

### **What is Augmented Reality (AR) ?**

**Augmented reality (AR)** is a live direct or indirect view of a physical, real-world environment whose elements are augmented by computer-generated sensory input such as sound, video, graphics or GPS data. Unlike virtual reality, which creates a totally artificial environment, augmented reality uses the existing environment and overlays new information on top of it.

### **There are three types of AR:**

- **Image target**, in which you overlay a real-world 2D image with video, text, images, or 3D objects
- **Object recognition**, in which you fix a digital 3D model to a real-world 3D object
- **Plane detection**, in which you fix a digital 3D model to a real-world flat surface

### **Advantages of AR Technology**

- Through AR technology users can interact with the real world in real time.
- AR technology also enhances the perceptive power of humans.
- AR technology facilitates the users to ubiquitously and timely access to information that is required.
- It saves the time of users (doctors, surgeons, students etc.) on searching information about a particular topic.
- AR technology recognizes the user's freehand gestures and saves electricity to a large extent.
- Due to AR technology, information has become more realistic.

### **Disadvantages of AR Technology**

- Many of the smartphones do not possess the capability of feeling the external camera in real time.
- AR technology could lead to people becoming more dependent on devices this may cause a large number of health-related issues.
- AR technology is not equipped with security policies. Intruders can hack the AR-based devices and can manipulate the devices according to their needs.
- It is expensive to develop AR based systems and its maintenance is also very expensive.

### **Benefits or advantages of Augmented Reality (AR)**

Following are the benefits or **advantages of Augmented Reality (AR)**:

- ➔ The AR system is highly interactive in nature and operates simultaneously with real time environment.
- ➔ It reduces line between real world and virtual world.
- ➔ It enhances perceptions and interactions with the real world.
- ➔ Due to its use in medical industry, life of patients has become safer. It helps in efficient diagnosis of diseases and in early detection of them.
- ➔ It can be used by anyone as per applications.
- ➔ It can save money by testing critical situations in order to confirm their success without actually implementing in real time. Once it is proven, it can be implemented in real world.
- ➔ It can be used by military people without putting their life in danger by way of battle field simulation before the actual war. This will also help them in actual war to take critical decisions.
- ➔ It can be applied to part of training programs as it makes things memorable and eye catching.

## **Drawbacks or disadvantages of Augmented Reality (AR)**

Following are the drawbacks or **disadvantages of Augmented Reality (AR)**:

- ➔ It is expensive to develop the AR technology based projects and to maintain it. Moreover production of AR based devices is costly.
- ➔ Lack of privacy is a concern in AR based applications.
- ➔ In AR, people are missing out on important moments.
- ➔ Low performance level is a concern which needs to be addressed during testing process.
- ➔ It requires basic learning to effectively use AR compliant devices.

## **What are the Advantages of AR?**

Augmented Reality can help create an entirely new, interactive experience for users. Moreover, augmented reality offers a solution to the problem of being left out of the latest technological advances. The following advantages of AR make it a perfect tool for many sectors in the future.

### **1. Enhanced Experience**

One of the benefits of Augmented Reality is that it can provide an enhanced experience. This means users will be able to take their phones and hold them up in front of a certain area, such as a building or natural landmark. The app then overlays information on top of what they are seeing, providing more depth than could otherwise be seen by just looking at something without AR technology like this.

You can see buildings from different angles and determine where you are standing through enhanced maps and positioning. For example, when used for navigation purposes, perhaps one perspective shows pedestrians crossing while another looks down onto the street below with arrows showing which direction drivers should go next.

### **2. AR will be Easy to Use**

For mobile phone users, augmented reality is really easy to use. Just point your camera at an object, and the app will show you what it does with that particular item. So, for example, if you wanted to know how many calories are in a slice of pizza, all you would have to do is find an image of one on your screen and watch as the number pops up right next to it.

You can also look at something like furniture or clothing, so when you walk around your room or go shopping, you'll be able to see how well they fit into the space. It's easy for anyone who knows the way around their smartphone because all this information isn't just sitting there inside some clunky program; it's in fact, everywhere they look as far as the eye can see.

### **3. Supports Business Activities**

AR is speculated to transform every business from housing to the retail market as the customers would be able to get more of the benefits and invest accordingly. Augmented Reality helps you with construction projects. The technology allows workers to identify and fix damaged parts of a building, structure or facility.

AR can also be used in the designing and remodelling processes; for instance, it is often more cost-effective than physical prototyping. This means companies have fewer upfront costs when they are designing new products. They will know what the final product looks like before manufacturing begins.

#### **4. Educational Advantages of Augmented Reality**

The pros of augmented reality include its potential as an educational tool that can provide rich content. The data is based on accurate GPS coordinates and provides navigation and directions without relying on paper maps.

Furthermore, there is greater access among students, educators and researchers to knowledge. For example, teachers can interact with students in classrooms globally while simultaneously teaching a lesson on the other side of the world using AR-enabled tools like Google Expeditions (Currently closed) or Aurasma.

#### **5. Improved Technology**

Augmented Reality is often used in the medical field for teaching methods and even surgery guidance. It has also been found that AR may help with learning disabilities such as dyslexia or ADHD by making it more fun and engaging than traditional methods can.

Augmented Reality can also make a person's job easier because they can have information on demand about their work at any time. This would enable them to alleviate the need of interrupting someone else for this type of request or wait until they get back into an office before checking out what was needed.

#### **What are the Disadvantages of AR?**

Augmented reality is not as natural and intuitive as it appears. It's a lot of work to create an AR experience that feels organic for the user, and there are many different ways in which your product can be used incorrectly by consumers. The limitations of augmented reality include the costs majorly. Some other disadvantages of AR are as follows.

##### **1. Unaffordable**

Augmented reality is expensive to create, and some AR apps are too complex for the average user. The cost of an app can range from \$0 up to around \$100k; it all depends on how complicated you want your app or advertising campaign to be.

Not everyone has much capital to invest in augmented reality (AR) technology, so only certain large organizations have this advantage. Small scale companies would also be unable to afford this technology due to higher expenses.

##### **2. Privacy and Security Problems**

Augmented Reality can cause privacy or security concerns. This is rooted in AR making it difficult to discern between what's real and what's not, thus leading to a fear of being "tricked" by an attack.

For example, people using social media may be more likely to believe in false information if they're convinced their friends posted about it on Facebook.

### **3. Promote Risky Behavior**

Augmented Reality is a technology that uses virtual overlay on the physical world. It can be used in games, entertainment, and many other ways. Augmented Reality has been around for decades, but it's only recently that they've had significant advances in technology to make them more mainstream, with smartphones and tablets providing AR experiences to consumers at an affordable price point.

### **4. Addiction and Fatalities are major disadvantages of AR**

One of the cons of AR is that people share how addictive it can be to constantly check their phone for updates on the game or other apps. This addiction has been deemed as "smartphone fever" by psychologists and physicians.

Augmented reality can be a little challenging when it comes to real-life problems such as workplace accidents. For example, factory workers might lean over too far and end up injuring themselves due to vision being blocked by their glasses/contact lenses, such as leaning over while operating machinery at high speeds where there's no time to react.

### **5. More health issues**

As the limitations of augmented reality are still in discussions, studies say the technology has many unprecedented health risks. The wearer of AR devices would immerse themselves into Virtual content which could lead to hearing loss, damage to eyes, even induce some behavioural changes.

According to another study by Google daydream, users may tend to experience a virtual environment to be real leading to differences in how they perceive and process things. Such processes would lead to psychological problems like PTSD.

### **Benefits of AR:**

- The primary benefit of Augmented Reality is that it can be used by anyone including mentally and physically disabled individuals.
- It blurs the line of difference between the virtual and real world, thus increasing its usability and effectiveness in the area of application.
- It possesses a highly interactive nature which enable to assess several instances in advance.
- Success or failure of an instance can be determined by using the computing power of AR, thus saving a ton of money.
- It finds its heavy usage in the field of health, thus increasing the accuracy of diagnosis for diseases. Since now, it has saved lives of numerous patients.

### **Drawbacks of AR:**

- One major drawback of AR based application is the lack of privacy
- AR based applications or devices cannot be leveraged without appropriate training thus increase costs and time involved
- There can be certain instances where such applications have recorded low performance, thus reducing the overall appeal of the package.

- It can get extremely costly to develop and maintain an AR based device or an application.

### **How will virtual and augmented reality affect me?**

We could have a worldwide workforce without the need for any single structure. You may work from anywhere if you have internet access. VR also can enable individuals to be present in real-world settings ? in the best seats ? to attend events with no human footprint, transportation expenses, or infrastructure required.

### **Does AR have a future?**

Augmented reality (AR) may have exploded on the scene as a means to bring digital things into the physical world. Still, it has subsequently evolved into a valuable tool for many sectors. It has become an everyday occurrence, and the future appears to have no boundaries.

### **How will AR change the world?**

Augmented reality (AR) is the technology that allows digital information to be overlaid and woven into our physical world. AR is a tool that may help us use our homes as learning, working, and entertainment areas during a worldwide pandemic because many of us are now there at home.

### **Virtual Reality**

#### ***Pros:***

- VR, when implemented properly, can be an incredibly engaging sensory ride. Using computer-generated imagery (CGI), there are no limits aside from money and imagination when creating other worlds, product demos, or spaces in novel and interesting ways.
- When applied to education, VR makes learning easier and more comfortable.
- Virtual reality users can experiment with artificial environments

#### ***Cons:***

- VR is a fragmented market. Headset pricing ranges from about \$15 USD (Google Cardboard using a smartphone) to \$1,500 USD (HTC Vive Pro) and many choices with widely varying capabilities in between. VR standards are in the early adoption stage and content created for one platform will usually not work with another.
- Content creation tends to be customized and, oftentimes, expensive. Best practices for effective and engaging content creation are still being worked out as well.
- VR is often an isolating, individual experience – it takes you somewhere else, a place removed from the existing environment. This is the opposite effect of events where one of the main goals is to bring people together and interact in a group.
- VR is slow for demos. It takes time to configure the headset, to put on/adjust the headset, explain the controls, and for the user to view the content. Even if the content is only two to three minutes long, an exhibitor would be lucky to get 15-20 people per hour through the system.

### **Augmented Reality**

#### ***Pros:***

- AR, when used properly, can provide very useful and engaging information layered onto a real-world scene.

- Basic AR apps using smartphones are well-established.
- Apple's latest phones/tablets and AR developer kit have some very significant new capabilities. Newer Google Android phones also have strong AR functionality. Smartphone users can see furniture in their own home before buying (IKEA), find their way to an airport gate (American Airlines AR), play games (Monster Park), see restaurant menu options in rotating 3D before ordering (KabaQ), measure distances very precisely (AR measuring tape), and much more. As these newer phones become widely used, it is likely that AR apps will see mainstream use with lots of opportunities for exhibitions and events.
- New tools have been created to help doctors during surgeries by allowing them to be constantly aware of patient data during the procedure.

#### **4 Strategic Benefits of Augmented Reality**

There are 4 major benefits of Augmented Reality that cannot be denied in any way. In fact, they are tangible and deliver measurable results that brands have already started leveraging AR to their advantage. Here is a quick brief of those benefits of Augmented Reality.

##### **1 Creates unique customer experiences**

The biggest advantage of Augmented Reality is that it creates unique digital experiences that blend the best of digital and physical worlds. Also, it does not need any special hardware or software to savor the experience.

Mainstream smartphones and mobile apps are sufficient to experience Augmented Reality. In fact, the latest developments in AR have even made it possible to experience immersive experiences through web browsers.

Now how are AR experiences unique compared to other experiences? The most common audio-visual experiences we know of exist either in the physical realm or in the digital realm. Augmented reality, for one, blends both the realities. It places digital components atop physical components thus creating a mirage effect.

For example, users can point their smartphones at a tourist attraction when near its vicinity. When viewed through the screen, the AR app places digital snippets on the screen thus allowing the user to consume both the physical and digital information synchronously. A perfect example of this is the Apple Park Visitor Center.

##### **2 It eliminates cognitive overload**

Have you ever tried repairing an automobile by referring to a manual? If not, give it a shot and you will quickly realize what a bad idea is. Nothing against support manuals and docs, but, most often they do not help amateur users make sense of how to fix something. Especially if it is a new model that does not resemble the previous car makes and engineering.

What we are referring to here is the cognitive information load. Cognitive overload happens when your working memory is made to process a huge chunk of more information than otherwise, it can handle comfortably. When you are unable to handle it, it leads to frustration and hampers your decision-making. This is exactly the reason why amateur users struggled fixing something by referring to lengthy and detailed support documents.

Can Augmented Reality solve this problem? Augmented reality presents information in neatly summarized digital snippets. It spares the user from having to process too much information to arrive at a conclusion. Be it to identify a component by size or to see the popularity of a restaurant with a star rating, AR can help users take quick decisions without cognitive overload.

This might seem too futuristic, but there are brands that have already implemented AR-based mobile applications that are helping users do more with less time.

### **3 Heightens user engagement**

When it first became popular, Augmented Reality was largely labelled as a technology for gaming and entertainment. However, with time it has expanded into several other use cases that can deliver solid business gains. Heightened user engagement is one such gain.

In 2021 and beyond, if there is one priority that ranks top on the agenda of most business leaders, it is improving user engagement. User engagement is like the gateway to several other benefits. From more spending to brand loyalty it can yield countless gains for a growing as well as an established business. The challenge is in serving the right material at the right time to the use that will make them engage.

Years ago, brands were mainly able to engage with users through print because of the large user base. However, in 2020, 83.1 million consumers in the US were estimated to have used AR on a monthly basis (threekit)

Scannable product labels, interactive ads, catalogs, store signage — there are countless ways how AR can be used to heighten user engagement. The novelty of the technology combined with its ability to deliver information in a quick and snackable way makes it engaging for users.

To cite a real-world example, Pepsi's bus stop ad in London caught more eyeballs and attention than any print and TV ad could have. It was pulled off with the help of Augmented Reality. Perhaps it is the single best campaign that showcases the advantages of Augmented Reality in Advertising.

### **4 Competitive differentiations**

In a market where all competitors are offering homogenous products at the same price band, it is necessary for brands to differentiate themselves. For so long, brands have used traditional advertising channels and the creative possibilities within them to differentiate themselves.

Augmented Reality will help them go out further with creative campaigns that will position them differently in a crowded market.

Let's take Nike as an example. The sportswear market is definitely one of the most crowded and thickest markets there is. Although Nike has been around for a long time, maintaining its market position and continuing to attract millennial customers needs extra effort. Especially when the competition is on the heels with new innovative products.

Nike was able to cement its position as a global brand and a pioneer in marketing with its AR app. If you have been shopping for shoes recently, you know how difficult it could be to find the right size shoe. Sometimes the brand measurements don't match your physical size. To help customers find their sizes easier, Nike has introduced an Augmented Reality tool. The tool uses your smartphone camera to scan your feet and returns the exact size you should be going with.

Additionally, the app also gives several other trivia about the shoe, data, and so on that turns the shopping process into a fun activity rather than a chore. Rest assured that the sky's the limit when it comes to creating differentiating campaigns using Augmented Reality.

### **In a Nutshell**

As a race, we humans spend more time staring at screens of various sizes. Our realities have become deeply integrated with digital experiences. In fact, we have been programmed to rank a brand as superior and inferior based on its ability to dole out digital experiences.

In such a scenario, it is necessary for brands to leverage a mixed reality technology like Augmented Reality. After all, it is the only technology that does a pure blending of physical and digital reality.

To sweeten the deal, Augmented Reality also offers a series of strategic benefits that businesses cannot ignore. Be it winning attention, differentiating yourself from the competition, or simplifying processes for customers, Augmented Reality can help with it all.

With these benefits from Augmented reality in plain sight, the question to ask is NOT whether to adopt Augmented Reality, but how soon?

### **Some Examples of VR/AR Costs**

#### ***VR Costs***

VR application development costs come down to the kind of content you are aiming to create. Sometimes you will need a mobile VR application, other times you are looking for a VR game. Some applications can be built with simple 360 videos, while others will be built in full computer-generated based environments.

**360-3D interactive video:** \$10,000 for each minute filmed + post-production. Example:  
[https://youtu.be/xAbEm4\\_8K3g](https://youtu.be/xAbEm4_8K3g)

**Computer-generated based environment applications:** between \$40k and \$70k for a non-gaming mobile VR application. Example: <https://youtu.be/Igvl2xdYp-E>

**Computer-generated based gaming applications:** between \$50k and \$100k for gaming-based projects. Example: depends on the complexity and other factors, such as the kind of platform it will be released on, the quality of animations, etc.

- AR/MR headsets are pricey (Hololens: \$3,500 USD; Magic Leap \$2,295 USD) and have some serious limitations in their current forms. Both have a limited range of fields and the gesture controls are somewhat difficult to use. We will not see widespread consumer use until costs lower substantially and the form factor improves.
- AR/MR headsets are geeky looking and will be used only for specific applications; they will not be meant for everyday use in the foreseeable future.

#### ***AR Costs***

Marker-based AR or image recognition based AR provides additional information about a scanned object. An object is detected with a front-facing camera and then proceeds to provide information on the screen regarding the object. This allows the user to view the object in more detail from various angles or potentially rotate the image in 3D as well.

**Marker-based AR:** \$5-10k per 3D modeled object interaction and UI. Example:  
<https://youtu.be/qhq5leJt280>

**Room Scale AR:** \$40-50k per room, depending on the number of objects.

Example: <https://demodern.com/projects/ikea-vr-showroom>