TechCast A Virtual Think Tank
Tracking the Technology Revolution

When Will Virtual Reality Become a Reality?

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The idea of a "virtual reality" was first conceived in 1956, when Morton Heilig designed the Sensorama, the first device to provide the user with a fully immersive interactive experience. The Sensorama was mechanical but it had the ability to replicate sight, sound, touch, and even smell.

Present technologies surfaced in 1968 when Ivan Sutherland created "The Sword of Damocles" (SOD), the first fully-integrated head display. The system used two separate monitors for each eye to provide stereoscopic viewing, and motion tracking equipment to monitor the user's head movements. The result was the first fully virtual environment.

The first haptic interface was developed in 1977, and was known as the Sayere Glove. It used light tubes and photonic sensors to detect hand movement. Though the Sayere Glove was primitive, it led to the creation of the VPL Dataglove in 1987, the first commercial glove, and variations on the design of the Dataglove are used in most VR interface systems today.

VR systems today take many different forms and have many different applications. From entertainment to scientific visualization, three-dimensional walkthroughs to real-time prototyping, virtual reality has become an extremely useful tool for researchers, scientists, and manufacturing companies that are striving to improve design capabilities. VR has also had a long history of use for training purposes, from flight simulators to surgery.

Pop culture has also had a major influence. In 1992, "The Lawnmower Man" was a movie about a simple-minded gardener who is turned into a psychotic super-genius by VR. It made great use of vivid computer graphics, and has been credited with starting the VR research boom of the 1990's. Other movies have been made about VR, including "Virtuosity" and "Disclosure," but none have come close to capturing the VR experience.

Despite the fascination with VR, the technology is a long way from being in homes. In the 1990's there were some feeble attempts to bring VR to the masses. The now-defunct company Virtuality introduced immersive video games with a head-mounted display, primitive wireframe graphics, and a 3D mouse to interact with the environment. While the public was briefly captivated, high-end video game consoles were introduced shortly thereafter, and Virtuality, along with their VR videogames, quickly disappeared.

Impediments to Mainstream Adoption

Three major limitations impede mainstream adoption of VR: technical sophistication, cost, and value.

Technical Sophistication   Despite enormous advances in computing power, common PCs are still not capable of creating environments that can be displayed in real-time. Moreover, VR systems require an enormous amount of data input that is far more complex than keying information into a database or spreadsheet. Three-dimensional scanners, complex processing algorithms, and extensive data analysis are required to build fully-virtual environments. This technological sophistication is available only to researchers in the field, and even then it takes a great deal of time to build just one experience.

Cost   Cost is the single most significant impediment to mainstream adoption. Current VR systems generally cost more than $5,000 for even a basic heads-up display and a haptic glove or 3D mouse, and there are no indications that these costs are likely to decrease soon. Screens typically cost more than $2,000 each and do not match the resolution of a typical computer monitor of today.

Value   Although the PC has become a necessity today, twenty years ago it would have been extremely unusual to find a PC in a home. VR is currently in the same position. Apart from the limited technology and high cost, most people question the utility of VR. Would it be useful to have a three-dimensional video chat with friends instead of a phone call? Where would you put a VR system, given that current devices require an entire room for the equipment? Until someone can demonstrate a utility function that everyone can understand, there is little chance of VR reaching mainstream adoption.
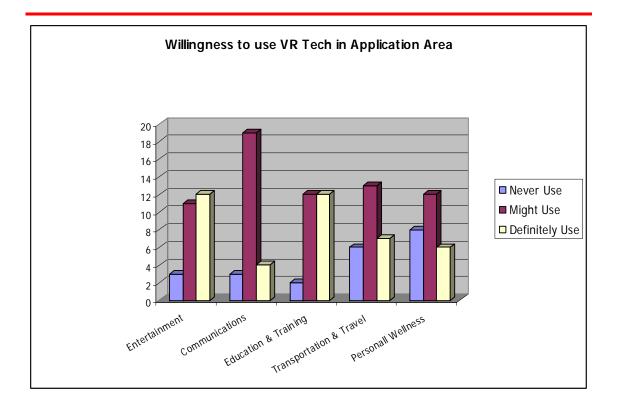
Research Methodology

        To learn about potential uses of VR and forecast its mainstream adoption, I surveyed 30 experts in the field. I asked the respondents to estimate when VR will reach mainstream adoption (defined as 30% of the public), along with their opinions on where the VR revolution is likely to be born.
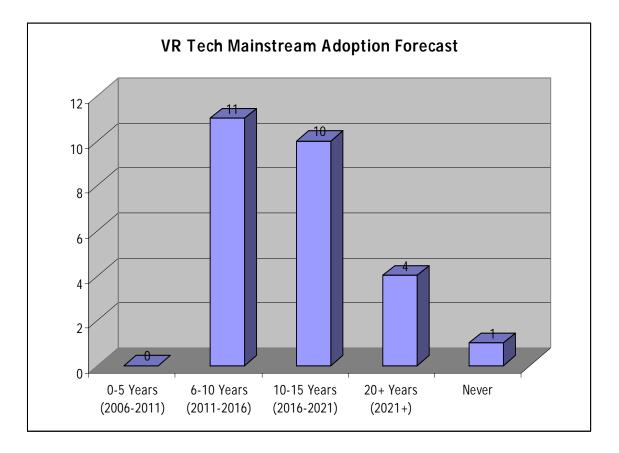
        I also surveyed 50 consumers that are tech-savvy "first adopters" of new technologies. They were youngish (late 20s to early 30s), college educated, single, and middle-class. The respondents were asked to estimate when VR would reach mainstream adoption and a series of questions regarding their opinions on the cost of VR technology in application areas (entertainment, communications, education and training, transportation and travel, personal wellness/exercise). There were 26 responses to the survey.
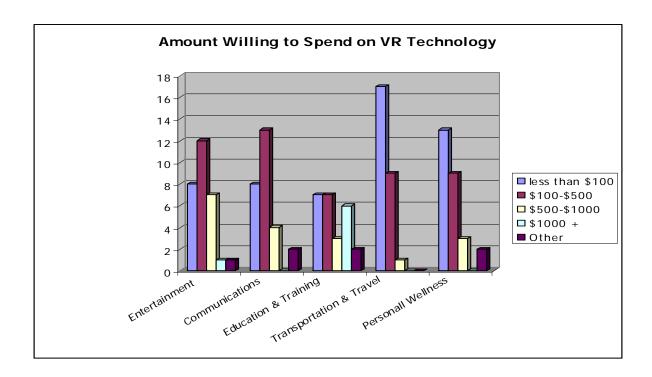
Results

        The experts thought VR would not reach mainstream use for at least 10 years and possibly more. Additionally, two of the respondents believed that technological sophistication was the single largest impediment to mainstream adoption, while the other thought cost is the largest impediment. All felt that job training and educational uses are the most promising applications of VR, which agrees with literature sources.

        As shown in the graphs below, most of the tech-savvy respondents thought mainstream adoption of VR will occur somewhere in the next 5 to 15 years, which is a little more optimistic than the experts. They also rated their willingness to use VR most highly in communications, training, and entertainment applications. Finally, they would be willing to spend only $ 100 or so on most applications.

Willingness to use VR Tech in Application Area

Legend:
- Never Use
- Might Use
- Definitely Use

Categories: Entertainment, Communications, Education & Training, Transportation & Travel, Personall Wellness

VR Tech Mainstream Adoption Forecast

Category	Value
0-5 Years (2006-2011)	0
6-10 Years (2011-2016)	11
10-15 Years (2016-2021)	10
20+ Years (2021+)	4
Never	1

Amount Willing to Spend on VR Technology

Legend:
- less than $100
- $100-$500
- $500-$1000
- $1000 +
- Other

Discussion and Conclusions

Utility is the key factor in determining whether a user would be willing to try VR, let alone spend significant capital on it. The most significant trend among users is the tendency towards spending $500 or less on VR equipment for any application, indicating that cost will be a key factor in achieving mainstream adoption. Most respondents were willing to spend more on VR technology for entertainment and communications purposes than for travel or personal wellness.

One of the most unexpected results of the survey was that 10 survey respondents reported that they believed cybersex would be the single largest contributing factor to taking VR into the mainstream. Considering that DVD technology was brought into the mainstream by the adult film industry, this may be a very prescient indicator.

These results suggest VR still has a long way to go before it reaches mainstream use. TechCast forecasts mainstream adoption will be achieved around 2016, which seems to match most of the available literature as well as these results. In all likelihood, VR technology will first reach the masses as a form of entertainment. This will help build understanding and awareness of the capabilities of the technology, and will ultimately help build consumer demand for VR technology in other application areas. Major growth is likely to occur in the training and education markets, and widespread use of VR technology for

training is likely to occur before consumer use, particularly since the cost of such systems will be too high to justify its purchase for one user.

Despite the difficulties, as cost continues to come down and PC power improves, VR will eventually reach mainstream adoption. After synthesizing all of the data, the results of this research leads me to the conclusion that mainstream adoption will occur around 2020.

Selected References

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