NEXT GENERATION OF TECHNOLOGY
HOW DO WE GET THERE?

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WHAT ARE 6G AND METAVERSE?

Where we're headed in the communication technology

The rapid pace of technological advancements has highlighted the disparity in pace between what we would like to achieve and how we can facilitate this next generation of technology. In this article we discuss the future of communications, primarily through 6G networks, and the future direction of the automotive industry.

6G

Wireless technology has become a firm, general-use commodity. As we enter a period of widespread 5G usage, the next generation of 6G wireless communication technology has entered the pipeline.

It is projected to upsurge service quality and coverage will span air, space, water, and land.[1] In addition to coping with dense network traffic and meeting very high service requirements, 6G is projected to make possible a vast range of 'futuristic' technologies and allow these to be integrated into society.

So, what is 6G and why is it useful?

Plainly, 6G is 6th generation wireless network. Set to significantly reduce latency using higher network frequencies, 6G will be able to withstand the dense population of wireless demand at these frequencies. It will also enable the integration of AI, IoT, and blockchain, all set to form part of a so-called 'network ecosystem'.[2]

6G is projected to facilitate the use and development of technologies such as Virtual Reality, holograms, and large machine-based communications. Although 5G rollout is in no way near complete, many industries are looking to begin the development of technologies which will heavily rely on 6G wireless for the seamless functioning of such.

We have already seen China launching the first 6G satellite in 2020.[3] The US also has a *Next G Alliance* which has working groups.[4] Companies such as Columbia Shipmanagement have used holograms for meetings and training which span multiple cities, countries, and time zones.[5] This has allowed widescale participation from across the globe without compromising its sustainability pledges, reducing the need for international travel.

With demand from businesses to become more efficient and deliver more to remain competitive, advanced digitalisation has been recognised as the power to do so. This only reinforces that preparation for 6G is never too early, regardless of 5G progress so far.

The comparison between 6G and 5G?

The key features of 6G, in comparison to past generations of wireless communication, include the following:

- **Higher data rate:** Network data rate, or the quantity of data transmitted over a period over time, will increase significantly with 6G. We have not yet seen the promised speed of 5G across the board; however, with 6G expected to be c.100 times faster than 5G, the difference will be noticeable.[6] To contextualise this, academics have predicted speeds which would enable 142 hours of Netflix films in just one second.[7]

  This will require an upgraded data network infrastructure by operators to allow the large numbers of users able to use the advanced services with the enhanced spectral efficiency.

- **Lower latency:** 5G is set to reduce network latency to 1 millisecond, which is vast in comparison to the average 53 millisecond latency of 4G. Considering this, the aim to reduce latency to a mere 0.1 millisecond through 6G wireless communication is a ground-breaking measure for the reliability and functionality of applications.

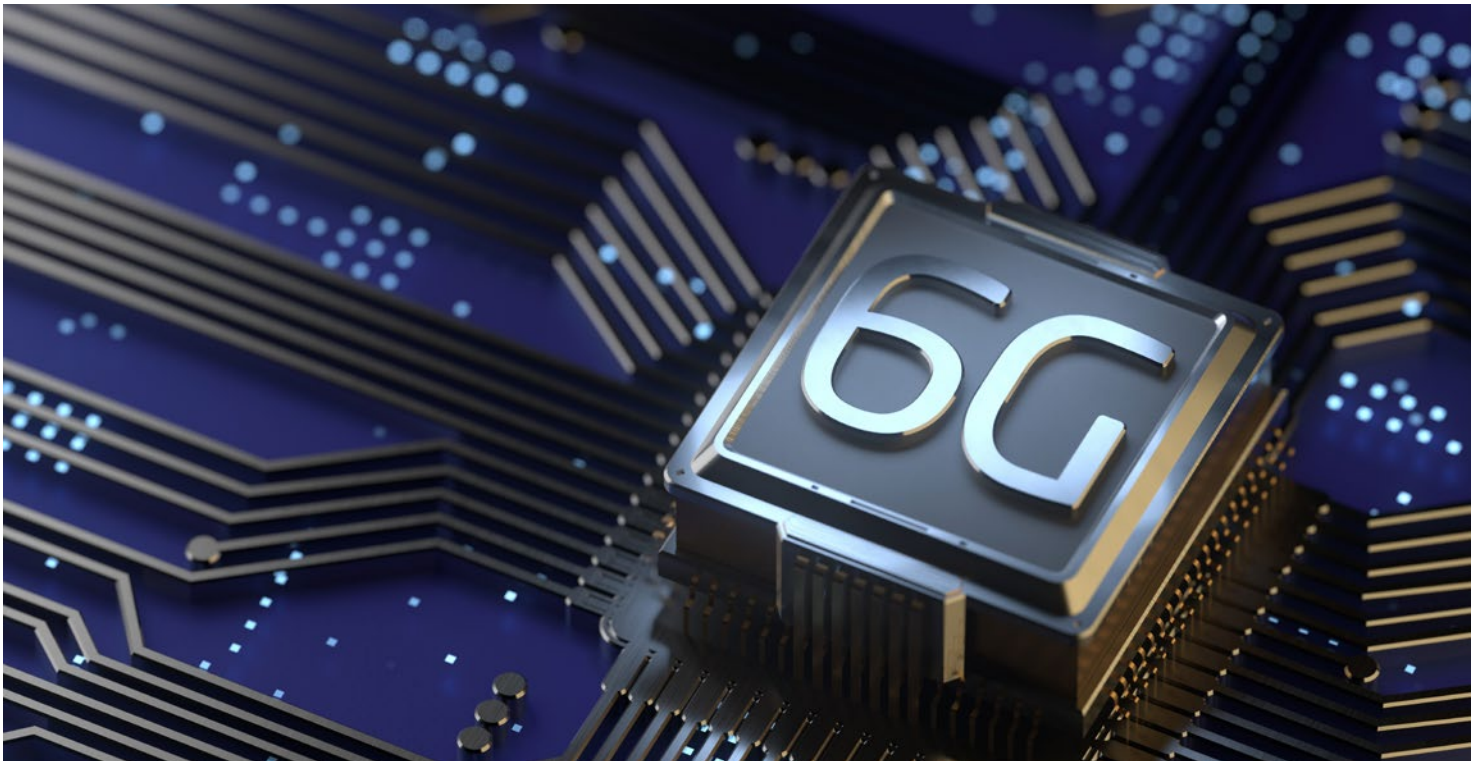
- **Energy efficient:** The energy efficiency of 6G networks in comparison to 5G networks is two-fold. Firstly, the enhanced speed and connection will reduce the requirement for energy. In addition, the secondary effect of having 4K pictures and holographic life will reduce the need for travel and the slow connection of current communication technologies.

- **Machine focused and AI Driven:** Where the main features of 5G are features such as the interconnection of billions of devices, 6G is a step further. There has been a lot of discussion of *interconnected intelligence* over 6G networks. This entails not just devices over the wireless, but new *services* and *life* facilitated by wireless. Technologies like cognitive devices, AR, VR, digital twins, and fusion of cyber-physical world, are just some of the examples of what 6G could facilitate.

  Cyber-physical systems could be fulfilled for the very first time with 6G with networks which can see both worlds: AI capabilities combined with mass numbers of devices loaded with sensors (sound, vision, infrared, radar).

- **Mainstream use:** Where 5G is currently being rolled out globally at present, 6G will not be able to come into play until 4G infrastructure has been completely replaced or upgraded. This has sparked predictions of 2030-2035 for 6G to make its way into the mainstream.[8] This is, in part, due to 6G only being practical when it comes with Satellite and the subsequent technologies that assist this (see below).

1 https://www.cbcamerica.org/blockchain-insights/blockchain-technology-benefits-in-6g-networks-the-way-forward
2 https://www.cbcamerica.org/blockchain-insights/blockchain-technology-benefits-in-6g-networks-the-way-forward
3 https://www.bbc.co.uk/news/av/world-asia-china-54852131
4 https://nextgalliance.org/
5 https://maritime-executive.com/corporate/columbia-shipmanagement-uses-hologram-tech-in-training-and-meetings
6 https://www.digitaltrends.com/mobile/what-is-6g/
7 https://www.digitaltrends.com/mobile/what-is-6g/
8 https://www.zdnet.com/article/what-is-6g-if-anything-a-guide-to-what-to-expect-from-whom-and-when/



What is the present and future of 6G?

Still in the research phase, the interest in developing such technology has not yet become mainstream. There are several challenges to overcome before 6G wireless can be integrated into existing infrastructures. With the 5G rollout forecasted to still be in action until 2025 in many parts of the world, 6G is at least 10 years away. There are two notable reasons that can be attributed to the importance of early preparation for the introduction of 6G: technology enablers and security.

The following factors must also be considered:

- What exactly new waveforms mean for the subsequent changes to underlying formats of the exchanged signals; and,
- How we can efficiently transmit both communications and sensing simultaneously.

Enablers

6G will use **terahertz bands** as well as mmWave bands.[9] With very high frequency products, millimetre ranges are densely populated.[10] This requires a lot of development and understanding to exploit these ranges for bringing to life the data rates promised by 6G.

To achieve these frequency bands, **satellite communications** will be required. The integration of satellite converged networks will have to be firmly established to avoid the high propagation losses affiliated with satellites. As we move up in the frequency, propagation losses in the wireless networks become more significant. Factors such as weather, remoteness, and indoor receivers will all play a part in how efficient satellite connectivity can operate. Currently, even water vapour in the air can limit satellite signals.[11] On top of this, there is a fight for space to launch satellites in space. There are desired distances at which satellites are located and as more are launched to facilitate connectivity such as 6G, this fight for area will only become greater.

Beamforming is just one of the ways around this – the concentration of energy in well directed beams to increase efficiency of transmission.[12] These are technologies existing in 5G but with 6G we are expecting to go a step further and exploit even wider ranges of the spectrum.

Hence, 6G discussion must begin early whilst we are still carrying out 5G rollout. It is very clear that there are a lot of technical details to be ironed out such as digital coding and appropriate infrastructures.

Security

The benefits of 6G are incredibly powerful; however, there is a practical assessment to be made. 6G will also come with the need for large scale processing of devices through new systems and the whole new range of systems will need to be secured. In terms of security, it is not just the sheer scale of the networks, but we will also have to meet a diverse range of constraints including data risk, delay constraints, energy constraints, confidentiality constraints.[13] With private and sensitive data on air constantly and ultra-dense networks with lots of complexity there is much potential for attackers to get ahead of our current standard security solutions.

9 https://www.free6gtraining.com/2020/12/taxonomy-of-6g-wireless-systems.html

10 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4934318/

11 https://artes.esa.int/space-6g

12 https://www.espublisher.com/uploads/article_pdf/es8d571.pdf

13 https://www.sciencedirect.com/science/article/pii/S2352864820302431

"6G will enable integrated technologies which have sensory functions in alliance with communication. A particular example of this is auto sensors and autonomous driving. Where there is a need for quick reactivity of such sensors to provide short distance solutions, high-speed data will be vital."

This has forced discussions regarding alternative approaches such as physical layer security.[14] Where our current approach solutions are based on cryptology and static security protocols, the same level and same security guarantees are given irrespective of the application. With 6G, it has been suggested to instead look at a full spectrum approach to support the range of uses from mobile network and OT low-end sensor devices to holographic and AI networks.

What does 6G indicate?

6G reinforces the rapid rate at which technology is storming ahead with requirements for unprecedently powerful networks. When technology reaches a point at which it can go no further without the infrastructure for ultra-efficient network and the subsequent appropriate level of security, preparation must begin as early as possible. The big question is how this will look globally in coming years with both the race to achieve, as well as the possible improvements to life?

The Space Race

SpaceX developments are occurring at a rapid rate. Countries have been competing on the space front with China launching the first 6G satellite in 2020. However, SpaceX, the U.S. aerospace manufacturer is by far ahead with a total of 144 space launches – its most recent Falcon 9 landing was just this month. This is not the first time the Falcon 9 has been launched and what sets Space X apart from other developments in the industry is their products' capacity to be reused. This not only comes with huge sustainability benefits, it also brings costs down significantly as Space X have manged to reuse even the most expensive parts.[15] With cost being such a limiting factor in future technology implementation, this is a huge step in the direction of widespread rollout.

Down on Earth

Down on earth, 6G will enable integrated technologies which have sensory functions in alliance with communication. A particular example of this is auto sensors and autonomous driving. Where there is a need for quick reactivity of such sensors to provide short distance solutions, high-speed data will be vital.[16]

The challenge is hardware and software all link together to draw the profile of the future IT. Suppliers of hardware need to know the development of software and software developers need to know what hardware is available to them. The disparity in pace has the potential for future technology to develop in silos. Ultimately the challenge with this is that it leaves potential gaps for cyber-security breaches and attacks.

6G, Metaverse and Blockchain

Technicians believe that 5G technology is sufficient to support the building that the metaverse world would require in the current stage. Based on 5G technology, 6G's advances in speed and latency will bring a more immersive experience to the metaverse (but this is not something that 5G technology cannot achieve).

Blockchain can bring a range of benefits to 6G including the mitigation of intermediaries and optimal inference management as well as eliminating scalability restraints. It can also provide trust between a range of parties such as caches and providers, as well as edge servers and user devices. Integrity of remote sources and offloaded technology can be established through blockchain whilst it also improves spectrum sharing security, limiting the possibility of lease record tampering.

The impact of 6G should be achieved mainly through blockchain, but the current network discussion is mainly about blockchain enabling 6G rather than 6G bringing impact to blockchain.

14 https://strathprints.strath.ac.uk/78145/1/Mucchi_etal_IEEE_OJCS_2021_Physical_Layer_Security_in_6G.pdf#:~:text=Physical%20layer%20security%20addresses%20one%20of%20the%20most,to%20on-body%20and%20in-body%20nano-devices%2C%20including%20biochemical%20communications.

15 https://www.msn.com/en-us/news/technology/spacex-s-reusable-falcon-9-rocket-launched-u-s-reconnaissance-satellite-on-wednesday/ar-AATrA1w?ocid=BingNewsSearch

16 What is 6G? | 6G Radio Frequency (miwv.com)

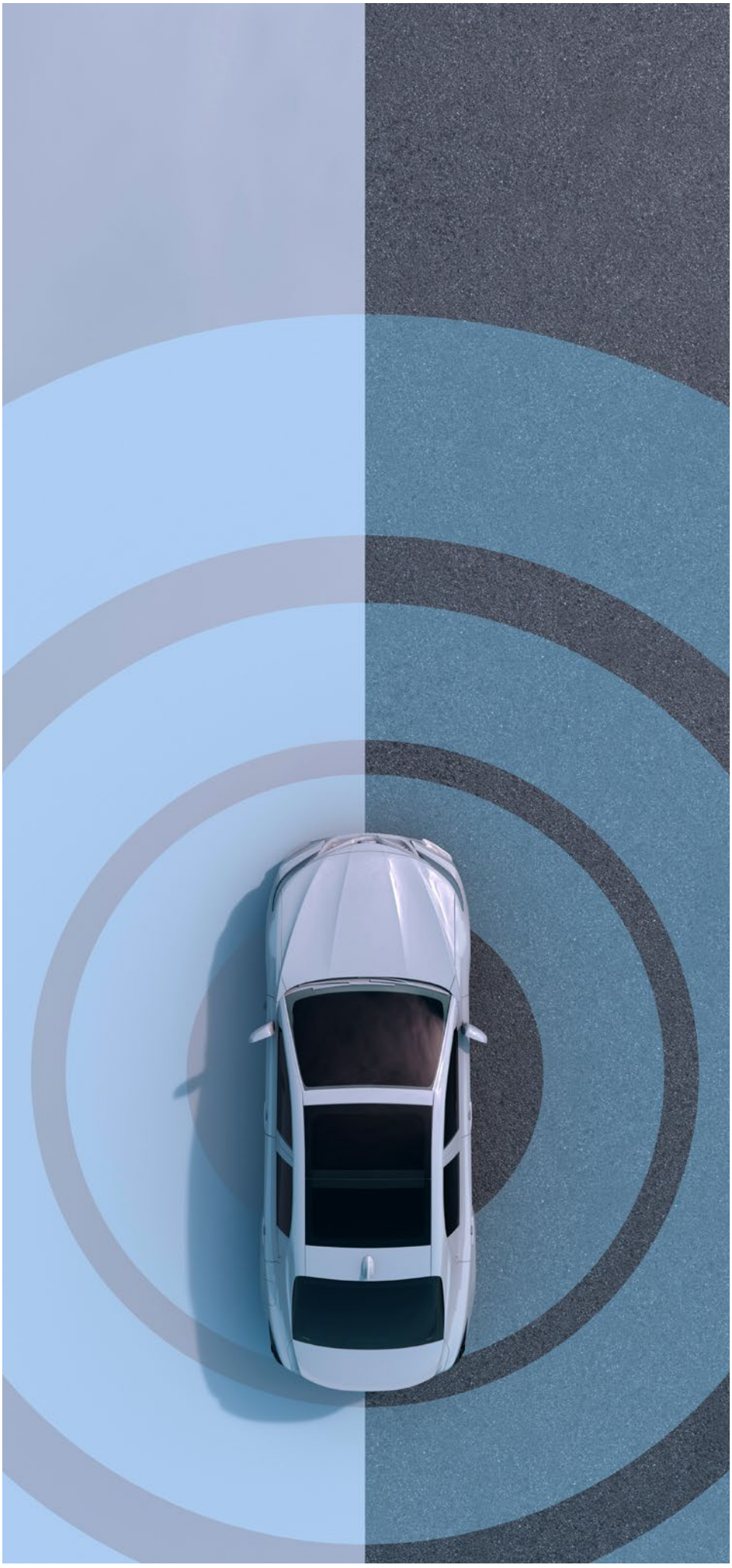
Financial implications

The ground-breaking nature of incoming technologies has also led economists and leading investors to believe that they cannot be invested in through traditional means. Cathie Wood's pioneering investment management firm, ARK Invest, believes that future technology cannot be boxed into a single market sector or location.[17] Unfortunately this is exactly how the current investment market appears.

ARK has broken this traditional mould in several ways including the following:

- Offering investors an opportunity to invest in opportunities and across several innovative sectors such as AI, energy storage, robotics, DNA sequencing, and blockchain;
- Exploiting the 3-5 year period ahead which has been underestimated by other fund managers;
- Becoming among the first to adopt this strategy, planning to capitalise long term from future technology;
- Creating a 'top-down and bottom-up' Open Research Ecosystem to expand their specialised understanding of the future technology market and target their investments in line with the pace of developments.

Investing in disruptive technologies does not come without inherent risks. With many innovative technology developers occupying private markets, whilst larger enterprises lag behind in research yet dominate the public markets, there is very little benchmark for where the costs and profit margins for future technology will be set.[18] There is no doubt that that disruptive technology will be a lucrative market but where this can be monetized is incredibly unpredictable.



17 https://cathiewoodstocks.com/who-is-cathie-wood-and-what-is-ark-invest/

18 https://cathiewoodstocks.com/who-is-cathie-wood-and-what-is-ark-invest/

Blockchain

What is Blockchain?

A blockchain is a type of distributed ledger technology – a shared digital infrastructure used to store data securely and enable the data exchange with third parties.[19] In the blockchain system, transactions are carried out between members of a network and information on these transactions is collected in the form of a 'block'. These encrypted data blocks are validated by network members and are then linked to the last block on the chain, via a hash function that ensures the immutability of the blockchain. Consensus algorithms ensure that the next block (i.e. transaction) in the blockchain is fully validated and secured.[20]

Blockchain and the Supply Chain

The multitude of parties involved in supply chains implies a wide range of documents shared as well as high transaction volumes. The majority of these documents have been created and processed manually. Decentralised ledger-based applications might provide a robust and resistant to modification record of trade history by storing trade-related data in permissioned blockchains so that stakeholders could have real-time access to past transactions and relevant documents.

- Real-time asset tracking, accessible to all participants provides more transparency and helps increase the precision of the information exchanged along the supply chain. This would also increase the accountability of the different stakeholders, with an increased visibility on their action and responsibility, leading potentially to a reduction of both fraud and litigations.
- The decentralised control brought by blockchains could also help reduce the number of intermediaries involved in trade exchanges, with a potential reduction of costs. Moreover, as the process relies on predefined consensus algorithms, no single actor has the ability to add or modify information to the blockchain without proper validation from the other participants.[21]
- Proactively managing the supply chain and getting ahead of the curve in traceability can help build a reputation as a leader in responsible manufacturing. Presenting data verified by a blockchain can contribute to improved public trust in the supply chain data.

Blockchain and the Automotive Industry

Impacts of blockchain in the automotive industry

The automotive supply chain is indubitably complex- involving a multistage manufacturing process, regulatory compliance, car dealership networks and aftersales services. The presence of so many 'moving parts' inevitably leads to inefficiencies vulnerable to exploitation.

- **Traceability:** Blockchain technology can be used to verify the source of materials used in a car's construction. This is of particular relevance in light of the increasing demand for Electric Vehicles (EVs) which depend on lithium-ion batteries, and thus Cobalt. At present, more than 60% of the world's supplies are sourced from Democratic Republic of Congo, where roughly one fifth of production comes from unregulated mines.

  IBM's Responsible Sourcing Blockchain Network (RSBN) is one example of how blockchain based technology is being applied in order to drive responsible sourcing for the ethically conscience manufacturer. This system allows for an immutable audit trail, assessing network participants against standards and best practices set by the Organisation for Economic Co-operation and Development (OECD) and the Responsible Minerals Initiative (RMI). The RSBN is able to document proof of initial ethical production of raw materials and from mine- to-end manufacturing. Indeed, the BMW Group have also collaborated with London-based startup Circulor to use the latter's blockchain-based mapping technology to find sources of cobalt that meet ethical guidelines. As a result of the project, BMW has announced that its batteries will use cobalt from approved sources in Morocco and Australia.[22]
- **Data Holding:** A vehicle's VIN number can be stored in the blockchain, meaning that if a recall is issued, owners of the exact vehicles with a fault can be contacted, dramatically reducing costs for manufacturers, and inconvenience for drivers. Second-hand car buyers benefit as the seller can share fully verified, incorruptible data about the car's history, pervious owners and the vehicle's title can be shared to the new owner simply via the blockchain, too. The technology can also be used to guarantee that only original OEM (Original equipment manufacturer) – supplied parts are being used to make repairs or replacements with a simple scan of a QR code.[23]

19 www.europarl.europa.eu/RegData/etudes/STUD/2020/641544/EPRS_STU(2020)641544_EN.pdf

20 ibid.

21 www.natlawreview.com/article/pros-and-cons-blockchain-supply-chain

22 www.ibm.com/downloads/cas/JX9KDGPJ

23 Ibid.

- **Insurance:** Smart Contracts could be automated to accurately reflect vehicle mileage – creating a usage-based insurance (UBI) allowing drivers who do not use their cars frequently to receive discounted premiums. Insurers could access hybrid blockchains in order to instantly calculate a driver's premium and simply execute pre-existing smart contracts to automate payments, rather than rely on a slower more cumbersome system of manual processes. Currently, The University of Luxemburg has created a sub-department dedicated to researching how blockchain can be applied to industries like insurance. Its Services and Data Management (SEDAN) research group is working to develop platforms suitable for blockchain-based car insurance.[24]

The Future of the Automotive Industry

Blockchain technology delivers a significant upgrade that could revolutionise the automotive industry even further – particularly in the context of increasingly autonomous vehicles. One of the biggest barriers to autonomous cars entering the mainstream is the fact that they are still not connected enough to their surrounding environment. Blockchain's decentralised ledger means that each node in the network – in this case each car and data point – has access to all data almost simultaneously, and more accurately. The Mobility Open Blockchain Initiative (MOBI), a nonprofit consortium, whose members include BMW, Ford, Hyundai and Honda is one of the organisations spearheading the effort to utilise distributed ledger technologies (DLT) to bolster the smart mobility industry.[25]

"Blockchain technology delivers a significant upgrade that could revolutionise the automotive industry even further-particularly in the context of increasingly autonomous vehicles."

Another important area where blockchain technology could likely be employed relates to vehicle-to-vehicle (V2V) microtransactions. In this model, car owners could use tokens – such as Streamr's DATA token – to pay for data they require from other cars. This could include weather forecasts, gas prices nearby, congestion data, and more. Vehicles could then earn tokens simply by sharing their data or choosing to sell it to advertisers or manufacturers. With this strategy, blockchain creates a V2V closed ecosystem that incentivises and rewards participation simultaneously.

MOBI's work towards developing a Vehicle Identity blockchain standard (VID) that creates a digital twin of each vehicle in the blockchain could in future effectively make the car its own financial entity of sorts – paying out for using roads that are more congested or receiving payment when green energy is used for recharging.

The impact of blockchain on the automotive supply chain

In the automotive supply chain, Blockchain technology's implementation expedites administrative supply chain processes, reduces additional costs incurred, and maintains transaction protection. Eliminating the supply chain middlemen and intermediaries reduces the risks of fraudulent actors, counterfeit goods and makes for increased productivity.[26] Used by all participants along the supply chain, in such a setting, the different participants of the supply chain would each host a node of a blockchain network to exchange information, track products and keep records of supply chain transactions and exchanges.

Case Study

Since end of 2018, the French automaker Renault has been working with IBM to create a blockchain-based solution to unite their suppliers on a single platform designed to certify the compliance of all vehicle components, from design to production. As more organisations join XCEED[27], companies can also begin to experiment with other ways of taking advantage of this information exchange. Recalls could be conducted on a more precise basis and much more swiftly, due to the increased visibility in the supply chain.[28]

24 Ibid.

25 www.ibm.com/downloads/cas/BKQDK0M2

26 www.ibm.com/blogs/blockchain/2021/07/how-blockchain-can-transform-traceability-in-the-automotive-space

27 https://en.media.renaultgroup.com/news/xceed-the-new-blockchain-solution-for-the-certification-of-vehicle-compliance-is-moving-a-step-further-in-europe-ee5b-989c5.html

28 www.ibm.com/blogs/blockchain/2020/12/blockchain-and-sustainability-through-responsible-sourcing/

NFTs

In discussing the viability and rise of nascent technology such as the Blockchain 'Web 3.0' innovations – NFTs, the Metaverse and happenings within the Cryptocurrency sphere – cannot be ignored. Record prices have already been reached for NFTs linked to different underlying assets:

- Beeple's digital art work, Everydays: The First 5,000 Days sold for a record US$69 million by Christie's auction house.
- Twitter's CEO, Jack Dorsey, auctioned an NFT of his first-ever tweet, "just setting up my twttr", which sold for over US$2.9 million.
- NBA Top Shot crossed the US$500 million mark, making it the biggest NFT marketplace as at the date of publication[29]

What are they?

An NFT is a cryptographic tool using a suitable blockchain to create a unique, non-fungible digital asset. Each NFT that is 'minted', i.e. created, is powered by a smart contract, typically utilising Ethereum's ERC-721 standard[30] and contains metadata (such as the rules and rights that attach to the NFT – i.e. a rule that the original creator of the NFT gets paid a percentage of any subsequent resale value) of the underlying digital or physical asset to which the NFT relates. The value in an NFT is derived from it being "non-fungible", meaning that the token cannot be replaced with an identical token. Much of the hype surrounding NFTs is their potential use in proving ownership and authenticity of the asset which it represents.[31] This technology lays the foundation for creators to have more control over the value and the conditions of the sale of their digital creative works

29 https://www.nortonrosefulbright.com/en-gb/knowledge/publications/1a1abb9f/nfts-and-intellectual-property-rights

30 However, the increasing popularity in Solana as a faster and more efficient alternative has the potential to dislodge Etherum from its stronghold.

31 https://www.lexology.com/library/detail.aspx?g=3f2af783-603b-427f-a988-4cc00cff7c52

“At present, NFTs have been issued by businesses in various sectors, to raise brand awareness, exploit gaming opportunities in the metaverse, and remunerate artists for their creative output.”

and create new distribution channels of art, performance access, or other valuable property. [32]

Current use

At present, NFTs have been issued by businesses in various sectors, to raise brand awareness, exploit gaming opportunities in the metaverse, and remunerate artists for their creative output. They are also generating interest among major players in the fintech sector, as seen with Visa's acquisition of CryptoPunk.[33] In the last year more than $208 million of NFT-based artwork was sold (in primary and secondary sales), as compared to the $250 million of total NFT volume traded in all of 2020. In addition, creators are utilising NFTs to generate novel methods of monetising digital creative works and other experiences. One interesting example is Nike's recent acquisition of Rtfkt, a startup that creates NFTs of shoes and other collectibles and patent obtained in 2019 for a system called “CryptoKicks” where Nike could tokenise ownership of shoes by linking an NFT to a physical shoe.[34] This system could allow businesses to have control over their shoe design – for example, by limiting the number of copies that can be produced. With the prevalence of fake trainers on the market, this provides an innovative way to combat counterfeiting. It also has the benefit of offering a limited edition product, engendering brand loyalty between brand owner and customer, and helps keeps the business current and relevant. Though not yet launched by Nike, this represents an interesting concept to be aware of in the retail sector. NFTs can also be used to verify the authenticity of physical assets. For instance, instead of issuing physical certificates, Breitling now issues a ‘digital passport’ which utilises NFT technology to certify the authenticity of its luxury watches.[35]

Benefits

The popularity of NFTs stems from the scarcity they create. Digital works by their very nature can be copied, recreated and replicated infinitely. An NFT does not change that. Rather, an NFT creates scarcity by generating a digitally unique record authenticating ownership of a particular version of a digital work (usually one the creator themselves holds out as being the true version). Therefore, they represent the ultimate example of an artwork deriving value from its provenance rather than the quality of the work itself. Anyone can view Beeple's ‘Everydays: The First 5000 Days’ online for free and a number of copies of the artwork exist; but only one person can claim ownership of the version authenticated by the artist himself.

Issues

A point to note however relates to the concept of ownership in regards to an NFT. While the owner of an NFT can prove it owns the NFT, it does not necessarily own anything more than that. NFTs are conceptually distinct from the underlying asset it represents. As NFTs merely represent a unique copy of the asset, rather than the underlying asset itself, the purchase of an NFT without more does not grant the purchaser intellectual property rights in the original artwork.

NFTs are a fascinating product of blockchain technology which presents exciting possibilities. However, its potential widespread uptake is not without significant hurdles that must first be resolved, including intellectual property right issues, as well as the technical risk of link pertinence whereby an NFT links to an off-chain digital asset that in reality no longer exists.

32 https://www.whitecase.com/publications/alert/rise-nfts-opportunities-and-legal-issues

33 https://artlawandmore.com/2021/07/08/what-are-the-legal-issues-concerning-non-fungible-tokens-nfts/

34 https://mediatel.co.uk/news/2022/01/31/metaverse-2022-we-aint-seen-nothing-yet

35 https://www.twobirds.com/en/news/articles/2021/australia/non-fungible-tokens-nfts-and-copyright-law

The Metaverse

The ultimate vision of the metaverse is a series of interoperable, decentralised worlds between which users glide seamlessly and would be able to create real estate, buy and create consumer products, and even develop careers, and establish economies. In simple terms, the metaverse is a 3D rendered virtual reality that can be engaged with to create a fully immersive, simulated experience. The Metaverse increases the permeability of the borders between various digital environments and the physical world such that a user can interact with virtual objects and real-time information.[36]

Of late, the metaverse has gained a higher profile because major tech companies, such as Meta (formerly Facebook) and Microsoft, have announced their plans to develop new metaverse platforms for both entertainment and working purposes. This has stimulated enthusiasm from other industry players to develop ecosystems compatible with the major players' metaverse visions, in a manner that is increasingly accessible for general users.[37] Indeed, Procter & Gamble have launched a BeautySPHERE metaverse experience in partnership with London's Royal Botanic Gardens, Kew wherein users can explore a gamified virtual tour of the gardens to learn about ingredients and the company's sustainability initiatives. Meanwhile, Samsung showcased existing products fit for the future via the 'Decentraland' metaverse experience.

Burgeoning Popularity

The global pandemic forced countless nations to overhaul their working and leisure practices, pushing millions of businesses into the online world through video-conferencing and other collaborative tools. Where before there was a growing interest in the adoption of technology to improve processes, the global pandemic accelerated this need for digital transformation.[38] Meetings enabled by virtual reality (VR) or augmented reality (AR) or a mixture of these (mixed reality) could take what we now have to an entirely new level. Microsoft has already been demonstrating this for a few years with their HoloLens technology, which already integrates with Teams and other 2-D programs in the Microsoft stack, and others, and uses hand gestures as controls instead of keyboards.[39]

Things to consider: Balancing opportunity with risk

Undoubtedly the metaverse presents a wealth of opportunities, but it is clear that the evolution of these virtual worlds is not without the legal issues that come with it. An example of this concerns licensing arrangements. For any brand looking to experiment in the metaverse today, it is crucial to establish clear IP licensing arrangements with the metaverse platform provider. As with any IP licence, typical terms such as term, territory, and royalty rates are important, however, particular attention should be paid to the scope of the licence. For example, a brand is looking to create a 3D sneaker as an add-on for a game and it wants that sneaker to be ported to another game or used in a different context, it should ensure that its contract with the metaverse vendor grants all necessary IP rights to give flexibility for the brand's future uses. Scoping the IP licence to account for broad use and anticipate future uses is crucial. Brands need to mitigate the risk of reputational damage arising from unwanted brand associations by setting the boundaries of usage. A brand may, for example, not wish to have its branded items in a particular part of a game depicting graphic violence. Setting out the limits of use at the outset will help avoid disputes down the track.[40]

"For any brand looking to experiment in the metaverse today, it is crucial to establish clear IP licensing arrangements with the metaverse platform provider."

36 https://www.ipwatchdog.com/2021/12/01/live-work-play-legal-metaverse-preparing-new-online-existence/id=140614/

37 https://www.lexology.com/library/detail.aspx?g=f88ba949-242d-4295-98c6-2d73415d2709

38 https://www.stephenson.law/what-is-the-metaverse-and-why-does-a-law-firm-care/

39 https://www.artificiallawyer.com/2021/11/02/law-firms-in-the-metaverse

40 https://www.technologyslegaledge.com/2021/11/an-unreal-issue-managing-ip-in-the-metaverse/

Solana

Solana is the current leader in the race to replace Ethereum with a better, faster and cheaper blockchain. From the perspective of investors, it is the leading "Ethereum killer." Indeed, Bank of America Digital Asset Strategist Alkesh Shah wrote in a client note Thursday (Jan. 13) that Solana could become the "Visa of the digital asset ecosystem." Bitcoin may be the first, best-known and richest blockchain, however Solana's rapidly expanding ecosystem and its versatility have inevitably drawn comparisons to Ethereum, the leading blockchain for decentralised applications (dApps).[41]

However, unlike Solana, Ethereum operates a Proof of Work (PoW) blockchain, where miners must compete to solve complex puzzles in order to validate transactions, making this technology more energy intensive and hence detrimental to the environment. Much of the buzz surrounding Solana in 2021 was due to its distinct advantage over Ethereum in terms of transaction processing speed and transaction costs – the blockspeed. Solana has shown it can process 50,000 TPS (transactions per second) and its average cost per transaction is $0.00025. In contrast, Ethereum can only handle less than 15 transactions per second, while transaction fees touched a record of $70 in 2021. Solana uses PoS (Proof-of-Stake), but it also adds a second consensus mechanism called proof-of-history (PoH) to the process. PoH acts like a time stamp, adding a second layer of security with a cryptographically verifiable date to the block.[42]

Both Solana and Ethereum have smart contract capabilities, which are crucial for running cutting-edge applications like micropayments, decentralised finance (DeFi), decentralised networks (Web3), the Metaverse and nonfungible tokens (NFTs). Whilst Ethereum has first mover advantage, Solana offers considerable scope for improved scalability, security and sustainability which may see it quickly grow in terms of market capitalisation.

41 https://www.investopedia.com/solana-5210472

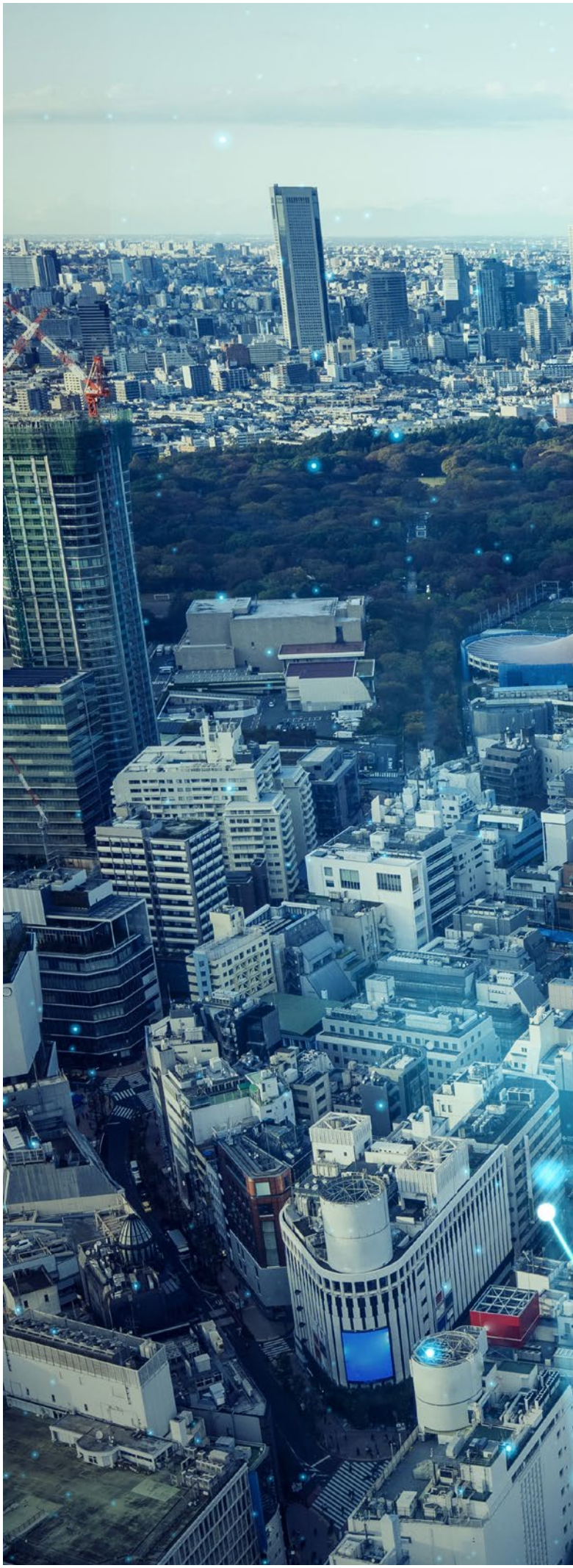
42 https://www.pymnts.com/blockchain/2022/pymnts-blockchain-series-what-is-solana/

CONTACTS

For more information pleased contact

DANIEL LEUNG
Partner, Hong Kong
T +852 3983 7669
E daniel.leung@hfw.com

FURONG REN
Senior Associate, Shanghai
T +86 21 2080 1058
E furong.ren@hfw.com



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