dentons.com

大成 DENTONS

Virtual legality:

Virtual Reality and Augmented Reality – Legal Issues

With Newsweek predicting that 2017 will be shaped by Virtual Reality (**VR**) and Augmented Reality (**AR**)[1] Dentons, as part of its on-going **TechTalk** series, thought it was timely to examine the legal issues associated with this new technology. The hype is real at least. There are predictions of the AR and VR sectors generating $150 billion by 2020.[2]

This article aims to get you comprehensively up to speed and up to date. It will be of particular interest to anyone in sectors such as media, retail, hotels, education, manufacturing, finance and healthcare.

Read on if you need a "VR and AR 101" session which gives you an overview and covers the legal issues. This article provides you with what you need to know right now about:

1. What are VR and AR?
2. How does the VR/AR technology work?
3. Who is who in the world of VR and AR?
4. Key legal issues associated with VR and AR.
5. The future of VR and AR.

Are VR and AR the same thing?

First – some definitions.

VR

Virtual Reality (**VR**) uses software and devices to show (usually realistic) images, sounds and other sensations (such as scent)[3] to replicate real or imaginary environments and to map the user's physical presence in them. VR's aim is to be realistic and immersive, and to simulate a three dimensional environment and experience. VR does this by interactive software and hardware which is controlled and experienced by movement of the human body, head or eyes. A VR user can move or look around and interact with the technology via a screen or headset/goggles (called a **head-mounted display or HMD**).

AR

By contrast, Augmented Reality (**AR**) supplements the real world. The user sees the real world but with the addition of computer generated images which are overlaid onto various real objects. Augmentations can be sound, video, graphics or data.

AR achieves this by adding computer vision and object recognition to data about the real environment surrounding the user. AR presents that content overlaid onto the user's real world view. The AR information itself can be either virtual or real data.

AR devices range from smartphones and tablets (say, for playing games like Pokémon Go) to windscreens in vehicles (for example, to display satnav information) or HMDs worn by the user (such as a harness, helmet or eyeglasses). The AR device displays the AR content by projecting through or by reflecting off the surfaces of the device.

---

1. See "Digital Trends: Why 2017 Will Be Shaped By VR, AR, AI and Personalized Digital Assistants" published by Newsweek.com 3 January 2017 at http://europe.newsweek.com/virtual-reality-virtual-reality-sets-phones-technology-537969?rm=eu

2. According to "Augmented And Virtual Reality To Hit $150 Billion, Disrupting Mobile By 2020" dated 6 April 2015 by Tim Merel from @DigiCapitalist at https://techcrunch.com/2015/04/06/augmented-and-virtual-reality-to-hit-150-billion-by-2020/

3. Both scent and taste are current developments. See, for example, the VR experiment to taste virtual sushi and donuts which is described in the article "We Sampled The Gastronomic Frontier Of Virtual Reality" dated 29 January 2016 at http://www.npr.org/sections/thesalt/2016/01/29/464885833/we-sampled-the-gastronomic-frontier-of-virtual-reality

In short, the main differences are that AR enhances reality whereas VR replaces reality with a simulated one. In doing so, there is a difference in the level of immersion of the user experience.

How do AR and VR actually work?

VR and AR technology works in slightly different ways. What they generally have in common is the need for a user to buy a device and to download an app to it to get started.

VR

In VR, getting the maximum sense of **immersion** is key to a good experience.

VR works by feeding video from a computer to the HMD or smartphone/tablet —either by cable or wirelessly. The headsets take the video feeds and send them to a single display or to two displays (one for each eye). Sometimes the lenses in an HMD are adjustable to match the distance between a user's eyes. This helps the image to be as focused and shaped as possible and facilitates a "stereoscopic" three dimensional image (created by angling the two separate two dimensional images to simulate how human eyes have small differences in the way each one views images).

Image of Sony PlayStation VR © 2016 Sony Interactive Entertainment LLC

The experience of immersion depends on how wide the display view is. A 360 degree display would be more immersive than the 100 or 110 degree displays which are currently most common in VR HMDs.

The headsets refresh the views as the user moves around. Users will feel disoriented and sick however if the field of view does not refresh often enough. Companies such as Sony impose standards on its game developers to meet certain frame rate per second (**fps**) requirements or they will not be certified on the PlayStation system.[4] At least 60 frames per second is needed to avoid user disorientation.

How is motion tracked?

VR devices track the user's head or arm/hand/body movements and through the software shift the picture in the headset display as the user moves around. VR devices constantly trace and retrace the real world movements through a process called **spatial mapping**. Tracking is measured according to a "six degrees of freedom" (**6DoF**) system (a reference to the freedom of movement of a rigid body in a three dimensional space). 6DoF systems plot the user's movements along x, y and z axes to measure in every direction.

VR systems use a few mechanisms to plot movement. These range from light emitting diodes (**LEDs**) and cameras, to infrared sensors, magnetometers, gyroscopes or accelerometers. The aim is to minimise lag between user physical movements and image changes. The process of converting a user's motion into commands in the VR computer software is vital to the sense of immersion. A low latency in terms of lag is crucial to the quality of the VR experience. Latency is usually measured usually in milliseconds.

VR systems mainly use one of two methods to track body motion. These are either optical tracking (using imaging devices to track body motion) or non-optical tracking (using other sensors attached to the body such as magnetic fields or sound waves).

Optical:

A user will wear optical markers (such as dots of highly reflective material) on parts of their body, the HMD or handheld controller and a camera maps their movement to three dimensional space.

4. See Charlie Hall's article for Polygon, "Sony to devs: If you drop below 60 fps in VR we will not certify your game. You cannot drop below 60 fps. Period. Ever." dated 17 March 2016 at http://www.polygon.com/2016/3/17/11256142/sony-framerate-60fps-vr-certification

Non-optical:
A user will wear equipment (such as an exoskeleton motion capture suit system or HMD) or use a handheld controller which contains micro-electromechanical sensors (such as accelerometers, gyroscopes and magnetometers). These sensors convert movement into electrical signals and so track motion. Some newer technology interpret electrical impulses directly from muscles to enable gesture-based control of the VR software.

How are eyes tracked?

Eye tracking is a newer VR frontier and involves use of an infrared sensor to monitor eyes and where the user is looking inside the HMD. This allows more precise reactions in VR imagery and a depth of field that is more realistic. For example, the VR display might blur the foreground slightly if the user is looking into the distance – which is what naturally would occur when eyes are looking into the distance in the real world. This feels more natural to the user as it replicates the way the human brain works and so a user is less likely to feel disoriented or dizzy.

Other senses:
VR devices are now aiming to increase the sense of immersion by adding aural/video technology and apps that give the user the sense that sound or scent is coming from all around them and near and far away.

AR

AR, being VR's real world cousin, works by a computer analysing what is being viewed and the position of it. AR applications superimpose two or three dimensional generated computer imagery or descriptive information over real time images obtained through a camera, webcam or phone.

There are two main types of AR: AR that is marker-based or AR that is marker-less or location-based.

Marker-based AR:

- This type uses a camera and a visual marker to determine the centre, orientation and range of its spherical coordinate system. The AR device is activated when an item (the **marker**) is placed in front of a webcam (which is connected to or embedded in the AR device). The webcam captures a video feed (by taking lots of photos in quick succession) and processing or recognising the information and patterns in the photos (such as a barcode or symbol). The AR computer then recognises that information and overlays the marker with an image or animation. A classic example is the world record line which is dynamically added across the lanes to show the current world record in a broadcast of a sports race. When a camera points at the marker, the digital image is overlaid at that point onto the AR device's screen.

Marker-less or location-based AR:

- Marker-less or location-based AR actively tracks and recognises the real environment without using markers. The AR device records its position in the real world and then provides the data relevant to that location (such as the names of landmarks being viewed around a user).

Image of Spyglass Compass and GPS navigation app for iPhone and iPad © 2016 Happy Magenta UAB

Who is in on the act?

There are a number of key players in the VR and AR sectors – either exploiting it, producing content or producing the hardware and software.

AR/VR Exploiters
In 2016, the game, Pokémon Go, was such a craze that Nintendo's value doubled in a two-week period.[5] It worked by showing on a user's phone or tablet where Pokémon characters could be "found" and then "caught". The gamer had to visit the physical location of the character to catch the character, which was seen on a device screen via the Pokémon Go app when it was pointing in the right direction using AR. At various

5. See "Thanks to Pokémon Go, Nintendo's Market Cap Just Doubled to $42 Billion" by Fortune dated 19 July 2016 at http://fortune.com/2016/07/19/thanks-to-pokemon-go-nintendos-market-cap-just-doubled-to-42-billion/

"PokéStops", players checked in and could gather items useful to the game. Post peak-Pokémon-Go, it is clear that the game exposed millions around the world to AR.

This has caught the attention of brands who have started to capitalise on AR and VR. Some notable examples are the following.

Retail and Leisure:

- **McDonald's** launched an AR app that showed the production process of its food.
- **Coca Cola** and **Spotify** partnered to let users listen to the most popular songs by holding their phone up to AR-enabled Coca Cola cans.
- **Häagen-Dazs** uses AR to entertain consumers while they wait for their icecream to become soft enough to scoop. A virtual violin concerto is projected onto the top of a tub of icecream.
- **Tesco** uses AR so that customers can visualise sofas in their own home.
- **Yelp** uses AR with a feature called Yelp Monocle to gives information about local establishments when a smartphone is pointed at them.
- **Marriott** uses VR (Oculus Rift headsets) to showcase its hotels to potential guests.

Shopping Centres:

- London's **Covent Garden** used AR for visitors to meet Santa in an interactive grotto and embark on an AR treasure hunt to catch reindeer hidden in the area. A giant Christmas tree was also digitally decorated with special offers.
- The **Galeries Lafayette** store in Paris uses AR to animate a polar bear wandering through virtual snow in a 360 degree view in the store.
- The Australian **Pacific Fair** beachside shopping centre provided an AR '12 Days of Christmas' experience featuring three sleeping koalas and eight shimmering seashells which came to life as shoppers shopped.

Beauty:

- A number of beauty brands have created AR apps to enable virtual sampling and try-on, including **Covergirl's** BeautyU, **Sally Hansen's** ManiMatch, and **L'Oreal's** Makeup Genius app which uses facial recognition technology to allow people to virtually apply products.

Fashion:

- **Rebecca Minkoff** and **Neiman Marcus** have AR powered interactive mirrors in their fitting rooms. **New Look** enables users to use their phones to scan their New Look Student Card to reveal special offers using AR. **Lacoste** has a virtual try-on experience using AR where users can share their experience with their social network via their phone.

Children:

- **BiCKids** has released a colouring book which uses an AR app to enable kids to interact with the pages.
- The **British Museum** uses AR to help children understand the Parthenon gallery by enabling statues from the museum's collection to tell stories.

Other:

- **Google** developed Word Lens as part of Google Translate. It enables a user to aim at a foreign sign and have the text translated into their own language.
- **Siemens** uses AR to showcase its range of magnetic valves.

For now, consumers are not generally paying for their initial AR and VR experiences other than through the download of apps or the purchase of games – as is often the case with new consumer-appealing technology. New technology is often sponsored so that experiences drive demand as consumers are exposed to it. This may change in the future — Gartner's research analyst, Brian Blau, thinks that consumers will be willing to pay more for quality VR and AR experiences in the future.[6]

AR/VR hardware producers

Top VR and AR hardware producers are Google Glass, the Facebook-owned Oculus Rift, HTC Vive, Samsung Gear VR, Microsoft HoloLens, Google Daydream View. Another key category is the branded headsets which pair with Sony PlayStation VR and Microsoft Xbox One.

There is a wide range of devices and price points. More affordable devices are now proliferating although HMDs can still range from as little as ten to thousands of dollars.

6. See the article on AR Blog Augmented Reality marketing resources, trends, videos and case studies: "5 top Virtual Reality & Augmented Reality technology trends for 2016" by Joe Bardi on 22 April 2016

- Oculus Rift VR is one of the leaders at present as they were early innovators with major game developers. The headsets retail around $500.
- HTC Vive retails for around twice the price of Oculus.
- Microsoft HoloLens is a wireless Windows 10 device with holographic capability which integrates data from the sensors, handling tasks such as spatial mapping, gesture recognition and voice and speech recognition.

The Oculus HMD

- Magic Leap is another significant player who makes HMD virtual retinal displays which superimposes imagery over real world objects by projecting a digital light field into the user's eyes.
- AMD has launched Sulon Q, a spatially aware headset that combines VR and AR.
- Samsung produces the relatively affordable Samsung GearVR headset which retails around $50.
- Google is another key innovator – it has released a three dimensional visual tracking device for mobile phones and a VR HMD called Google Daydream View which retails for around $80. Google also produces the Google Cardboard – an extremely low cost item which is a headset that pairs with a smartphone and uses the phone as its screen.

The Google Cardboard headset

Cardboard is designed specifically for using VR apps on Android smartphones and Google encourages developers to make and sell VR apps for Google Play.

Apple is said to be working on developing several prototype VR headsets and they are rumoured to be developing a set of smart glasses that would connect wirelessly to the iPhone like the Apple Watch. These would display images and other information using AR. There is also speculation that Apple will augment Maps for iPhones.

AR/VR content producers

VR content and applications are being released as consumer grade VR and AR products come down in price and mobile phone-based VR platforms bring greater ease of use, lower cost and a wide range of apps. VR and AR are expected to rapidly expand to become a primary tool to interface with social media and the internet. Originally content production for VR and AR was led by video games but that is broadening. Sony PlayStation VR is a smash hit but newer content is coming through now also from marketers and other corporate creators.

Some notable content producers are listed below:

- **YouTube** – which has a 360 VR video channel with a rapidly growing catalogue of videos to watch.
- **Sports** organisations – this sector was one of the first to enter with the use of AR during live broadcasts. NextVR has partnered with FOX Sports, Live Nation, NBC Sports, HBO/Golden Boy, Turner Sports, and CNN to provide scheduled programmes and highlights in VR (using either a Google Daydream View or Samsung Gear VR). A user can now move to the action – such as to behind the goal posts or onto the basketball court and game statistics can be displayed live on their devices.
- **The New York Times** and other companies such as **Vrse** and **RYOT** (which is owned by The Huffington Post) are producing VR films, documentaries and news. Vrse produces VR music videos, films, documentaries and comedy. NYT VR produces VR reports where, for example, viewers can be taken to the surface of Pluto.

- Google's **TiltBrush** (for HTC Vive) is a very popular VR art creation app which enables virtual painting with light.
- **Jaunt** is a VR app which mixes films and videos from live concert performances.
- **Pornhub** needs a mention too – it launched a VR category in 2016 and this has since experienced growth in views of 302%.[7]

One development to watch will be the streaming of VR content. Oculus for instance, has tested a VR streaming site.

Key legal issues with VR and AR

The growth in VR and AR is welcome and exciting but there are a variety of legal issues and ethical challenges ahead. The legal issues include those that relate to intellectual property, privacy, product liability, tax and crime – as well as issues which come about simply because of the inherent nature of the new technology and its ability to influence user behaviours while it immerses them completely in the experience. The technology is so new that laws may struggle to keep up.

Intellectual Property issues

With the market for AR and VR growing, the stakes are high – as indicated by numerous court proceedings dealing with the intellectual property rights in AR and VR technology. In February 2017 for example, Facebook was ordered by a US court to pay $500m to a US video game company called ZeniMax after Facebook's Oculus VR headset was found to have infringed ZeniMax's intellectual property rights.[8]

Away from the litigation dealing with the rights in the underlying technological developments, the legal issues relating to intellectual property in VR and AR can be categorised into two main areas:

(i) those relating to real world intellectual property rights and their role in the virtual or augmented world; and

(ii) those relating to virtual world intellectual property and their role in the real world.

Real world IP rights in the virtual world:

Consider, for example, who might own the intellectual property rights in a virtual T-shirt with a favourite brand's logo on it which is created by the user for their avatar to wear online? The owner of the logo would consider that it owned the copyright and trade mark rights in the logo on the virtual T-shirt. The usual intellectual property protection laws would be expected to apply in the VR world. In that case, VR system providers would act as facilitators to allow users to virtually import or incorporate music, photographs, and brand names or logos into their virtual experiences. Both the VR platform and its users would need the permission of the brand owner to use the logo virtually.

IP legal issues get trickier, however, when no such permission has been obtained. In this case, the rightful intellectual property rights owner will want to enforce its rights against the VR platform and its users.

A practical problem is that VR users log in from all over the world. They are hard to identify and pursue.

Another legal problem also surfaces because of the inherent difference between virtual world goods and the trade mark owner's real world goods. Virtual world goods are intangible. Real world goods are tangible. A trade mark owner may well find the scope of its trade mark rights covers only real goods. Could the trade mark owner still sue for infringement for the virtual T-shirt despite no actual T-shirts being produced when its rights relate to actual T-shirts only?

A hurdle to the brand owner obtaining damages for infringement also presents itself where sales of real goods are not impacted by the virtual goods. How is damage to be proved? It may be easier to rely on the common law principles of passing off claiming consumer confusion about the association of the trade mark for the real goods with the virtual world goods.

Virtual IP rights in the real world:

Generally, under intellectual property laws, a creator of content owns the intellectual property in it. There are some exceptions, but this is the usual position unless the creator has, by written agreement, varied from it and assigned his or her intellectual property rights in their creation to someone else.

---

7. According to "2016 VR Porn Statistics Say VR Is Hot " dated 30 January 2017 by Steven Paterson at 360-Degree Movies at http://www.vrcircle.com/post/2016-vr-porn-statistics-say-vr-is-hot

8. See "Facebook ordered to pay $500m in Oculus virtual reality dispute" by James Titcomb dated 2 February 2017 at http://www.telegraph.co.uk/technology/2017/02/01/facebook-ordered-pay-500m-oculus-virtual-reality-dispute/

A legal issue arising from AR relates to who owns the rights to geo-tag real world locations. An owner of a famous landmark may well want to claim rights as to how that landmark is to be identified or have a grievance if false information is given about it.

There is no doubt however that VR, rather than AR, has excited more comment about the complex intellectual property issues as VR allows users greater scope to create images, virtual property or other content by through the VR system.

Most VR platforms will have terms of use where users agree to assign their rights to the intellectual property created by them to the VR platform. In a few cases, the VR system will agree that users will own their VR creations but grant back to the VR platform a wide licence to be able to exploit the user's intellectual property created through the VR platform. It should be borne in mind however that users log in to VR platforms from all over the world – and their local jurisdiction may have laws that override the agreement between the VR platform and the user and govern the ownership and use of the intellectual property.

As VR facilitates the creation of very personal virtual worlds by the user – users' creations of different identities and an alternate world have the potential to be really novel. Clarity about the ownership of virtual assets in terms of use agreements with users is critical. Because of the deeply personal nature of virtual experiences and the capacity of users to identify with their virtual worlds, there may be pressure in the future for intellectual property laws which rebalance the standard allocation of the respective VR platforms' or users' intellectual property rights.

Virtual crimes

The inherent nature of VR is said to lead to ethical challenges which in turn an create fresh legal issues when it comes to assessing virtual crime.

A blogger for the European Commission, Michael Madary, has gone so far as to question whether VR experiences may ever be "safe" from an ethical point of view.[9] Madary calls for further research into the psychological effects of long-term immersion in VR experiences and the way avatars can be used. Madary has concerns about individuals who strongly identify with their own avatar and the "powerful unconscious influence" of VR on user behaviour. VR does and can induce particular kinds of emotions and can cause suffering as users will experience VR as real even if they know they are in a virtual environment.

It is these inherent qualities of VR that causes a reconsideration of the traditional approaches to crime in the VR world. There are numerous notorious examples.[10]

A female player called Jordan Belamire playing a VR game called QuiVr had her avatar's virtual crotch grabbed by another player named BigBro442 while shooting zombies.[11] For Ms Belamire, the virtual groping was the same as being groped in real life due to the psychological trauma inflicted. The criminal code would not treat virtual assaults in the same way as real life assaults involving actual physical contact. This may change in the future as the VR technology develops in sophistication. Body suit technology is developing to the point where the user may feel a kick or punch. VR content providers are already considering whether to provide in their software code solutions against virtual harassment. Possibilities include virtual shields, expanded super powers or extended personal safe havens to prevent cyber assault.

In 2013, an English game player named Steven Burrell was convicted after he "stole" virtual property.[12] Burrell stole virtual items (such as swords, capes, gold and armour) which were virtually valuable in a game called RuneScape after he hacked into gamers' profiles.He then sold these virtual assets for money in fan forums for the game. He was convicted, however, for hacking rather than theft as the items he stole

9. See "Are Virtual Reality experiences safe from an ethical point of view?" by Michael Madary dated 9 March 2016 at https://ec.europa.eu/digital-single-market/en/blog/are-virtual-reality-experiences-safe-ethical-point-view

10. See "Sexual harassment in virtual reality feels all too real – 'it's creepy beyond creepy'" by Julia Carrie Wong dated 26 October 2016 writing for The Guardian at https://www.theguardian.com/technology/2016/oct/26/virtual-reality-sexual-harassment-online-groping-quivr

11. See, for example, "My first virtual reality groping" by Jordan Belamire dated 21 October 2016 at https://mic.com/articles/157415/my-first-virtual-reality-groping-sexual-assault-in-vr-harassment-in-tech-jordan-belamire#.3x4yl7Kt5

12. See "Computer hacker stole virtual property from online fantasy gamers to pay off REAL gambling debts" by Dan Bloom of Mail Online dated 6 December 2013 at http://www.dailymail.co.uk/news/article-2519425/Computer-hacker-stole-virtual-property-online-fantasy-gamers-pay-REAL-gambling-debts.html#ixzz4Xed19tYh

only existed in the virtual world of the game. The virtual victims lost their gaming resources but had no redress.

In 2017,[13] two men pleaded guilty to running an illegal betting website connected to a FIFA VR game called FUT Galaxy. They let players transfer virtual currency out of the game and use that to bet on real-life football games. Winnings would then be transferred back in the gamers' accounts in the FIFA game – so the FIFA virtual currency ended up having real world value.

The ability to purchase digital assets that might have real world value that has led to a growth of thefts of virtual currency and digital assets. Popular games such as Second Life and RuneScape allow 'residents' to buy and sell new virtual land, run businesses and trade with virtual currency that can be converted to and from real currency.

The European Union Agency for Network and Information Security (**ENISA**) which is the centre of network and information security expertise for the EU has called for regulation following the proliferation of "crypto-currencies" — that is digital virtual currencies such as Litecoin, Dogecoin, Ripple and Bitcoin. Bitcoin is a decentralised peer-to-peer payment system from Hong Kong-based "crypto-currency" exchange Bitfinex where electronic payments are performed by generating transactions that transfer Bitcoin coins (**BTCs**) among Bitcoin peers. The regulatory environment is still grappling with how and whether these crypto-currencies are to be recognised as a form of money.[14] As illustrated by the Burrell case discussed above, they are not a form of real property which can be stolen – the issues are complex when they are not legal tender of any government or generally issued or controlled by centralised bodies. As existing criminal laws do not cope well with VR, we expect to see more regulation in this area in the future.

Taxing the virtual

Although virtual assets are difficult to deal with under traditional criminal laws, that does not stop governments looking to tax them. The United States of America's tax authority (the IRS) has issued guidance on the treatment of digital currencies in 2014[15] which clarified that the IRS treats digital currencies as capital assets which are subject to capital gains taxes. Similarly, Russian authorities have also produced guidance relating to digital currencies[16] as has Japan.[17] Other countries are grappling with the issues of virtual transactions too - such as Australia which recently ended sales tax on digital currencies following a policy decision to encourage investment by treating Bitcoins as a form of barter arrangement.

The popularity of Pokémon Go has led to growing calls for AR and VR transactions to be taxed although some thorny legal issues remain to be worked through:

- How should AR/VR content and transactions characterised for the purpose of tax – as software, a digital product, a service or intangible or something else?
- What exactly is being purchased and how in the virtual world e.g. software, virtual currency, digital assets or something else?
- Where precisely do transactions take place for tax purposes when the identity or location of the user, owner of the intellectual property is not clear or where the user may download in one jurisdiction but transact virtually in another?

It is still unclear how the European Union will progress matters of tax of the digital world. In 2014, the European Commission established a High Level Expert Group on Taxation of the Digital Economy to examine ways of taxing the

13. BBC News Online "YouTuber admits Fifa gambling offences" dated 6 February 2017 at http://www.bbc.co.uk/news/technology-38879969

14. As noted in "What The Heck Is Bitcoin? The Law Struggles For An Answer" by Daniel Fisher of Forbes dated 26 August 2016 at http://www.forbes.com/sites/danielfisher/2016/08/26/what-the-heck-is-bitcoin-the-law-struggles/#1902544bafaf

15. At https://www.irs.gov/uac/newsroom/irs-virtual-currency-guidance

16. As reported in "Bitcoin legal by default in Russia, confirms new federal tax document" by Cryptocoins News on 1 December 2016 at http://www.ewdn.com/2016/12/01/bitcoin-legal-by-default-in-russia-confirms-new-federal-tax-document/

17. See "To tax or not to tax? Japan debates how to handle bitcoin" by Toshihisa Kinouchi dated 1 March 2016 at http://asia.nikkei.com/Politics-Economy/Economy/To-tax-or-not-to-tax-Japan-debates-how-to-handle-bitcoin

digital economy in the EU.[18] One of the legal issues considered was whether the collection, processing and monetising of data should be reflected in the definition of a taxable nexus. By way of background, a taxable nexus means that there is a taxable presence to which profits could be attributed and so taxes could be levied.

The Group's report recommended no change to the current tax rules because they then considered the VAT systems would adequately address revenue concerns of countries where digital services and products are consumed. However, that assessment was made before the 2015 Court of Justice of the European Union decision which held that the exchange of Bitcoins as a pure payment instrument was sales tax exempt.[19]

Digital activities are growing. Additionally intellectual property owning entities in the VR and AR space have attracted negative publicity for shifting revenues into low tax jurisdictions. It seems likely that there will be a reassessment of the tax rules for VR and AR. Future taxing authorities may well take the position that an extensive collection of personal data in a country triggers a taxable nexus in that country — irrespective of whether digital products, streamed content, virtual currency or other types of virtual assets are involved.

Virtual privacy

With the coming of reform of the privacy laws in the European Union,[20] the legal consequences of data collection and sharing practices, user location tracking and privacy practices and policies associated with AR and VR are significant. It is important to get this area right – the new General Data Protection Regulation in the European Union imposes significant fines and penalties for breach. Hardware, software and content providers will need to assess the impact of VR and AR on the privacy of users and ensure that adequate safeguards are put into place for the type of personal data being processed so that they are compliant with the relevant privacy laws.

At the same time as there are more stringent privacy laws, the advertising and business models of many companies are increasingly relying on obtaining a unified profile of a user. VR platforms store and process substantial amounts of personal data about individual users. Some data may be more sensitive than others. Consider, for example, if a user's reaction times or ease of movement could be sensitive health data or if facial recognition data could be sensitive personal data under data privacy laws. Eye tracking would be considered more intrusive than click tracking or cookies.

VR and AR providers will need to assess if they are excessively collecting, using, and sharing a wide range of users' personal information without the appropriate consents in place. Many VR games and applications focus on shared experiences – which means that users may be sharing their details, such as location, with other users. Can a user's VR footprint be linked to their real identification?

Difficult choices are ahead. Insufficient or excessive restrictions on VR and AR users can lead to backlash. Witness how Facebook has needed to adjust its privacy settings for users many times in recent times. In 2016, The Independent newspaper claimed that Oculus Rift's terms and conditions allowed Facebook to monitor users' movements and use it for advertising.[21] Oculus VR responded at the time that it didn't share any information with its owner, Facebook, but expressed that it may have a desire in the future to do so.

We expect sensitivity about this issue will continue to grow and the issues will be more complex

18. See http://ec.europa.eu/taxation_customs/business/company-tax/tax-good-governance/expert-group-taxation-digital-economy_en

19. In case *C-264/14 Skatteverket v David Hedqvist* (22 October 2015) where the CJEU held that the purchase and sale of Bitcoin units were exempt transactions.

20. See the Dentons article "EU Data Protection Reform: Political Agreement" by Nick Graham on 16 December 2015 at http://www.dentons.com/en/insights/alerts/2015/december/16/eu-data-protection-reform-political-agreement and his accompanying blog at http://www.privacyandcybersecuritylaw.com/

21. See The Independent's article "Oculus Rift terms and conditions allow Facebook to monitor users' movements and use it for advertising" dated 4 April 2016 by Andrew Griffin at http://www.independent.co.uk/life-style/gadgets-and-tech/news/oculus-rift-terms-and-conditions-allow-company-to-monitor-users-movements-and-use-it-for-advertising-a6967216.html

because of VR and AR. It is not hard to imagine a situation where a house is geo-tagged by an AR user in a global database without the home owner's permission. Imagine if the house was previously occupied by a criminal and the geo-tagger was reckless or malicious in applying the old information about it being the home of a criminal to it? Current data protection in the European Union provides data subjects with a right to rectification of or erasure of their incorrect personal data – but could that extend to processing data about a location itself which is only coincidentally associated with an individual? Current privacy legislation does not expressly deal adequately with these issues.

Virtual liability

An interesting aspect of AR is that the virtual and the real are linked which raises the legal issue of who is responsible for injuries or trespass associated with the use of the technology. This is a more significant issue if users can interact with each other. Could they threaten or hurt each other?

Pokémon Go was criticised for its potential to encourage trespass onto private land. Could a user's trespass incur liability for the VR platform developer or provider? VR or AR system providers usually ensure that their licences do not permit users to break the law and they usually disclaim the platform's own liability if users do so. It remains to be seen if more would need to be done by the AR providers to avoid liability. There have been reports of distracted gamers walking in front of vehicles to catch Pokémon characters or mobile phones being stolen while gamers were in unsafe locations which they were encouraged to travel to when playing the game. AR users playing at sensitive sites (such as churches or war memorials) have also attracted negative publicity.

VR and AR systems should in the meantime, at the minimum, incorporate appropriate warnings and health and safety notices. Policing of virtual locations and acting on trouble spots may be also necessary – or VR providers may risk claims being made against them for negligence.

Classification of VR content

VR and AR are no different to the real world insofar as their potential for products with sexual or violent uses. VR has embraced teledildonics — a method for communicating touch electronically. The sex content provider, PornHub, recently announced a VR product which is a "twerking butt" which creates the illusion of sex for a user.

Such developments serve to highlight that, at least in the UK, there is no separate classification standard for VR despite the fact that violent and sexual content can have a greater impact on the VR user than other modes of content such as ordinary video. The VR industry has some self-regulation. For example, Oculus pre-approves VR apps and gives experiences a "comfort" rating in its app store according to how terrifying or sickening the content will make a user feel.

We would not be surprised to see extensions of the current classification standards regime to deal with the inherent nature of VR experiences and to ensure that this is taken into account when content is rated. The addictive nature of VR may also cause regulators in the future to consider regimes, such as those established for the gambling industry, to require VR and AR companies to identify and help problem users.

What does the future hold?

For VR and AR, two clear megatrends are emerging.

1. Mobile phone based VR platforms will continue to grow as they are easier to use, lower cost and there is a proliferation of applications.

2. More users will use AR to access existing content and services such as email or checking the best route to a location —and enjoy having dynamic AR data delivered directly to their device.

Below we list the top five forces that we think will shape events in the VR and AR sectors in the near term.

i. **Bandwidth demand:** The coming of the VR and AR era requires responsive media which changes content dynamically to fit a user's situation and engagement. Because of this, it is relatively easy to predict that there will be significant issues with bandwidth requirements.

   Without moving your head, your eyes can move across a field of view of at least 150 degrees

horizontally and 120 degrees vertically within 100 milliseconds. This means the ultimate display will need around 720 million pixels for full coverage. Adding head and body movement exponentially increases the pixel requirement – even for a static image.[22] A Forbes blogger, Bo Begole,[23] calculates there will be a need for 5.2 gigabits per second of network throughput soon to deal with VR.[24] Begole is not alone raising flags about VR being the next major bandwidth issue.[25] This need also comes at a time when competition for bandwidth is intensifying because of the internet of things (**IOT**) and the number of connected devices and general move to streaming. Demands will continue to grow for more bandwidth at faster speeds.

In part, the move to 5G may assist to grow VR as this will involve speeds that will be up to 100 times faster than most existing 4G networks, although there remain some concerns about how far the signals can travel or propagate. Fibre networks may continue to deliver content. However, it is traffic management solutions, compression algorithms and investment in low latency, high throughput networks[26] that are likely to come into their own as the key for "last-mile" networks to cope with the demands of VR and AR.

ii. **Wireless:** Wireless is the next big thing. Today's premium VR HMDs, such as the Oculus Rift and HTC Vive, use cables to send high definition video to a user which limits movement. VR users are demanding free hands, bodies and heads to use as manipulators of the technology.

This will happen at the same time as improvements in field of view, resolution and pixel density. At present, most HMDs deliver around 15 pixels per degree, a 90-degree field of view and a fixed 2m depth of focus – which is inferior to humans who are capable of 120 pixel per degree, 230-degree field of view and a variable focus.[27] The future will involve better lenses, less distortion and a marked increase in eye tracking and focus to take into account the way the human eye changes shape to focus when looking at different distances. Current research is focusing on "foveated rendering" which mimics human vision by only focusing on a small part of an image. In the same way future VR will render pixels in the area of focus only.

At present, streaming data to headsets wirelessly in high resolution video through existing wireless systems such as Wi-Fi is problematic as there is a need to compress data to fit into the available bandwidth to ensure there is no lag. Constraints with bandwidth cause lag and that kills the immersive effect. There is some research however into the application of a different wireless technology (called millimetre wave or mm Wave) which is in a higher band of the frequency spectrum than that used by Wi-Fi.[28]

---

22. See "Why The Internet Pipes Will Burst When Virtual Reality Takes Off" dated 9 February 2016 by Bo Begole at Forbes at http://www.forbes.com/sites/valleyvoices/2016/02/09/why-the-internet-pipes-will-burst-if-virtual-reality-takes-off/#f73560464e8c

23. Bo Begole is Vice President and global head of Huawei Technologies' Media Lab.

24. As per footnote 22 above.

25. See "ARRIS Gives Us a Hint of the Bandwidth Requirements for VR" at The Online Reporter dated 17 June 2016 at http://www.onlinereporter.com/2016/06/17/arris-gives-us-hint-bandwidth-requirements-vr/

26. See "Virtual Reality Is A Good News, But Telecom Operators Still Have A Road Long To Travel" dated 16 February 2016 by Alexandre Pelletier (Head of innovation at Tata Communications) at Gizmodo India at http://www.gizmodo.in/indiamodo/Virtual-Reality-Is-A-Good-News-But-Telecom-Operators-Still-Have-A-Road-Long-To-Travel/articleshow/51011186.cms

27. See "This is what virtual reality will (probably) look like in 2021" 7 October 2016 by Hugh Langley at Wareable at https://www.wareable.com/vr/michael-abrash-what-vr-will-look-like-in-2021

28. See "How high-end virtual reality headsets could lose the cables" by the New Scientist author, Hal Hodson, dated 14 November 2016 at https://www.newscientist.com/article/2112622-how-high-end-virtual-reality-headsets-could-lose-the-cables/

iii. **VR and AR for the enterprise:** As VR and AR are concepts that many people get excited about, they will become common in the corporate setting.[29] AR and VR are no longer just for gamers and consumers. Layering contextual information over a physical environment for a presentation is an attractive business proposition. AR is relatively low cost and being used in a lot of training applications. VR will become an aid to collaboration and analysis in companies. Imagine people remotely joining a meeting by virtually including their avatar to exchange information and ideas.

Ford Motor Company is using VR for designing vehicles at the company's Immersion Lab. VR's business applications will accelerate with "Big Data" initiatives.[30] NewVantage Partners' 2016 Big Data Executive Survey of Fortune 1000 companies,[31] noting the push in large companies for more analytic tools, predicted that VR will have an impact. This is because there are inherent limitations in the amount of data that humans can absorbed through a flat computer screen. That can be overcome by immersing a user in a digitally created space with a 360-degree field of vision and simulated movement in three dimensions. Simply, humans can interpret the available data in VR more easily.

All this means headaches and greater investment for the average Chief Technology Officer – not just in dealing with an explosion of online learning. CTOs need to be thinking now about their organisations' future needs for VR and AR content creation, bandwidth needs and integration with legacy systems.

iv. **Integration of VR and AR – "Mixed Reality":** The future will also mean Augmented VR (sometimes called **Mixed VR** or **Hybrid VR**) – where virtual and real are mixed. Mixed VR will enable the virtual world and the real world to combine so that an artificially generated world will be superimposed on the real environment. Imagine remote colleagues joining your real meeting as an avatar and that they appear solid in front of you. Or if you could pin, move, hold, shrink or enlarge or flip or flop virtual items in a real room in front of the group."

v. **Senses:** Finally, VR hardware will allows you to "feel" or "smell" in the VR world.[32] One gadget, called "FEELREAL",[33] attaches to a HMD. The user then puts his or her nose or mouth within range of the sensation-inducing nozzles and their face is blasted with hot air when near a virtual fire or with water if near a virtual waterfall. FEELREAL has removable smell cartridges in seven basic odours: Jungle, Burning Rubber, Flowers, Ocean, Fire, Gunpowder and Aphrodisiacs or FEELREAL will custom make a smell for you.

The potential is mind boggling. In 2011, the University of Tokyo conducted an experiment and found that a VR scent system fooled the flavour sense.[34] The University concluded that what you see and smell is what you taste. The experiment involved a VR system which was able to trick people eating a plain biscuit into thinking the biscuit was of another flavour. Similarly another VR experiment, called Project Nourished, fooled people into thinking they were eating sushi although it was only gelatine cubes – because a smell atomiser misted scent while they were eating and looking at the "sushi" with their VR headset on.

VR may well be the next big thing for dieters and gourmet experiences. VR could dispose of unwanted side effects from foods – such as allergens or kilojoules – yet still allow them to be enjoyed to the full.

---

29. See "Augmented and virtual reality make a play for the enterprise" by Nicole Laskowski at TechTarget dated February 2016 at http://searchcio.techtarget.com/opinion/Augmented-and-virtual-reality-make-a-play-for-the-enterprise

30. According to "Beyond Entertainment: Enterprise Big Data Modeling with Virtual Reality" dated 20 May 2016 by Meg Cater' a blogger with Signiant at http://www.signiant.com/blog/beyond-entertainment-enterprise-big-data-modeling-with-virtual-reality/

31. See NewVantage Partners "Big Data Executive Survey - An Update on the Adoption of Big Data in the Fortune 1000" at http://newvantage.com/wp-content/uploads/2016/01/Big-Data-Executive-Survey-2016-Findings-FINAL.pdf

32. See "FeelReal Is An Oculus Rift Add-On That Lets You Smell Virtual Reality" by Josh Engen dated February 2016 at http://www.cinemablend.com/games/

33. See http://feelreal.com/

34. See "Virtual-Reality Scent System Fools Flavor Sense" by John Boyd dated 18 April 2011 at http://spectrum.ieee.org/computing/embedded-systems/virtualreality-scent-system-fools-flavor-sense

Conclusion

In summary, the future for AR and VR looks bright and interesting although there are a number of legal issues to overcome. We will update this article periodically and suggest you bookmark the Dentons web page for updates.

Contacts

If you have any queries or need advice or assistance in understanding the legal issues associated with VR or AR or any other technology, please contact:

Robyn Chatwood
Managing Associate
D +44 20 7246 7343
robyn.chatwood@dentons.com

Ingrid Silver
Partner
D +44 20 7246 7483
ingrid.silver@dentons.com

Dentons is the world's largest law firm, delivering quality and value to clients around the globe. Dentons is a leader on the Acritas Global Elite Brand Index, a BTI Client Service 30 Award winner and recognized by prominent business and legal publications for its innovations in client service, including founding Nextlaw Labs and the Nextlaw Global Referral Network. Dentons' polycentric approach and world-class talent challenge the status quo to advance client interests in the communities in which we live and work. www.dentons.com

CSBrand-1856-VR/AR brochure_final — 17/02/2017