

# VIRTUAL REALITY: FROM WOW TO THE REAL WORLD

Authored by: **Barry K. Mills, CFA**

*The technology is best known in the videogame space, but it also opens up wide-ranging possibilities for many industries, including travel, retail, engineering and health care. In this paper, Senior Analyst Barry K. Mills, CFA, delves into its disruptive potential.*

“What is real? How do you define ‘real’? If you are talking about what you can feel, what you can smell, what you can taste and see, then ‘real’ is simply electrical signals interpreted by your brain.”

Morpheus, *The Matrix*, 1999

Although we have not yet reached *Matrix*-level degrees of virtual reality, this popular technology has undergone significant refinement, enabling users to suspend disbelief and enter an imaginary, interactive world, complete with full sensory experiences. Perhaps most obviously, virtual reality, or VR, has the potential to transform how videogames are played. However, it is also poised to benefit a wide range of industries and be used in a variety of applications.

## The VR Evolution

Despite its futuristic, science-fiction associations, VR is not a recent invention. The first iteration might be considered the View-Master, which made its commercial debut in 1939 and gave users their first taste of an immersive experience using still photos.



In 1991, Sega planned to launch the Sega VR headset, but the product never made it to store shelves because it caused nausea and severe headaches for users. Four years later, Nintendo brought its 3D game console Virtual Boy to market, but it failed because it made too many component compromises and required users to sit at a table.



Today, the VR experience is much more immersive with better graphics, giving users a 360-degree sense that they are participating in the event they are watching. Imagine watching a rock concert, hearing the music and feeling the electricity of the crowd. Or imagine watching a movie produced in VR and being able to see the characters and scenery around you. These experiences are happening now. And technology giants are betting big on VR's future, as evidenced by the splashy launches of Oculus Rift and HTC Vive, a new generation of consumer hardware that, quite literally, brings virtual reality home.

The cost of a VR experience is nearing the mass-market level of affordability. The Oculus Rift and HTC Vive are retailing for \$600 and \$800, respectively, plus the cost of a PC. The Samsung Gear VR is a \$100 virtual-reality device that attaches to and works with Samsung Galaxy smartphones. The smartphone revolution has caused hardware costs to plummet, as displays, graphics processors and memory components are all in abundant supply, given the volume of phones sold every year.

### What Are the Killer Apps?

While no VR software yet exists to send the mass-market running for hardware upgrades, thousands of applications are now available for purchase, including some popular games for consumers and useful apps for businesses. Some of the most common uses include virtual home tours used by real estate agents and prospective homebuyers, and virtual car simulators used by automakers, engineers and potential customers. Other app samples are highlighted here:

- **NextVR** has developed a system to capture and deliver live and on-demand VR experiences in true broadcast quality. It recently signed a five-year deal with Fox Sports to stream virtual content from its live sports contests, transporting viewers to courtside seats at NBA games, for instance.
- **YouVisit** uses its studio to create interactive experiences for a range of industries, including travel. Adventure-seekers can take a virtual sailing trip to Croatia or witness the northern lights over the Alaskan sky. YouVisit also has created virtual college and university tours to give prospective applicants a taste of campus life.
- **Marxent Labs** focuses on commercial VR apps and helped create Lowe's Holoroom, a VR-based in-store tool that allows customers to design remodeling projects and "see" their designs in a full-size 3D visualization.
- **Bioflight VR** built a VR platform that enables the health care industry to create fully interactive, medically precise biological models designed from comprehensive custom digital data sets. Surgeons can use these immersive and interactive simulations for diagnostics and training.
- **IrisVR** has developed software that architects, engineers and designers use to make immersive, true-to-scale VR walk-throughs from 3D files. Users can visualize a new building, complete with a range of sun positioning. If a client and architect are in different cities, they can interact in a VR environment and adjust their designs.



## The Future of Virtual Reality

When Facebook Inc. purchased Oculus for \$2 billion in March 2014, Mark Zuckerberg said in a blog post: “Virtual reality was once the dream of science fiction. But the internet was also once a dream, and so were computers and smartphones. The future is coming.”<sup>1</sup>

It is impossible to forecast the market size for VR with any certainty, although we expect to hear a lot of hype in 2016. Goldman Sachs recently estimated the market size to be \$80 billion in 2025, with a split of \$45 billion in hardware and \$35 billion in software.<sup>2</sup>

We believe investors will likely overestimate the technology’s short-run prospects – while underestimating the potential long-term success. That said, the market provides a host of challenges to VR’s wide adoption:

- A virtual reality head-mounted display (HMD) is not an attractive fashion statement. In time, we expect the design to improve, but the device still needs to cover the user’s face.

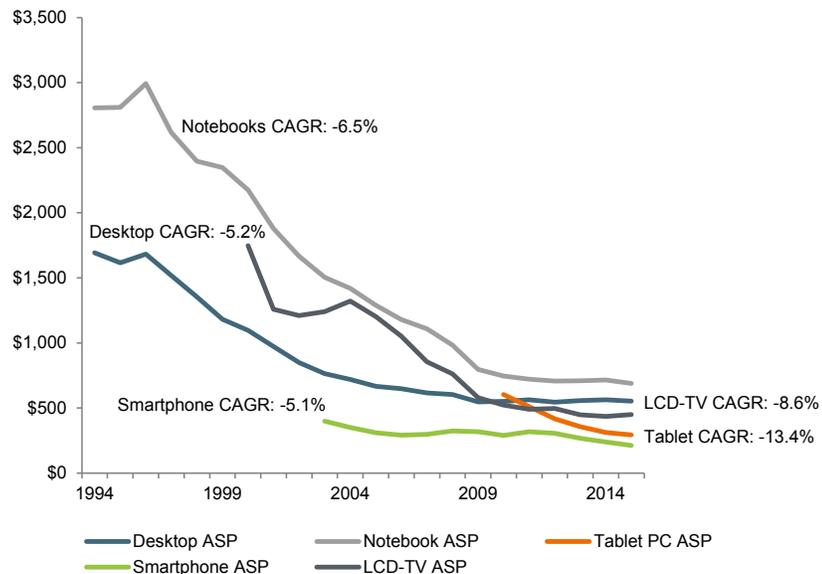


- Image resolution on HMDs resembles looking through a screen door, although we anticipate this will also improve over time.
- To have a rich VR experience, users have to be able to control hand gestures. When wearing HMDs, users can’t see their surroundings, making it difficult to hold a controller. HTC Vive is shipping hand controls now, and other OEMs are expected to follow suit.
- It is unclear what type of HMD will be successful in the marketplace.
  - » Currently, the best immersive experience requires a connection to a PC with robust graphics, which can cost \$1,500 -- not including the HMD.
  - » On the other hand, Samsung Gear VR costs \$100 and requires a Samsung phone to snap into it. While convenient, today’s phones lack the graphics horsepower and battery life conducive to an optimal experience.
  - » We could see the launch of standalone and dedicated HMDs that do not need to be attached to a computer or phone but would be wireless and have longer battery life.



- While costs have declined, VR HMDs are still expensive and haven't reached the sweet spot of \$200 to \$300.

HMD price declines could be similar to what we've seen in the past



Source: Goldman Sachs Global Investment Research, 1994-2015.

### Potential Winners and Losers

While it is too early to make predictions about the dynamic VR market, we have identified several elements for a successful framework.

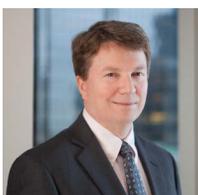
- App stores have proliferated in the smartphone world, and their structures are intuitive for consumers to use. We anticipate the same will be true in the VR world. App stores also are good for application developers, given the payment mechanism or the 70/30 revenue-share split.<sup>3</sup>
- Historically, in the PC and mobile world, a strong developer base has been vital. Therefore, it will be important for large platform companies to have software development kits (SDKs) and solid application programming interfaces (APIs) to ensure trusted, reliable and secure applications.
- We believe companies with a large installed base of users will be very successful. For instance, game-console companies should be in a good position initially. Approximately 55 million people have an Xbox One or PlayStation 4.<sup>4</sup> In its January 2016 earnings report, Apple said it has 1 billion active devices, while Facebook has 1.5 billion active users, according to its company info page.<sup>5</sup>

It will require significant effort to get all the ingredients right. Hardware costs and device performance need to improve, but history suggests this is where hardware companies can succeed. At the end of the day, great content -- whether games, apps or experiences -- will go a long way to drive adoption.

## End Notes

1. <https://m.facebook.com/zuck/posts/10101319050523971>
2. Heather Bellini, CFA, Wei Chen, Masaru Sugiyama, Marcus Shin, Shateel Alam and Daiki Takayama, "Profiles in Innovation: Virtual & Augmented Reality – Understanding the race for the next computing platform," Goldman Sachs Group, Inc. Jan. 13, 2016. <http://www.goldmansachs.com/our-thinking/pages/technology-driving-innovation-folder/virtual-and-augmented-reality/report.pdf>
3. Ross Sandler et al, "Has VR Finally Arrived?" Deutsche Bank, March 3, 2016.
4. Mark Walton, "EA lets slip lifetime Xbox One and PS4 consoles sales," Ars Technica, Jan. 29, 2016. <http://arstechnica.com/gaming/2016/01/ea-lets-slip-lifetime-xbox-one-and-ps4-consoles-sales/>
5. Apple: <https://www.apple.com/pr/library/2016/01/26Apple-Reports-Record-First-Quarter-Results.html> & Facebook: <http://newsroom.fb.com/company-info/>

## About the Author



### **Barry K. Mills, CFA** | Director, Senior Research Analyst

Barry is a senior research analyst on The Boston Company's Global Research team, primarily covering the semiconductors, hardware and consumer electronics industries. In addition, he serves as a portfolio manager of the Core Research Technology Sector Equity strategy. Before joining The Boston Company, Barry was a senior managing analyst at Dreyfus, where he worked for six years as a portfolio manager and analyst. Prior work experience includes serving as a portfolio manager and senior equity analyst with Phoenix Investment Partners and as director of research for Howe and Rusling. He holds a B.A. in economics from Hobart College and the Chartered Financial Analyst® designation.

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