

Project Breakthrough

Disruptive Technology Executive Briefs

NEW REALITIES

Discovering the virtual world

New realities describes a collection of technologies that change how we view and interact with our own world and how we create immersive experiences in new worlds. The most well-known of these are virtual reality (VR – a completely digital environment) and augmented reality (AR – where digital images are superimposed on the real world). However, the evolution of the technology means that new areas such as mixed reality (MR) are also beginning to have a disruptive effect. MR is a sub-set of augmented reality where the real and virtual worlds merge to produce visualisations where physical and digital objects interact in real time.

The technology

The technology underpinning the realities themselves is not new but the computing power has only recently become available to make them truly commercially viable. New realities are typically accessed through head-mounted displays (HMDs) though, in the case of AR, these can be provided through a device with a camera and display screen, such as a tablet or phone.

The potential

The real excitement surrounding new realities is in their potential to succeed today's mobile devices and become the dominant medium through which people

interact with technology. It also has the potential to significantly improve technologies such as videoconferencing, telepresence and remote collaboration. While these are in use today, many have failed to live up to their initial hype.

VR and AR both enable new kinds of experiences and platforms for collaboration and interaction. In future it will be possible to carry out many of today's business and leisure activities inside virtual spaces. An early example from the commercial world is the use of VR by architects or property agents to provide consumers with virtual tours of buildings. AR technology is also being used in the manufacturing sector for product training and field engineering services, helping in the installation and maintenance of equipment.

The barriers

The current generation of HMDs are rather bulky and uncomfortable to wear for prolonged periods. There are also concerns about the psychological and health impacts that may arise from long exposure to highly immersive virtual environments. A further barrier to adoption is the cultural sensitivities around the use of HMDs in public places, as seen in the widespread rejection of GoogleGlass due to privacy fears.



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Some Example Applications...



AR in medicine

Two thirds of the world's population don't have access to safe surgery. Proximie is helping the lack of access to specialists in developing countries by providing a rich and interactive augmented reality platform to train, guide, and support surgeons. It allows specialist surgical training to be delivered globally, and is enabling specialist surgeons to provide expert support to guide procedures in conflict zones.

AR in maintenance and engineering

Israel relies on desalination for 80% of its drinking water. Keeping the equipment in the desalination plants running 24x7 is critical for Mekorot, the nation's water supplier, as the length of time from sea to tap is only three hours. Through the use of AR, Fieldbit have helped make Mekorot's field service engineers more efficient and effective. Field engineers now have access via smart glasses and a mobile app to experts and vendors anywhere in the world. They can see

exactly what the engineer is seeing and provide targeted guidance, sharing messages and superimposing markings and diagrams directly to the engineers field of view. This has improved the rate of first time fixes, enables more effective diagnostic and dispatch of replacement parts rates, increasing the overall speed of recovery and reducing equipment down-time. It is also enabling a resource library of protocols for complex fixes to be developed which is changing how they train and develop of engineers.

AR for workers with intellectual disabilities

Wireless Reach and the Vodafone Spain Foundation collaborated to provide customisable mobile AR applications for workers with intellectual disabilities. The applications included step-by-step training guides, multimedia tutoring materials and access to other work-related information. These helped them work successfully, increased their autonomy and advanced their careers.

Key Numbers

\$162 bn

Estimated market size by 2020 (AR and VR)

Source: Statista

5 bn

Estimated amount of AR applications on mobile devices in 2019

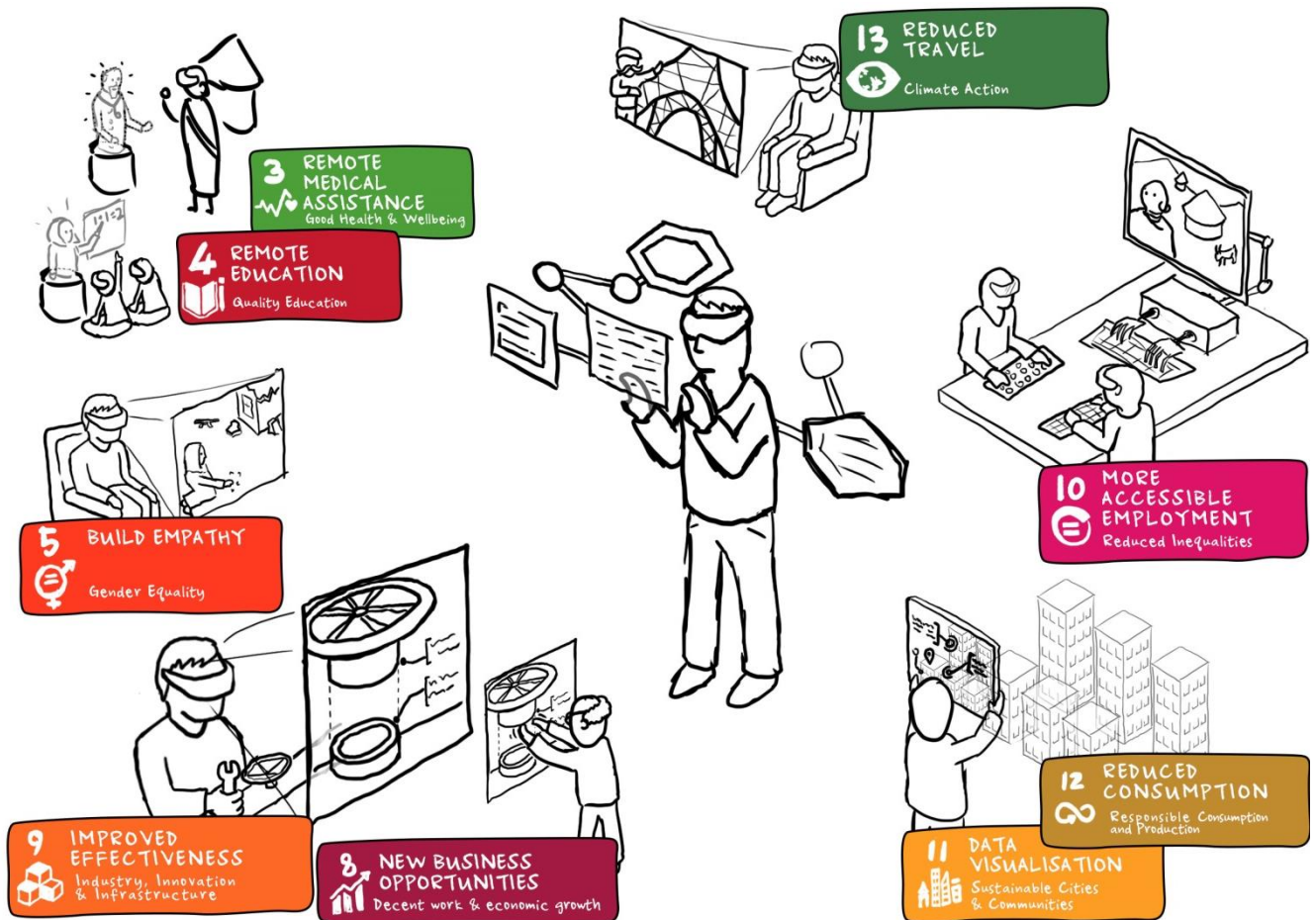
Source: Statista

760%

Increase in the number of AR/VR specific systems shipped between 2016 and 2020

Source: Statista

Advancing the Sustainable Development Goals (SDGs)



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New realities have the potential to advance many of the SDGs. Below are some examples of areas of application across a wide variety of sectors.

π SDG 3 Good health and wellbeing

- Make virtual reality mental health treatments for disorders such as PTSD, anxiety and phobias accessible to the many.

π SDG 4 Quality education

- Provide education and training remotely to learners in remote locations, in practical and immersive ways that lead to better outcomes.
- Allow access to education by leading experts irrespective of location.
- Enable on demand learning at the point and time of need.

π SDG 5 Gender equality

- Promote equality and build empathy through creating shared immersive experiences and the ability to “see the world through another’s eyes.”

π SDG 8 Decent work and economic growth

- Drive economic growth through effective collaboration regardless of location, bringing together the right skills and knowledge.
- Allow access to expertise and know-how to be shared regardless of location.
- Build empathy and trust across distances and cultures through rich telepresence experiences, opening up new markets.
- Create new business opportunities in the entertainment and leisure sectors.

π SDG 9 Industry, innovation and infrastructure

- Provide rich virtual environments for remote working that allow effective team working and collaboration.
- Improve effectiveness and speed of design and development through shared visualisations of products and services.

π SDG 10 Inequality

- Reduce the importance of proximity for certain types of economic activity and partially mitigate existing regional economic imbalances.

π SDG 11 Sustainable cities and communities

- Reduce the overall need for travel by substituting physical presence for telepresence.
- Boost awareness and appreciation of the world's cultural and natural heritage through virtual tourism.
- Reduce the need for physical signage in cities and provide immediate dynamic information relating to the environment.
- Test responses and engagement with new urban designs in virtual reality before starting building.

π SDG 12 Responsible consumption and production

- Enable cleaner factories through visualisation and instant feedback with AR.

π SDG 13 Climate action

- Significantly impact climate change through a reduction in travel.
- Encourage better stewardship of the natural environment on land and sea through immersive campaigning and better education.
- Reduce the need to travel through the use of high quality and immersive VR and AR technologies in business and social / tourism contexts.

Potential Negative Impacts and Barriers

Just as the potential benefits for New Realities are still being explored, so too are the risks:

Health

Some potential health risks have been identified with the widespread mass market adoption of virtual reality. These include the risk of addiction and increased social isolation for those who choose highly realistic and immersive virtual experiences over participation in their society and communities. There are also some fears that prolonged use of VR could damage eyesight, and some users experience nausea and motion sickness.

Privacy

AR devices generally require always-on cameras and other sensors that can lead to privacy concerns. The backlash against the use of Google Glass in public places was evidence of this.

Access

High-end HMDs required for both VR and AR applications are currently quite costly and remain out of reach for a consumer mass market, although popular alternatives are HMDs that incorporate a phone or phablet such as Samsung's Galaxy Gear, or the low-cost Google Cardboard. As with many technologies, ensuring that it does not create significant divisions between rich and poor will be a key concern.

Fake news

The use of immersive experiences in journalism offers the potential to bring stories to life powerfully and allow experiences to be shared and to build empathy. However, it also has the potential for misuse, manipulation and as a tool for creating polarising propaganda

Technical Considerations

Whilst advances in computing power have allowed new reality technologies to be viable commercially, there are still technical barriers to wide-spread adoption.

Size and comfort

Many of the augmented reality and virtual reality HMDs available today are quite bulky and can become uncomfortable if worn for prolonged periods. This is less of an issue for VR, where usage is often in benign environments such as home or office, but is crucial for AR where the focus is on use in a wide range of physical environments and workplaces. Creation of a convenient, non-bulky HMD that can be worn constantly remains a considerable technical challenge. Ensuring a big enough field of view is another technical difficulty in current devices that are restricted

to smart-phone sized screens. This is a particular issue for AR as when it is close to large objects they can only be partially viewed.

Computing power

Virtual reality, in particular, demands very high specification computer hardware to run (often a PC optimised for gaming) and the HMD is usually tethered to the computer, limiting movement. Most manufacturers are seeking to cut this physical link in future products and costs are likely to decline substantially over coming years, increasing access to higher end technology. Lower cost VR and AR technology has benefited from the innovation in processing chips and displays from the dramatic growth in smart phone evolution over the past five years.

Enabling New Business Models

New reality technologies have wide ranging impacts across sectors and value chains.

This is particularly true in areas where remote collaboration is required and in education, visualisation and simulation.

VR in particular is already being used within business and industry and examples of applications include:

- Virtual tours of a business environment or workspace and the simulation of architectural designs that allows architects and builders to experience a building before is constructed
- VR and AR training for new and existing employees
- On-the-job expert support for remote and field force employees
- 360 degree views of a product for marketing
- Immersive simulations to gauge human performance, sentiment and to identify risk
- New forms of entertainment and leisure activities.

Many businesses have embraced VR as a cost effective way of developing a product or service. For example, it enables them to test a prototype without having to develop expensive physical versions. It is also a good way of detecting design problems at an early stage, when they can be rectified more cheaply than if they are uncovered later.

AR applications are also emerging in supply chain management. SAP has developed a warehouse operations systems that use smart glasses from Vuzix to provide real-time data about products and materials. While the impact may be small in the short term, the cumulative effect of reduced inefficiency could bring substantial overall improvements.

The relatively low cost of new reality technologies and computing power mean that there are opportunities for start-ups to come up with innovative applications and use cases, and bring these to a global market through internet enabled distribution platforms.

New realities will enable a number of the disruptive business models identified on the Project Breakthrough website, specifically:

A more personalised product or service

When coupled with other technologies such as AI, new realities will provide personalised experiences to meet the needs of individuals, whether that be for education and training, coaching and support, or entertainment.

A collaborative ecosystem

New reality technologies enable organisations to collaborate in virtual environments, regardless of location, and will enable team working.

An agile and adaptive organisation

New reality technologies will allow organisations to design new products and services more rapidly, and explore how consumers might engage with them.

More Examples...

Treating the global mental health crisis with virtual reality therapy

<https://techcrunch.com/2016/01/06/virtual-reality-therapy-treating-the-global-mental-health-crisis/>

Inspiring action to end polio for ever with VR films

https://www.inition.co.uk/case_study/virtual-reality-films-inspire-action-ending-polio-forever/

Bringing Augmented Reality to Heavy Industry

<http://www.engineering.com/AdvancedManufacturing/ArticleID/11264/DAQRI-Smart-Helmet-Brings-Augmented-Reality-to-Heavy-Industry.aspx>



United Nations
Global Compact

The United Nations Global Compact is a call to companies everywhere to align their operations and strategies with ten universally accepted principles in the areas of human rights, labour, environment and anti-corruption, and to take action in support of UN goals and issues embodied in the Sustainable Development Goals. The UN Global Compact is a

leadership platform for the development, implementation and disclosure of responsible corporate practices. It is the largest corporate sustainability initiative in the world, with more than 9,000 companies and 3,000 non-business signatories globally.



Project Breakthrough

Project Breakthrough – a collaboration between UN Global Compact, Volans and partners – spotlights the best thinking in sustainable innovation. It showcases innovators across mainstream companies and next generation entrepreneurs who are developing solutions with the potential to achieve exponential impact. It features analysis and resources designed to help leaders understand the new business models and technologies that will be crucial in achieving the SDGs, catalysing action amongst today's businesses to meet the needs of tomorrow's world.



The Disruptive Technology Executive Briefs are produced in collaboration with PA Consulting Group, combining cross sector technology, innovation and business design expertise. The briefs are intended as an easy to digest introduction to disruptive technologies, to help organisations understand how they could advance the Sustainable Development Goals and business performance. These overviews explore key features, examples of applications, potential positive and negative impacts, and how they may enable the new business models.

Visit www.projectbreakthrough.io for more information, or contact projectbreakthrough@unglobalcompact.org