

# Augmented Reality & 5G

By Jim Harris

The Augmented Reality market has evolved. By 2025, the AR global market will be \$300 billion with 1.2 billion users.

I attended Huawei's Better World Summit for 5G + AR online on Jun 17, 2021. The company introduced the Huawei AR Engine, a development platform for mobile devices, and released a white paper *AR Insight and Application* by Strategy Analytics which you can download [here](#). AR has huge potential in application in retail and eCommerce, tourism, health care and education. To drive AR's adoption and predicted explosive growth, Huawei called for greater collaboration among industry players.

The explosion of AR will be driven by developer tools becoming simpler and more powerful. For instance, Huawei's Air Photo uses unique algorithms to convert a 2D photo into a digital 3D model, significantly simplifying AR 3D character modeling. And Huawei's AR Engine allows developers to write 10 lines of code to create mobile AR effects during app development.

## What is Augmented Reality (AR)?

Ikea has an AR application that lets you see what a room would look like with an Ikea couch in it. The **reality** (a photo of your home) is **augmented** with an image of an Ikea couch. This is a great example of how AR can be used in retail.



One of the most basic mobile AR apps are the Instagram filters people overlay on pictures that they take of themselves.

### Cosmetic App

During the COVID pandemic, women don't want to try on makeup samples. A number of cosmetic companies have released AR apps that let you see what you'd look like with different colours of lipstick. Here's L'Oreal's app:

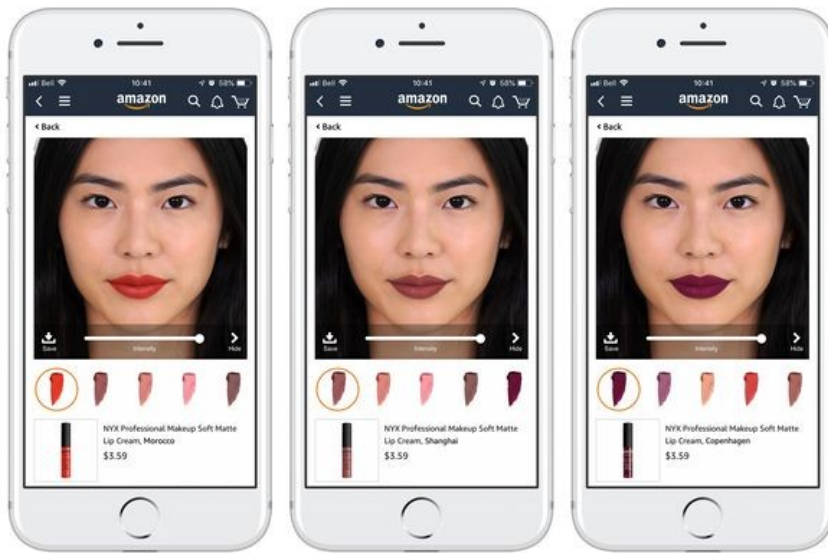


Image: <https://venturebeat.com/2019/06/04/amazon-and-loreal-let-you-digitially-try-on-makeup/>

The ultimate AR app of course is Pokémon Go. It was released in 2016 and was downloaded more than 500 million times globally by the end of its first year!

Using the mobile phone's GPS the user can locate, train and battle virtual creatures called Pokémon which appear in real world locations on the player's mobile device. Pokémon Go has been downloaded 1.1 billion times generating \$1.23 billion of revenue in 2020. There are four critical insights from Pokémon:

#### 1) Specialized Equipment vs. Smartphones.

If Augmented Reality requires special equipment like an Oculus headset (see below), the market will be limited for a couple of reasons. First, people don't carry a specialized headset around with them at all times, but they do carry their smartphone and secondly, when they wear one of these they may find that they get disoriented and dizzy as I do.

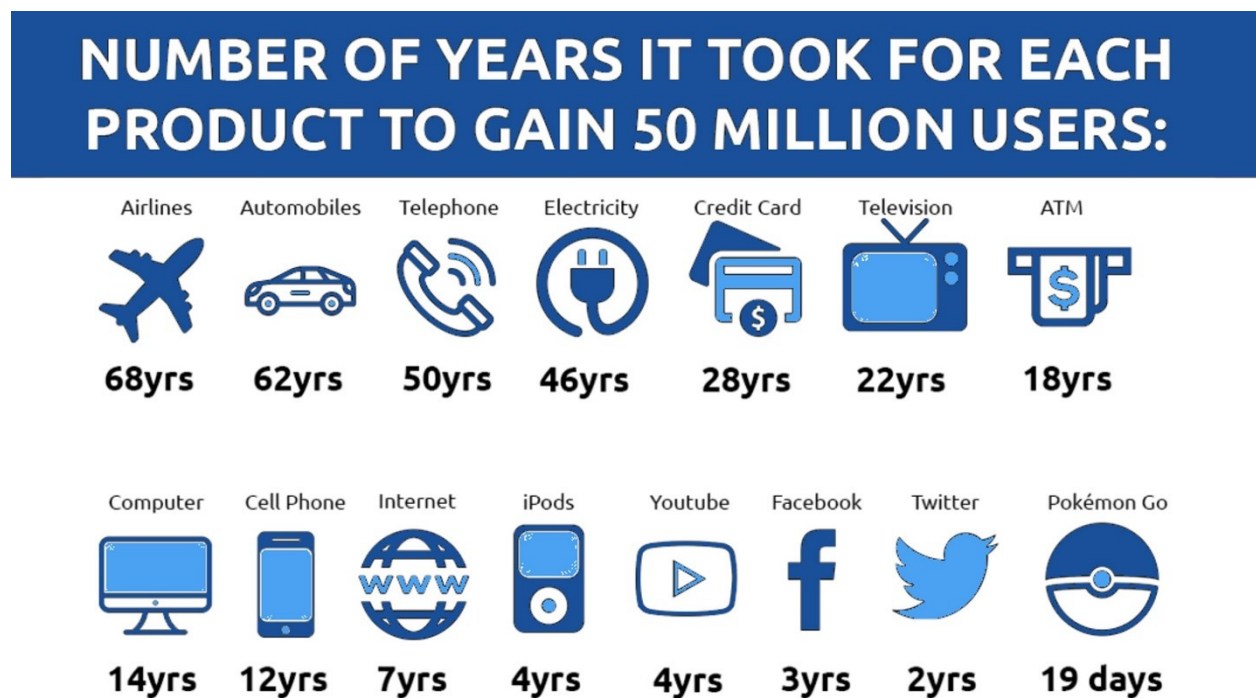


But if AR is driven by smartphone use, then adoption is significantly increased, because there are more than [six billion](#) smartphone users globally.

Here is a staggering statistic: in 2018 smartphones represented [59% of all consumer electronics spending globally](#).

## 2) Scaling: Adoption Rate.

Adoption of a new technology is driven by the use case. Below is one of my favourite statistics: How long it took different technologies to reach 50 million users. While it took the airline industry 68 years to reach 50 million customers it too Pokémon Go just 19 days. Back to point #1 when an application makes use our smartphones it will scale far, far faster and have broader application than one that uses specialized headset and hardware.



## 3) Smartphones Eating All Consumer Electronics

Years ago, did you buy a GPS for your car? It might have been a Garmin, Tom Tom or Magellan. You likely paid \$750 for it plus a monthly subscription for keeping it updated. But who uses one of these devices now?

Today my smartphone with GPS and Waze gives me everything I need and its FREE. What enabled this shift was 1) GPS being embedded in my smartphone; 2) the release of Waze which has more than [140 million monthly users globally](#) who drive more than 24 billion miles (40 billion kilometers) every month.

To me, this highlights how the smartphone is continually sucking more value into it.

Peter Diamandis looked at the modern smartphone and went back to 1980 to calculate the value of all the consumer electronic (CE) functionality it now includes. To buy all the CE devices that offer the same functionality and value that a smartphone does today would have cost \$1 million in 1980. (I feel a bit like Doctor Evil saying this).



#### **4) Compounding Multiple Trends:**

A number of technologies are exponentially improving in price performance. When these are stacked, the results are even more shocking.

The classic exponential law most people know is Moore's Law: the number of transistors on a CPU (central processing unit) will double every 18 months while remaining at the same price point. Over time the result is staggering. In 1970, an Intel CPU had 2,000 transistors, in 2021 chips have 50 billion transistors.

That in turn means the price of computing has plummeted. A gigaflop is a measure of compute speed – performing a billion transactions in a single second. In 1961, a

gigaflop cost \$164 billion to execute on mainframe computers. In 2021, sixty years later, a gigaflop is a single cent.

Not only is computing faster and cheaper, devices are smaller, lighter, less energy intensive, and most importantly allow for all sorts of new applications. It is also at the edge (meaning on my smartphone as opposed to in a data centre).

With faster speeds and cheaper computing all sorts of new applications become possible. For instance, voice recognition is one of them. Think of Alexa, Siri, or Nuance's *Dragon Naturally Speaking*.

In 1997 IBM's Deep Blue beat Garry Kasparov the World Chess Champion in chess. That was a \$100 million dollar project. Today my Huawei Mate Pro 20 smartphone has more raw computing power than Deep Blue!

This same head spinning price performance increases are happening with the roll out of 5G and bandwidth, artificial intelligence (AI), and cloud computing.

All of these trends are compounding one another allowing entirely new products and services, business models and ways that companies can add radical new value for customers.

### **We Don't Have Health Care We Have Sickness Care**

We don't have health care we have a sickness care. I wait until I get sick then go to the doctor. This approach catches many serious problems when it's too late. Instead of detecting cancer at stage 4 what about catching it at stage 0?

Before a plane takes off the pilots test every single critical system. Imagine I did the same every morning when I woke up. With wearables and the miniaturization of technology we can monitor and predict the emergence of disease.

For instance, it's recommended that you have a colonoscopy every 5 years. For many people that would be far more frequent than their current practice. Instead, imagine taking a little pill that has a camera on either end, batteries in the center and a radio



transmitter. You'd swallow the pill and which would take thousands of photos from launch to splash down 72 hours later. Those photos would be transmitted by radio to a receiver you'd wear on your waist.

If cells in your intestine and colon are precancerous they emit a different colour of bile than normal, health cells.

The thousands of photos can then be analyzed by AI to detect cancer before it's progressed to stage 1. Which would you rather do: swallow a pill or have a colonoscopy?

## Telehealth

Before the pandemic, if I wasn't feeling well, it took me on average three weeks to get an appointment with my doctor. On the appointed day I had to take a half day off work, drive to her office, find a parking spot and pay for three hours of parking because I never knew how long I would be. I'd have to go sit in a waiting room with other people who were coughing and sneezing and had rashes.

Finally, I would get to see my doctor for five to ten minutes and then perhaps have to do a test in a lab next to her office. Then I would be sitting in a different waiting room with different people sneezing and coughing. Finally, I might have to go the pharmacy and get a prescription filled out.



But with the COVID pandemic more than 50% of medical visits in China were by telemedicine. In the United States digital health surged from 11% of patients in 2019 to 46% in 2020.

In 2020, I had a pain in my stomach and using Telus Health MyCare, a partnership with UK based Babylon Health, I was able to secure a same day appointment for 15 minutes with a medical doctor and diagnose my problem.

## AR in the OR: Transforming Surgical Visualization

Dr Christopher Monely, is the co-founder of MediVis which uses augmented reality and 5G to take big data and using 3D modeling and AI dramatically improve surgical outcomes. Many surgeries today are performed the same way they were 30 years ago: blindly.

Among the most frequently performed neuro surgical procedures is the freehand ventriculostomy. The way it's done traditionally is for the surgeon to drill into the patient's skull, determining the angle by eyeballing it. There's no consideration for the immense variation between individual patients. Unsurprisingly 40% of procedures go wrong and 20% of patients have serious complications. This procedure requires that the angle, width of hole, and drilling depth are ALL EXACTLY right. Eyeballing it, highlights how inexact this historical procedure has been.

All patients have a detailed digital map of their brain from CT and/or MRI scans. These data have been historically trapped on 2D monitors. But patient data can now be transformed into actionable intelligence. Using augmented reality, 5G and cloud computing the data can be modeled in 3D so that the surgeon wearing AR goggles can determine EXACTLY where to drill in the patient's skull, at what angle and what depth and what width of hole BEFORE the procedure begins. The surgeon can see all the blood vessel and landmarks of the brain. The technology allows surgeons to radically rethink how they work making procedures safer and simpler.

The technology enables remote medical procedures to take place and has significant implications for how medical schools train future doctors. Harnessing mixed reality to transform surgical visualization

### **Bringing Museums To Life**

*Dali Lives* is a way for visitors to interact with Salvador Dali at the Dali Museum in St Petersburg, Florida.



The system uses artificial intelligence (AI) to answer questions that museum goers might ask. Everything that Dali ever wrote, all his interviews and photographs of him were the input for the AI read, which determines the most likely answer Dali would have given to any question he was asked.

Dali's image was extracted from photographs and video of him. And his voice, accent and intonation all come from audios of the artist.

*Dali Lives* is a large stand alone display with speakers (left)

Now imagine that rather than a stand alone display answering questions, using 5G and GPS you could listen to the AI on your smartphone as you walk around the museum – listening on your earbuds. Dali would be serving as your personal tour guide telling you about the exhibits, but also answering your unique questions about any piece of art that you were curious about – with a vast reservoir of the world's knowledge about Dali tailored to your every question.

How interesting is that? How engaging would a museum be for children learning about art history? Literally art would come to life! Now think about all the applications for any museum, historical site and tourism in general.

### **Education**

Hearst, a leading global media and information company launched virtual models for its magazine SuperELLE – bringing static 2D pages to life. Hearst used Huawei's AR engine:



## **Gaming**

The world's 2.6 billion gamers spent \$159 billion in 2020 – roughly half of the revenues from mobile gaming. The market is predicted to grow to \$200 billion in 2023 and more than \$400 billion in 2026.

While the average price of an AR headset was \$800 in 2020 it's predicted to fall to less than \$500 by 2026. This is why, in my opinion, mobile will dominate AR. Almost everyone already has the hardware in the form of their smartphone.

The average selling price of a smartphone in North America was \$471 in Q2 of 2020, while in China it was \$310 according to Counterpoint. Smartphones will stunt the growth the specialized AR headset sales. It will be hard core gamers and specific and custom business use cases that will drive AR headset sales.

## **Mechanics**

Think about a new mechanic working on your car. They could wear AR goggles and have a training program take them through step by step what procedure to follow. This use case uses the same principles as the neurosurgical case above. Any trades person could learn in real time what to do in a situation they were not certain about.

AR combined with 5G, AI, cloud computing allows for an infinite array of new applications and business models to deliver more real-world value to people. We are living in exciting times.

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