Insight

The Increased Adoption of Augmented and Virtual Reality and its Challenges: A Primer

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Executive Summary

- Augmented reality (AR) and virtual reality (VR) have seen a significant rise in popularity in recent years, including applications catalyzed by the pandemic due to social distancing restrictions.
- Once considered niche products in the entertainment and gaming industry, AR/VR is seeing expanded use in many industries including education, health care, and marketing.
- Some have expressed concern regarding privacy and safety issues as the adoption of AR/VR technology for general use grows, especially for wearables such as glasses.
- Some privacy and safety concerns can be addressed through the development of informal social norms and by innovators and consumers, while others may require more formal policy action.

Introduction

The introduction of social distancing during the coronavirus pandemic has spurred further adoption of digital tools that reduce the need for physical interaction. Once niche products used exclusively for entertainment and video games, augmented reality (AR) and virtual reality (VR) technologies have increasingly been employed by a wide range of sectors—from education and health care to retail and real estate—to provide users with an enhanced remote experience.

But as AR/VR are more widely adopted, some are expressing concern about privacy and safety issues related to the technologies. Google's Google Glass, the first major introduction of wearable AR glasses, brought to light some of the major concerns in the widespread adoption of these technologies. These include the potential for non-consensual capture of photo and video, face recognition data collection and management, potential for malware, and potential distractions for drivers wearing the device. Due to these concerns, Google Glass failed to gain traction in the general consumer market. The product experience did, however, provide the industry with valuable insights, and it has adapted and evolved to address these concerns while further experimenting with new applications of the technology beyond its original intent.

The success of AR/VR will depend on consumers accepting the way innovators and policymakers allow applications of this technology to develop. Current laws and regulations regarding data privacy might slow the adoption of these technologies, as it can prevent them from capturing and processing basic data needed for their core functions. This primer explores the current state of AR/VR technologies, the benefits from expanding its implementation, and how policymakers and innovators may address the concerns regarding this expansion.

The Evolution of AR/VR

In recent years, there has been increased implementation of augmented reality and virtual reality technology in various devices for general use. These technologies have provided an "extension" of reality, by providing sensorial experiences that blur the line between the digital and the physical world. The biggest difference between AR and VR is in their approach. Augmented reality typically enhances images from a camera, often a cellphone camera, to introduce a digital shape into the "real-world" image. Emblematic examples include the "try with AR" function where users can preview how certain products would look and fit in a determined location by using a smartphone camera and projecting a virtual model of the product over the captured image in real time. Such technology is available from retailers including Amazon, Target, and IKEA.

Virtual reality opts for a more immersive approach, often using special glasses and headphones to block outside images and audio and deliver a fully digital experience. These devices make use of cameras and gyroscopes to track user movement, and provide an immersive simulation where users have a feeling of being in a virtual world.

AR/VR technologies have seen the most success in the entertainment sector, particularly in the video game industry. AR video games such as Pokémon GO and VR devices such as the Oculus Quest 2 and PlayStation VR have had widespread adoption. Other applications are also growing in popularity. Online retailers are increasingly adapting AR technologies to allow potential buyers to preview the products. According to e-commerce platform Shopify, products that introduced a "preview with AR" option in their platform showed a 94 percent higher conversion rate. This trend accelerated with the pandemic, as consumers used this function to preview products online, due to the difficulties or risks of visiting physical stores.

The application of AR/VR technologies has also shown promise in the future of education, where these technologies are being used for immersive teaching of historical events, virtual school trips, and even firefighting training. By making use of AR/VR, teachers are able to increase student engagement and retention, as it allows students to have a more vivid experience of the materials being taught. It also allows for better training in many industries where real-life simulation might have been more difficult. For example, emergency first responders are now able to simulate scenarios such as wildfires or airplane fires, which are often too dangerous or difficult to recreate.

Health care is another sector in which AR/VR technologies have seen increased use. VR simulation is enabling surgeons to plan surgeries beforehand, allowing them to foresee circumstances that could put patients at risk, and often making these procedures less invasive. There have also been advances in the application of AR for tele-health services and in the use of VR for the treatment of post-traumatic stress disorder. The application of AR technologies in which users scan a QR (Quick Response) code to access additional material or media has also seen increased use for tourism and marketing, where these codes are included in booklets, advertisements, and even on the sides of paintings. of paintings.

Despite the shortcomings of the Google Glass in the general consumer market, various companies have manifested their interest in releasing similar AR-ready wearable glasses in the future. While currently most of these wearables—including Google Glass—focus on enterprise use, companies such as Facebook or Snap have announced their plans to release wearables for general use. Wearables of this type give users various tools, such as in-screen GPS, photo and video capture, and location-based interaction with other users.

Greater implementation of these technologies could have tremendous impact on the quality of life of individuals with special needs and disabilities. AR and VR are providing students with attention-deficit/hyperactivity disorder (ADHD) or within the autism spectrum with tools for better educational experiences. Additionally, these technologies are aiding visually impaired individuals with day-to-day tasks such as reading and signing

documents, and heightening their senses in order to have a better cognition of their surroundings.

The Challenges in the Implementation of AR/VR Applications

While the benefits of AR/VR technologies seem to be plentiful and promising, their widespread implementation, especially for general use, might face pushback on multiple fronts.

Google Glass serves as a case study that provides the technology industry with multiple insights into consumers' and policymakers' concerns regarding privacy and safety. This product faced a range of criticisms, from the potential for non-consensual capture of photo and video, to the use of face recognition data collection and management, the potential for malware, and creating potential distractions for drivers wearing the device. These concerns likely played a role in its low adoption in the general consumer market and bans in certain cities, such as Las Vegas. These hurdles relegated Google Glass to the enterprise market, where its use is more restricted and easier to monitor.

As this prior experience shows, often the most significant concern regarding the adoption of wearable AR/VR glasses is the potential violations of privacy for third parties. This concern stems mainly from the option to take photos or videos from the glasses. Typically, when a user wants to take a picture, he or she has to take a device out to do so, providing awareness to those around that they are potentially being captured on the image. But with wearables, such signals might not exist. These concerns are heightened by the threat of spyware and unsanctioned, sideloaded apps (apps that are installed through third-party, non-approved app stores) that bypass recording restrictions. As sideloading mandates are being pushed at the federal level, these threats could become more prominent.

Privacy concerns are not limited to the impact on third parties, but also for users. A report by the Information Technology & Innovation Foundation fleshes out the different types of data that AR and VR technology needs to process in order to provide their services. These technologies must amass tremendous amount of data such as location, face and object recognition, and movement. These data are then either processed by the computer, saved into the device, or uploaded into the cloud in some way. The mechanisms implemented in order to protect this flow of data will be key, especially as these products can and often are marketed toward minors, meaning the products can be held to higher privacy restrictions.

Another major concern with these technologies, especially wearable devices, is the potential distractions it can cause to drivers, bikers, or pedestrians—even if using the technology for commuting purposes, such as GPS functionality. This concern was a key argument in the proposals for restricting the use of Google Glass in West Virginia, which pushed to prohibit the use of AR glasses while driving.

The Balance Between Protection and Innovation

How can policymakers and others address privacy and safety concerns while enabling beneficial AR/VR technologies to flourish? The right balance will likely include a combination of careful policy and social norms. Overly restrictive legislation could effectively hinder the growth of valuable technologies. Policymakers should avoid attempting a one-size-fits-all privacy protection scheme that ignores users' risk tolerances and limits their ability to choose which and how much data they are willing to share. Policymakers should seek to address the specific risks associated with certain applications of the technology or use scenarios. Striking a balance between privacy and innovation is not an easy task, especially when some of these products are used by children and may require additional scrutiny. Existing privacy regulations in the United States focus on much of the data

users consider particularly sensitive such as health information or data belonging to children, but the extent to which these regulations are applicable for AR/VR is unclear. The implementation of soft law tools, such as regulatory sandboxes, would allow manufacturers to have the necessary legal certainty and establish guidelines for privacy protection.

Concerns regarding regulatory certainty are also present in light of state-level privacy policies Some states have passed their own laws regarding data privacy or collection of biometric data. These could severely limit some of the functionalities in AR/VR devices, such as eye and motion tracking. It could also limit the ongoing development of devices and software relying on photo-realistic avatars, such as virtual conferencing tools or virtual social networks.

In contrast to federal regulation, state laws' impact on AR/VR will be more direct over their respective states, as companies can opt-out of selling in certain markets. A recent example of this dynamic is high-energy-consuming computers, where PC manufacturers have stopped selling their products in certain states due to the adoption of new power consumption regulations. This provides consumers with the option to "vote with their feet," deciding if the results of these regulations are acceptable for them, while also providing states with the option to experiment with what regulation works best in achieving that balance between protection and innovation.

Past experiences with other technologically disruptive devices, such as cellphones and cameras, suggest that formal policy tools are not necessary to address all of these concerns. As new technologies are increasingly adopted, there is a process in which social norms and device etiquette are formed that prevents socially undesirable use of these devices, and this process is already observable with wearables. For example, manufacturers have voluntarily adopted certain design practices to address concerns regarding the capture of photo and video. One of the most prominent measures is the inclusion of indicators, such as a light, that show others that the camera in a wearable is active. Another feature that is prominently being adopted is the requirement that users must push a button to capture photo and video, so that the hand motion required to activate the function can give a distinctive signal to others that they might be recorded.

To address concerns regarding the potential distractions for drivers, these wearables can adopt practices already established in smart cars or cellphones, where they activate a "car mode." This mode is less visually intrusive than its normal functionality, restricting notifications and only displaying essential functions on the screen, such as GPS. Additionally, existing distracted-driving laws could be updated to address potential problematic scenarios as well.

A lighter and less directive approach allows manufacturers to have a flexible, evolving mechanism, where customer feedback is the primary driver of adjustment. This feedback allows for faster response and adaptation than regulation often provides, while also allowing for experimentation and innovation. As a result, manufacturers would have the tools to address these concerns in different ways, providing users with choices based on their preferences and risk tolerance.

Conclusion

Once considered niche devices primarily for entertainment purposes, AR and VR devices have seen higher adoption rates and a more extensive application in recent years. Their evolution might lead to new technological breakthroughs in fields such as education, health care, and professional training.

Despite their tremendous growth and potential, these technologies face a wide range of challenges. Responding

to these is mostly the responsibility of manufacturers, but policymakers should recognize the need to adapt regulations to allow for the growth and adoption of these technologies. Current regulations could prove to be inadequate, as the extent to which they are applicable for AR/VR is unclear. The use of soft-law tools such as sandboxing provides clear guidelines and legal certainty to manufacturers that could aid growth in the sector, while an overly restrictive regulatory approach might prevent these devices from performing their basic functions. As with other devices, such as cellphones and cameras, social norms and innovation have proven to be powerful tools to address these concerns.