HDTV, UHD, 4K, LCD, OLED, Retina. There are so many options when it comes to screen size, resolution and display type. How do you choose which is best for you? What are the differences between the types of high definition? What factors should you consider? These various types of display resolution serve different purposes for different consumers.

The “high-definition,” or HD, market has matured rapidly during the past decade. In 2008, only 25% of American households owned at least one HDTV. By 2013, the percentage has increased to 75%. The number of households owing 4K television sets, which stood at 1% in 2014, climbed to 10% by 2016, and will reach almost 50% by 2020 according to to Strategy Analytics.

HDTV uses a standard called 1080p, which delivers a resolution of 1920x1080p, equivalent to 2,073,600 pixels per frame or 2.07 megapixels. 4K Ultra HD televisions use a newer standard called 2160p, increasing the pixel dimensions to 3840x2160p, which is four times the pixels and double the resolution of HDTVs. HDTV is based on a system of 3 primary image signal components, as opposed to the standard definition television’s single composite signal, thus eliminating the need for signal encoding and decoding processes that can degrade image quality.

4K display is generally 3840x2160 regardless of screen size, unlike retina displays whose resolution is dependent on the size of the display. It takes more space to store a 4K video than HD and uses more bandwidth to stream. ‘Ultra HD’ has a resolution quality between HD and 4K. Because every 4K frame contains four times the information of HD, it is not yet standard for television broadcasts to display in 4K. If you're buying a TV that's 50-inches and above you should certainly consider investing in a 4K display. All of the top brands are considering it the new standard, and the amount of content is only going to increase over time. While it is possible to get a 4K TV that is as small as just 40-inches, it's unlikely to have a decent level of high density range, or HDR, to make much of a visible, visual improvement. The HDR increases the difference between the lightest and the darkest portions of an image. Blacks get properly dark and whites get blindingly light. This means that images have more depth to them, and you should also be able to perceive a higher level of detail in the lightest and darkest portions of the image.

Retina display means that the pixel density is high enough that individual pixels can no longer be discerned by the human eye when the device is at normal viewing distance. Apple considers normal viewing distance of a smart phone to be 10 to 12 inches and 15 inches for tablet viewing. Retina displays come with varying screen resolutions. The distinction of retina displays is very important because the fact is, once the human eye can no longer distinguish individual pixels, the display is as clear and crisp as it is going to get. Higher screen size or resolution will not provide any more viewing benefits.

A liquid crystal display, or LCD, is a flat panel display that uses the light-modulating properties of liquid crystals. The backlight in liquid crystal display provides an even light source behind the screen. This light is polarized, meaning only half of the light shines through to the liquid crystal layer. The liquid crystals are made up of a part solid, part liquid substance that can be twisted by applying electrical voltage to them.

They block the polarized light when they are off, but reflect red, green, or blue light when activated. LCD displays are used in a wide range of applications, including televisions, computer monitors, smartphones and indoor/outdoor signage. LCD screens have replaced the heavy, bulky cathode ray tube displays in nearly all applications. LCDs also tend to perform quite well in direct sunlight, as the entire display is illuminated from behind, but does suffer from potentially less accurate color representation than displays that don't require a backlight.

LCDs are slowly getting replaced by organic light-emitting diodes, or OLED displays, which can be easily made into different shapes, has a lower response time, wider color gamut, virtually infinite color contrast and viewing angles, lower weight, slimmer profile and potentially lower power consumption. The lighter weight comes from the fact that OLED displays use a single glass or plastic panel, whereas LCD displays use two panels. OLEDs, however, are more expensive than LCDs because of the quality of materials used to make the displays. Indeed OLED panels are used today to create the most stunning TVs ever with the best image quality combined with the thinnest sets ever. In the future, OLED will enable large rollable and transparent television sets. As for drawbacks, one widely cited problem is that OLED displays don't last as long: degradation of the organic molecules meant that early versions of OLEDs tended to wear out around four times faster than conventional LCDs or LED displays. Manufacturers have been working hard to address this and it's much less of a problem than it used to be. Another difficulty is that organic molecules in OLEDs are very sensitive to water. Though that shouldn't be a problem for domestic products such as TV sets and home computers, it might present more of a challenge in portable products such as cellphones. OLED technology is still relatively new compared to similar, long-established technologies such as LCD.

There are also important differences between display mediums, such as tablets and televisions. Because televisions are primarily used for watching video, the resolution of the video must match the resolution of the television to get any viewing benefit. 4K is a television industry standard. Since tablets are used for more than streaming video, 4K has less meaning and significance. Most tablets now display specification in PPI. PPI of around 250 or above is considered to be hitting the retina display range. The 9.7-inch iPad Pro and the 12.9-inch iPad Pro both have a resolution of 264ppi with no viewing variation.

The future of high definition is ever-progressing. 8K resolution, which uses 7680x4320 pixel display, was texted at the 2016 Summer Olympics. Sharp has also released the world’s first 8K television in the Fall of 2015 at a retail price of $133,000. Samsung has announced, in June 2016, that an 11K TV was being developed for the 2018 Winter Olympics. In the smartphone world, 2019 could see a major breakthrough with the 'holographic' display promised by the RED Hydrogen One cinematic camera.

In conclusion, numbers and technical data are worth considering when comparing the screens on two smartphones, but the real-world performance and intended usages of these displays is more important. You really need to see the display in person before making a decision.