Virtual Reality and Augmented Reality: Industries and Applications

For: CTM, Marshall School of Business, USC
June 30, 2017

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What is VR and AR?

• Virtual reality: Computer generated simulation of 3D image or environment that can be interacted with in a seemingly real or physical way by a person using special equipment, such as headsets and controllers.

• Augmented reality: Integration of digital information with the user’s environment in real time. AR superimposes computer-generated image on a user’s view of the real world through a headset or smart-device.
**Examples of VR Hardware**

- **PSVR:** Sony’s Virtual Reality headset for the PlayStation 4
- **HTC Vive:** Developed by HTC and Valve Corporation
- **Samsung Gear VR:** Pairs with Samsung Galaxy smartphones

*Source: The Best VR (Virtual Reality) Headsets of 2017, Greenwald 2017*
**Examples of AR Hardware**

- **Microsoft HoloLens**: Most widely used commercial AR headset.
- **Epson bt300**: Among the least expensive options current on the market.
- **Smartphones**: Simple AR apps are available on smartphone devices on the apps store.

Source: Fab Five - The Top 5 Pieces of Augmented Reality Hardware, Hemmer 2016
Industries Investing In VR/AR

Source: 10 Industries Rushing To Embrace Virtual Reality, Morris 2016; 10 Industries Embracing Augmented Reality, Cox 2016
What Companies Are Doing

COMPANIES

• Major companies include Sony, Microsoft, Samsung, Intel, Qualcomm, IBM, Facebook, and HTC to name a few
• Facebook purchased Oculus VR for $2 billion in 2014
• Facebook has acquired 11 VR/AR companies, mostly through its subsidiary Oculus
• In terms of the number of investments made, Rothenberg Ventures has made 32 investments in the industry, while HTC has made 28 investments in VR/AR startups

INNOVATION

• Facebook is building AR glasses and has a separate VR team working on ways to bring VR into Facebook
• IBM’s Watson is being applied to VR. Rectangular Studios is creating a VR experience that allows users to speak in natural language to avatars in the virtual world and have them reply in kind
• The number of AR/VR jobs posted on LinkedIn has tripled in the last two years; most of these positions are from Facebook

FORECAST

• According to the International Data Corporation (IDC), worldwide revenues for VR and AR technologies in 2017 was projected to be $14 billion, an increase of 130.5% from 2016’s 6.1 billion
• IDC also predicts AR and VR spending to increase over the next few years, amounting to over $140 billion in 2020

Source: Mason (2016); Molla (2017); Vanian (2015); Worldwide Spending on Augmented and Virtual Reality Forecast to Reach $13.9 Billion in 2017, According to IDC (2017)
How VR and AR Is Being Used In The Middle East

- Trade and Tourism
- Advertising and Media agencies using AR/VR for creative ways to present to their clients

- VR and AR being vigorously adopted in architecture and engineering
  - Immersive apps and content being used to showcase project details

- VR and AR being used in 3D visual design and animations, video games, graphic design, and post-production services
  - Event technology and turnkey solutions

- Certain schools using VR and AR to provide history lessons

Source: Top Virtual Reality companies in Dubai (2016)
How VR and AR Is Being Used In Japan

- Use of AR/VR in healthcare; treatment of patients with cognitive behavior disorders, phantom limb syndrome, etc.

- Extensive use in video games and entertainment; by companies such as Nintendo and Sony; in video game arcades and shopping malls

- Japanese motor companies are using VR/AR to understand how customers experience their car. Toyota used virtual reality as part of its TeenDrive365 campaign to educate teenagers and parents about distracted driving

- Branded VR experiences are helping Companies understand viewers opinion on their logos and the like for their companies. Digital marketing agencies are also exploring how they might couple VR and brands

- Companies are using VR/AR for training purposes; training mechanics, future surgeons, etc.

- VR/AR is being used in tourism. Customers get a first hand experience of how their trip will look and feel like in VR before taking the actual trip

Source: Drake (2017); Carson (2015); Virtual Reality technology: Virtual Reality business in Japan (2016)
An Interesting Use of AR in The Military

Applied Research Associates developed the ARC4 system as a gadget that can attach to most military equipment, such as helmets, and can even be integrated into weapons control systems. Its purpose is to allow commanders to send maps and other information directly to the soldier’s field of vision. The system provides accurate, real time data on any wearable see-through display, including night-vision equipment.

Source: Google glass for war: The US military funded smart helmet that can beam information to soldiers on the battlefield, Prigg (2014)
Some Interesting Case Studies

• Virtual driving trials to assist road sign design: a case study of Ohashi junction
  • A VR driving simulation system used to design a tunneled highway junction in Tokyo Japan. The simulation allows for road and transport plans to be experienced from a driver’s perspective in a real-time 3D environment. User feedback will be used to assist design of road signs. This study is testing the effectiveness of the VR tool for safety assessment and designing road signs and markings for the Ohashi junction project.

• Effect of Virtual Reality Graded Exposure on Anxiety Levels of Performing Musicians: A Case Study
  • This study examined the effects of computer generated virtual reality graded exposure on the physiological and psychological responses of performing musicians. The study was conducted on three upper division undergraduate saxophonists while immersed in four virtual environments, each designed to gradually increase the anxiety level of the performer. The study found that virtual reality graded exposure did elicit physiological and psychological indications of increased anxiety in musical performance environments designed for that purpose.

• Using electronic maps and augmented reality-based training materials as escape guidelines for nuclear accidents: An explorative case study in Taiwan
  • This study examines the effectiveness of e-maps and AR based escape guidelines on mobile phones in getting to safe zones and shelters during nuclear disaster training. This system was proposed since the older paper-based training material was ineffective. Results showed that e-maps and AR based training was more effective than paper-based training.

Source: Lorentzen, et. al. (2011); Orman (2004); Ming-Kuan, et. al. (2013)
**SWOT Analysis**

**S** • New technology with a wide range of applications  
• Reducing the need for physical objects or interaction  

**W** • Prolonged use can produce sickness  
• Hardware is expensive  
• Not a lot of content available yet  

**O** • Variety of uses and potential markets  
• Growing market with new areas of job growth  
• Biggest opportunities in the Asian and Middle Eastern markets  

**T** • Lack of content  
• Media reports of addiction to VR can drive away potential users  
• High competition in a niche market


