over the last few months since Facebook's acquisition of specialist startup Oculus Rift. A growing number of companies and software developers including Samsung, HP and Qualcomm have released products in an effort to grab a slice of a market that seems to have regained some of its promise. VR was one of the main talking points at this year's Consumer Electronics Show (CES) in Las Vegas.

For Jim McGregor, founder and principal analyst at Tirias Research, the main reason for the rising interest in virtual reality is improvements in the technology itself. Although he admits there is still "room for improvement", he argues that VR has now become a good experience.

Nic Mitham, CEO of KZero Worldwide and co-founder of WeArVR, agrees that significant improvements in the technology used in graphics cards, mobile devices and chips means that VR is now a much more consumer-friendly proposition.

"Every eight years or so since the 1980s there has been a revolution in computing. In the 1980s there were personal home computers, in the 1990s mobile phones and in the 2000s the Internet. VR is the next revolution," Mitham claims.

According to Eric Romo, founder and CEO at California-based start-up AltspaceVR, which has developed what he calls "social virtual reality" software that users can download to the Oculus Rift DK2, interest in VR is also rising as a result of dramatic price falls. He points out that headsets of equivalent quality to those currently available for \$350 would have cost over \$25,000 "only two or three years ago".

"So you have a nearly a hundred times

reduction in the price, and now you're starting to see significant improvements in quality as well," he says. "These headset technologies were driven by the mobile industry. The advancement of VR is also buoyed by improvements in graphical processing units, optical sensors and 3D engine technologies. You have a confluence of technologies, all maturing at the right time to create this VR renaissance."

At CES, AltspaceVR ran an interactive demonstration to show how the software can be used alongside Intel's RealSense camera technology to track the hand movements of players in a game of virtual beach volleyball.

"This allowed the participants to wave, gesture and engage in a game of beach volleyball with others in the demo as well as some of our staff located in the San Francisco Bay Area. We had the first virtual high-five between two people hundreds of miles away from each other," says Romo.

Comfortably immersive

Jim Christensen, director of media and influencer relations at HP, highlights the fact that the technical performance required to deliver "comfortable, convincing and immersive" desktop VR systems has only been available in recent years – and also singles out increased user comfort as another key development that has helped to improve market prospects. At this year's CES jamboree in Las Vegas, HP unveiled its own VR display, the Zvr.

"The VR environment provides images, audio and haptics in a way that leverages the human perceptive system. However, this must be done correctly to create a comfortable viewing experience," Christensen says.

According to Qualcomm, interest in VR as

well as augmented reality (AR) technology is rising because the capabilities of both hardware and software are expanding. "And there are now many more compatible and accessible devices in the market," a spokesman says, adding that devices are becoming "more sophisticated and user friendly, and simultaneously more widely available." Qualcomm has recently released Vuforia, a software platform that enables developers to create AR applications for mobile eyewear such as the Oculus-powered Samsung Gear VR Innovator Edition.

"In addition to being a reality consumers can now experience, the capabilities AR provides drive engagement and add value that users weren't able to achieve a few years ago," the spokesperson adds. "AR apps can allow consumers to visualise a TV or couch in their home before they buy it and turn everyday objects into gaming experiences right in their favourite pub or restaurant – and we see this as just the beginning of how AR can enhance people's everyday lives."

Despite such bullish predictions, VR technology developers are still likely to face a number of difficult technological challenges in order to fully realise the potential of any future growth in the VR market. For Christensen, the key challenge lies in building a developer ecosystem that will meet the demand for content with user value and integration with the new technology.

"VR represents a shift that is analogous to the advancements from a command line to a graphical interface, and a much bigger change compared to transition to touch. The user's ability to directly reach in and interact with data, objects and the scene represents a significant opportunity for innovation in the software development community," Christensen says. >

The Oculus Rift virtual reality headset, seen here, has been positioned as a device for gamers but developers are wary of VR being typecast as a gaming technology



< AltSpaceVR's Romo admits that there are several "very difficult technical issues" to be solved as the VR industry grows, including the need for "greater computing power, smaller and lighter devices and lower costs". He also points to the wide range of equally important market issues for the developer community to consider.

"The early adopters of VR were heavily concentrated in the gaming community – Oculus itself was positioned as a device for gamers. That was a great place to start, but we don't want VR to be typecast as a gaming technology. Not that this is not a very large,

and very exciting, market, but the potential of VR is much broader. As a community we need to showcase a greater variety of use cases and be seen as more appealing to a greater number of consumers," Romo adds.

When it comes to expanding the VR market, WeArVR's Mitham is also keen to stress the importance of improving user experience through the ongoing development of apps, games and experiences that are fit for purpose.

"Content is everything with VR – so the main challenge will be creating content compelling enough to encourage people to

buy the headsets," he says. "This is being overcome by open source and easily available tools to create experiences, meaning 'people power' is being harnessed to experiment with and create these new types of games.

"Awareness is important too," Mitham adds, "people need to know about VR. This is why the Facebook involvement is very good for the sector as a whole."

Tirias Research's McGregor believes the biggest future challenges will relate to the development of appropriate business models and their effective integration into the overall VR offering.

"The best experience is going to come from a game and platform that is designed for the experience. So, step one is working with the rest of the ecosystem. Step two is selling the headsets. The best way is to have it as part of the console or PC platform. We'll have to see if any of the VR vendors can come up with a way to sell it as part of the platform rather than a separate add-on," he says.

Key applications

For Mitham, although games will "always have a place" in the VR space, he believes that 'social' applications will soon emerge as the key driver – particularly by "allowing people to interact in shared online 3D spaces".

"If you think about it, social media as we currently know it isn't actually very social at all and is typically asynchronous – you comment on my Facebook picture or send me a message," he says. "Social virtual reality is the killer app, although of course the enterprise and business-to-business

MASS MARKET APPEAL EIGHTY YEARS IN DEVELOPMENT

Ever since the American science-fiction writer Stanley G Weinbaum first described a goggle-based virtual reality system in his 1935 short story 'Pygmalion's Spectacles', people across the world have been fascinated with the idea of creating and interacting with a fully immersive virtual environment.

However, it was more than 30 years before the American computer scientist Ivan Sutherland, in collaboration with his research student Bob Sproull, built what is now considered to be the first ever virtual reality (VR) and augmented reality (AR) head-mounted display.

Although primitive by modern standards, and so heavy that it had to be suspended from the ceiling, the system became the inspiration for ever more

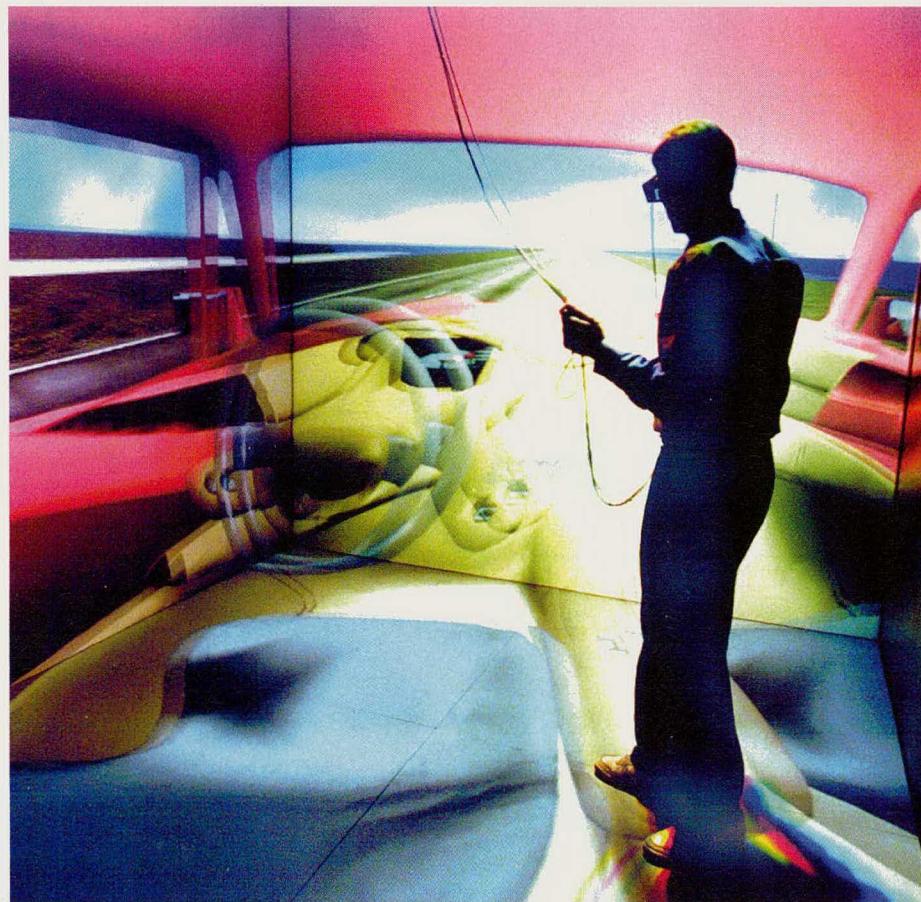
sophisticated VR technology over the following decades.

Sutherland himself went on to form half of the team that built the first CGI-based flight-simulation engine for, among others, Redifon – arguably the first true, and possibly the only long-term economically successful, VR app to date.

Over the last 20 years or so, a number of other companies – notably Sega, Nintendo and now Samsung and Oculus Rift – have also developed credible VR headsets.

However, although many commentators – including the magazine *Computer Gaming World* – predicted the advent of affordable VR by the mid-1990s, the technology has struggled to make the breakthrough into mass market appeal.

CAVEs are used to prototype designs such as the interiors of road vehicles



side will be very important too."

Along with steady advances in the hardware aspects of VR, HP's Christensen predicts that the key innovations are going to come from the software development community and he is confident that applications will be developed to take advantage of the "new, yet also comfortably familiar, VR environment".

"A common element to new VR applications will be a new level of engagement and discovery," he says. "The applications are wide and far ranging, including education, simulation and training, medicine, e-commerce, and communication."

Romo is convinced that an ever greater variety of use cases for VR will emerge in the future. In addition to personal and leisure activities, he expects that such uses will extend to business applications as well.

"Consider a global product design and manufacturing team. How much quicker could they complete design cycles if they could meet anytime in virtual space? How much would they save in travel costs and time?" he argues.

"VR could be an excellent tool for customer engagement, for example enabling a CEO to engage with key customers worldwide. We think that any use case where people benefit from feeling like they are in the same place as other people will be great for VR, and I'm sure this includes many uses we haven't thought of yet," Romo adds.

At Qualcomm, two trends that are anticipated over the next few years are the

growing popularity and capabilities of AR and hybrid AR/VR applications, and enhanced mobile hardware technology. According to the Qualcomm spokesperson, new capabilities with AR and VR on digital eyewear devices will also drive mobile engagement by "adding new layers of interactivity to products or objects in the users environment".

Gamers in the driving seat

In McGregor's view, it is still gamers that are driving the search for a better VR experience and, although he confirms that the industry is beginning to witness some interest in design applications, he predicts that gaming will be the primary driver for the next few years.

"There are a plethora of applications ranging from product design to civil engineering and system maintenance to education. However, most of these applications will require massive databases of information and the compute power to make them a reality. Like most new technologies, we are at the beginning of its introduction," McGregor says.

"It typically takes three to five years or two to three generations before the rest of the ecosystem matures enough to make mass market adoption a reality: this includes new applications, business models, and usage models. Note that I call this the technology adoption curve. It's always easy to get excited about a new product or technology, but it takes time to build the ecosystem to support it," McGregor concludes. *

TECHNOLOGY VR GOES TO WORK

Outside the gaming sector, some of the biggest common users of VR technology are scientists and university researchers. VR technology was an integral part of a recent collaborative research project between staff at University College London (UCL), Royal Holloway University, London, and Institut Català de Recerca i Estudis Avançats (ICREA), Barcelona, into how 'owning' another body affects social cognition and attitudes to other social, age and gender groups. As project partner Mel Slater, professor of virtual environments at UCL, explains, in virtual reality it is possible to substitute a person's real body with a virtual one.

When looking down at themselves while wearing a programmed head-mounted VR display, participants in the project saw a computer-graphics-rendered body instead of their own.

"This would be life-sized and also seen in stereo. If their movements are motion-captured in real time then as they move the virtual body would be seen to move correspondingly," says Slater.

"This is a powerful signal to the brain that this virtual body is their real body – even though, of course, everyone knows that it is not. But it is a perceptual illusion, and even knowing that it is an illusion doesn't take the feeling away – like most illusions," he adds.

In Slater's view, VR is a "great technology" for body representation research because it is possible to directly change the body, which he believes would be impossible with any other system.

In January, Aston University, Birmingham, also announced plans for a major expansion of its VR technology capabilities. The university's Centre for Vision and Hearing Research is spearheading a joint venture across the School of Life and Health Sciences and School of Engineering and Applied Science called ALIVE (Aston Laboratory for Immersive Virtual Environments). The university says the £3.9m project, when completed in 2017, will provide students with an "immersive full-scale experience" for studying topics "as varied as the physical world, the body, turbulence, prototype design, complex mathematical constructions, data visualisation and programming in computer science".

Tim Meese, professor of Vision Science at Aston University and director of ALIVE, says the facility will contain three main components, including a motion capture laboratory, a driving simulator and a 3m³ virtual reality room, known as a CAVE (Cave Automatic Virtual Environment).

"The CAVE will be at the heart of ALIVE and will be used to produce immersive 3D environments in which students, patients and participants can interact with simulated objects, surfaces, and other simulated people, [or] avatars," he adds.

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