McKayResearch

www.mckayresearch.com

DIGITAL ASSETS & BLOCKCHAIN:

The top trends to watch in 2022 and beyond

Special Briefing Report

About the author

James McKay is an independent research consultant with multi-market expertise in the design and end-to-end implementation of custom research projects.

As principal and founder of McKayResearch, he has 14 years' experience providing strategic research services both to the world's leading market intelligence firms and a growing portfolio of private clients that include legal consultancies and investment firms. His research instruments and analyses have been widely published by a variety of technology and business publications, including the Financial Times.

On a personal level, James's experience in varied sectors makes him at home with the multi-faceted application of digital assets in the worlds of tech and industry and he is passionate about contributing to a greater understanding of this rapidly evolving space.

Contact:
James McKay
Research Consultant
+44 (0)7854 214 830
james@mckayresearch.com

Executive Summary

With the continued growth and buzz surrounding the rapidly maturing digital assets space throughout 2021, one could be forgiven for overlooking that the technology is still in its infancy. While bitcoin (and other major cryptocurrencies) have moved ever closer to gaining acceptability within mainstream traditional finance, a multitude of other emerging trends within digital assets that have supplanted it with respect to the wider adoption of blockchain technology.

Despite the inevitable regulatory headwinds and implementation challenges that accompany any potentially revolutionary technology, the broader macro trend of increasing investor participation in digital assets and rising adoption of decentralised systems continues apace – from NFTs and the metaverse to blockchain-based sustainability initiatives.

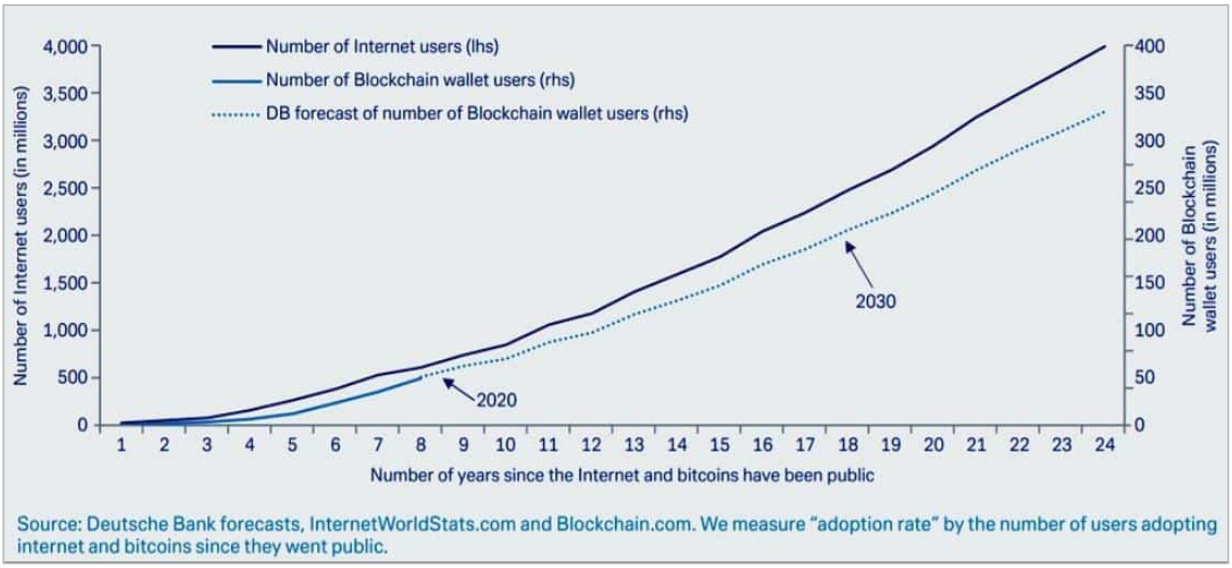
In this special briefing report, we examine and critically review seven of the biggest trends in digital assets and blockchain, and chart how they will continue to shape the evolution of the space in 2022 and beyond.

Contents

INTRODUCTION: Blockchain's Winds of Change

The continued growth of the digital assets space over 2021 has left little doubt that the overall trend towards greater adoption of cryptocurrencies and decentralised systems is very much intact, in spite of the challenges. Even though there are projections that indicate that blockchain adoption is proceeding at a slower rate than the early days of the Internet (Figure 1), there is plenty of evidence to suggest that the technology is only just beginning to hit its stride and has the potential to be equally if not more transformative. Either way, much of the early delivery and progress has been hampered by many of the same growing pains, such as a lack of talent, poor communications, flawed application design, and a low appetite for risk. While the quadrupling of the total cryptocurrency market cap (which briefly touched $3 trillion in November 2021) was to an extent fuelled by the continued warming of institutional investors[i], both towards bitcoin and altcoins, the broader increases in adoption have continued to be fuelled by other major drivers. In particular, the growth of NFT use cases and the rise of the metaverse became headline trends, both of which have proven a natural fit for blockchain technology and have accelerated crypto adoption in the process.

Figure 1: Comparative adoption rates of cryptocurrencies and the Internet



Source: Deutsche Bank forecasts, InternetWorldStats.com and Blockchain.com. We measure "adoption rate" by the number of users adopting internet and bitcoins since they went public.

TREND #1: Macro Decoupling

For most of its short history, bitcoin has been largely uncorrelated with the traditional financial assets it was built to challenge, but since 2020, this correlation with stocks has trended positive, particularly in risk-off environments. While the 'digital gold' narrative continues to gain traction, bitcoin has yet to display the characteristics of a 'traditional' safe haven asset – however its outsized returns have rendered this point moot. More important is the decoupling taking place *within* digital assets, and here, the decline of bitcoin dominance signals the weakening of macro inputs on crypto market in favour of the blockchain-based, distributed systems that hold the key to mass adoption.

The bitcoin network first introduced blockchain technology to the world in 2009 and has to a large degree remained the dominant influence over crypto market price action ever since. However, 2021 saw the noticeable acceleration of the counter-cyclic movement already observed in 2020, where bitcoin dominance (the totality of crypto market cap owned by bitcoin relative to altcoins) continued to decline throughout the year (Figure 2).

A weakening impact of macro inputs

This reflects the declining influence on the broader cryptocurrency market of the macro inputs (e.g., FED policy, inflation, stock market performance) that typically impact the price of bitcoin due to its falling proportion of the total market. Secondly, it suggests that more participants are understanding the functional difference between Proof of Stake (PoS) and proof of work (PoW) protocols, as evidenced by the price action of layer one blockchains such as Ethereum, Solana, and Avalanche, whose value is toa large degree determined by the network effect derived from the number of transactions taking place within their ecosystems.

At the same time, this decoupling has also been manifest between different markets, with bitcoin exhibiting significant tendencies to decouple from stock market movements, in what has become an increasingly uncertain macro environment. For example, while the S&P500, gold, and other markets all trended negative during September and October due to fears of a possible EverGrande collapse and the earlier-than-expected announcement from the FED to put the brakes on asset purchases, bitcoin was still able to rally over 50%.

As bitcoin's market cap grows and its volatility stabilises over the long term, investors will increasingly seek out returns in the altcoin market, making a return to the days of 70%+ bitcoin dominance highly unlikely, particularly as overall adoption of production-grade decentralised systems gathers pace.

Figure 2: Bitcoin market cap dominance in 2021

Bitcoin dominance declined in 2021, as Layer 1s and other areas of the crypto economy expanded

Key Takeaways:

- Bitcoin's correlation with equities has trended positive in the last two years, with price action exaggerating market trends with volatile up and down swings similar to a leveraged position.
- With a growing number of spot and derivatives products, financial institutions could exert increasing influence over the price of bitcoin.
- As blockchain applications mature, bitcoin is unlikely to recapture its prior share of total crypto market cap as an array of blockchain applications continue to mature.

TREND #2: Institutional Investment

2021 will be remembered as the year that intuitional investors arrived on the crypto scene in earnest, a development very much spurred on by increasing regulatory clarity. The steady crescendo of announcements of institutional participation in the crypto assets space was/is a reflection of how quickly the attitudes of investment banks, hedge funds, and family offices have shifted over the past 12 months. Despite this, a large number of institutional investors – particularly corporate treasurers – would have been unwilling to gain exposure during bitcoin's surges to all-time highs and would instead be looking for corrective pullbacks to take up any large positions.

While some argue that the original intent of blockchain-based cryptocurrencies is diametrically opposed to stocks, bonds, and other financial assets under the centralised control of governments and financial intermediaries, others opine that participatory vehicles for institutional investors are essential for the long-term stability and viability of the market.

Regardless of one's point of view, there is no denying that institutional interest has been building for some time[ii], and is widely considered to be a net positive for the overall health of the market. As such, the institutional drive to bring about the facilitation of greater market participation via pensions and investments meant that the need for regulatory clarity hit the top of the agenda in 2021.

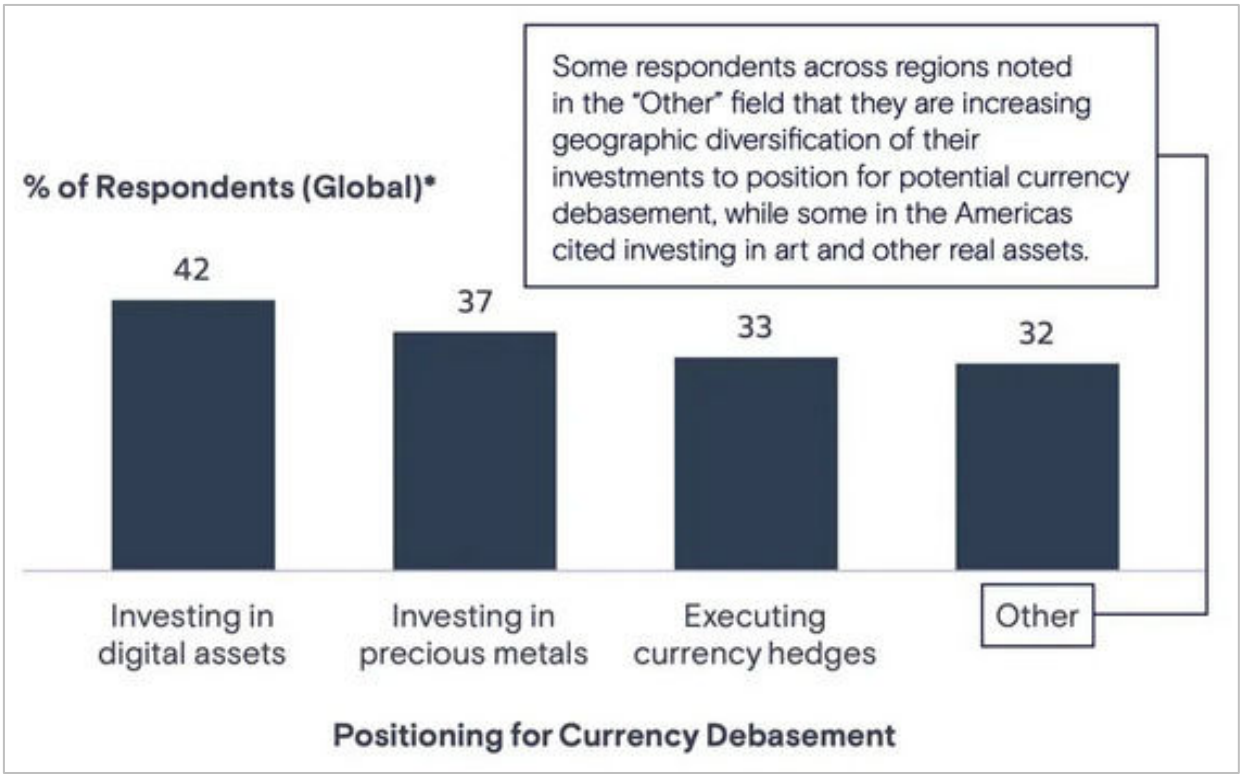
Source: GettyImages

First ETF approval? – Spot the difference

The approval of the first bitcoin ETF on October 19 was perhaps the most emblematic development of this increased appetite for institutional participation in the crypto markets. Even though its launch proved controversial – the version of the ETF launched was futures-based and not the spot-based product so many market participants had hoped for – there is no question that it reflects the consensus view that regulated products will be a net positive for the overall health of the market through the institutional and professional investment participation.

For example, in a survey conducted by Bitwise/ETF Trends of nearly 1,000 financial advisers, though only 9.4% said that they allocate to cryptocurrency in client accounts, 47% said the launch of a Bitcoin ETF would make them more comfortable with cryptocurrency exposure, up from 37% the previous year[iii]. Furthermore, institutional investors and family offices are increasingly securing digital asset exposure, not only to benefit from the sectoral out-performance, but also in order to position clients for the current economic realities of persistently low-interest rates and high inflation.

Figure 3: More family offices are turning to digital assets as a hedge against currency debasement



Source: Widening the aperture: Family Office Investment Insights, Goldman Sachs, July 2021

This is highlighted in the global family office survey conducted by Goldman Sachs[iv], in which 40% of family offices globally indicated that they are thinking about currency debasement, with 42% investing in digital assets as a core part of their strategy to position themselves for these macro realities vs. only 37% in precious metals (Figure 3).

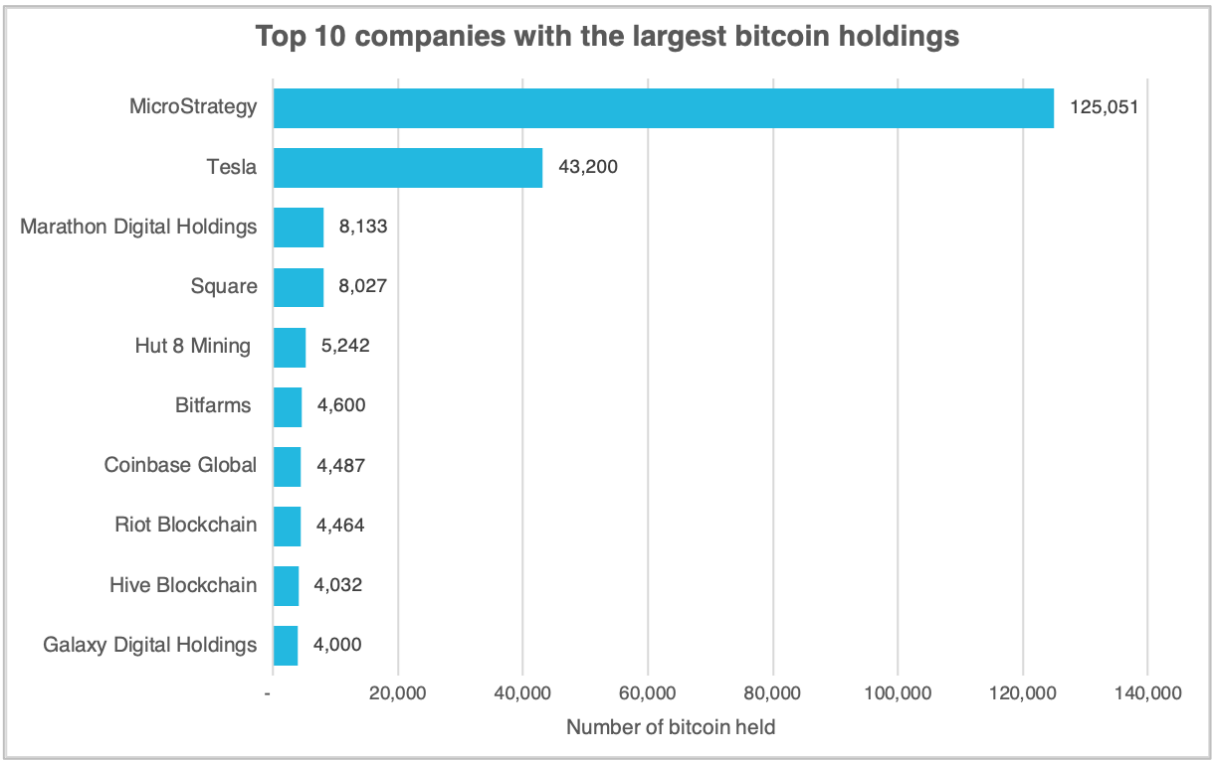
Another indicator of this "institutionalisation" of the crypto market was FTSE Russell announcing in December that 43 assets had been vetted to be added to the FTSE Digital Assets (DA) index in 2022, pointing to the need for accurate pricing data as more institutional players enter the market.

> **"We see risks in participating, but we see bigger risks in not participating."**
>
> – *Matt Comyn, CEO, Commonwealth Bank of Australia*

Corporate 'Cryptofication'

Arguably one of the most important institutional developments has been the steadily rising number of corporate treasuries purchasing bitcoin – a development that would have been unthinkable a mere two years ago. For example, Michael Saylor, the CEO of business intelligence firm, MicroStrategy, has been very vocal about steadily accumulating what now amounts to a position in bitcoin in excess of $5 billion. As it was the first publicly-listed company to invest in bitcoin, the move generated a huge amount of media and investor attention which saw the company's share price surge over 600% in the months following its first bitcoin purchases in August 2020. This quickly opened the floodgates and effectively unleashed what amounts to a bitcoin arms race, with major corporates drawing down dollar-denominated cash balances in favour of bitcoin. Since then, several other major corporates have gone bitcoin treasury hunting, such as including payments processor the Block (formerly Square), investment management company Galaxy Digital, and EV manufacturer Tesla.

Figure 4: Companies with the largest holdings of bitcoin on their balance sheets, data as of March 2022



Source: BitcoinTreasuries.net

Despite this, corporates pursuing a 'cryptofication' of their balance sheets does present novel challenges for investors. Not only could bitcoin's volatility impact a company's bottom lines in cyclical bear markets, the energy-intensive nature of bitcoin could undermine its environmental credentials which is an increasingly important factor for investors and particularly problematic for sustainability-centric companies like Tesla. Secondly, many investors continue to view bitcoin as relatively speculative, irrespective of price action, and companies acquiring large unhedged positions could find themselves shunned by portfolio managers due to a perceived mismatch with individual risk tolerance. Regardless of these risks, however, it appears that MicroStrategy et al. have already set the trend that will likely see more and more corporate treasurers follow suit over the long term, particularly if the current high-inflationary environment persists.

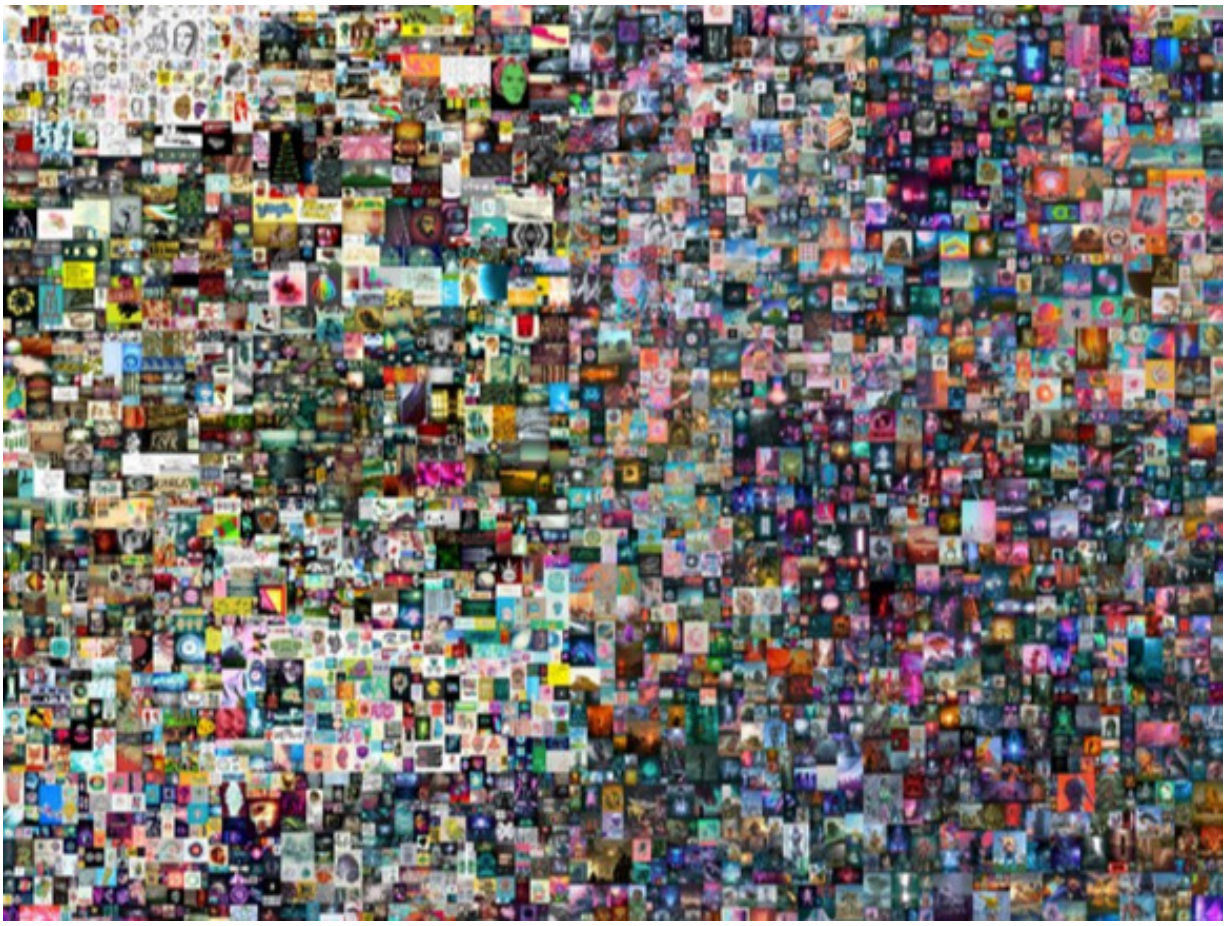
Key Takeaways:

- A large increase in the number of investment products and increasing regulatory guidance is pulling more institutional investors into the crypto markets, with total institutional inflows increasing by over a third in 2021.
- Many asset managers have been 'pushed' to favour crypto exposure over 'fiduciary concerns' by HNWI clients eager to participate, again underscoring the rapidly-evolving attitudes towards digital assets.
- Despite the significant increase in institutional participation, many institutions – particularly corporate treasuries – are sitting on the sidelines, waiting for deeper corrective pullbacks before taking up positions.

TREND #3: NFT Expansion

As one of the defining trends of 2021, there appears to be no slowdown in the number of high-profile NFT collections launched and promoted in the world of sports, art, and entertainment. While this is positive news for the holders of these NFTs and for the adoption of crypto more broadly, it remains to be seen to what extent many of these tokens will retain their value over the long term, given the hype-driven nature of what is still a relatively-nascent asset class.

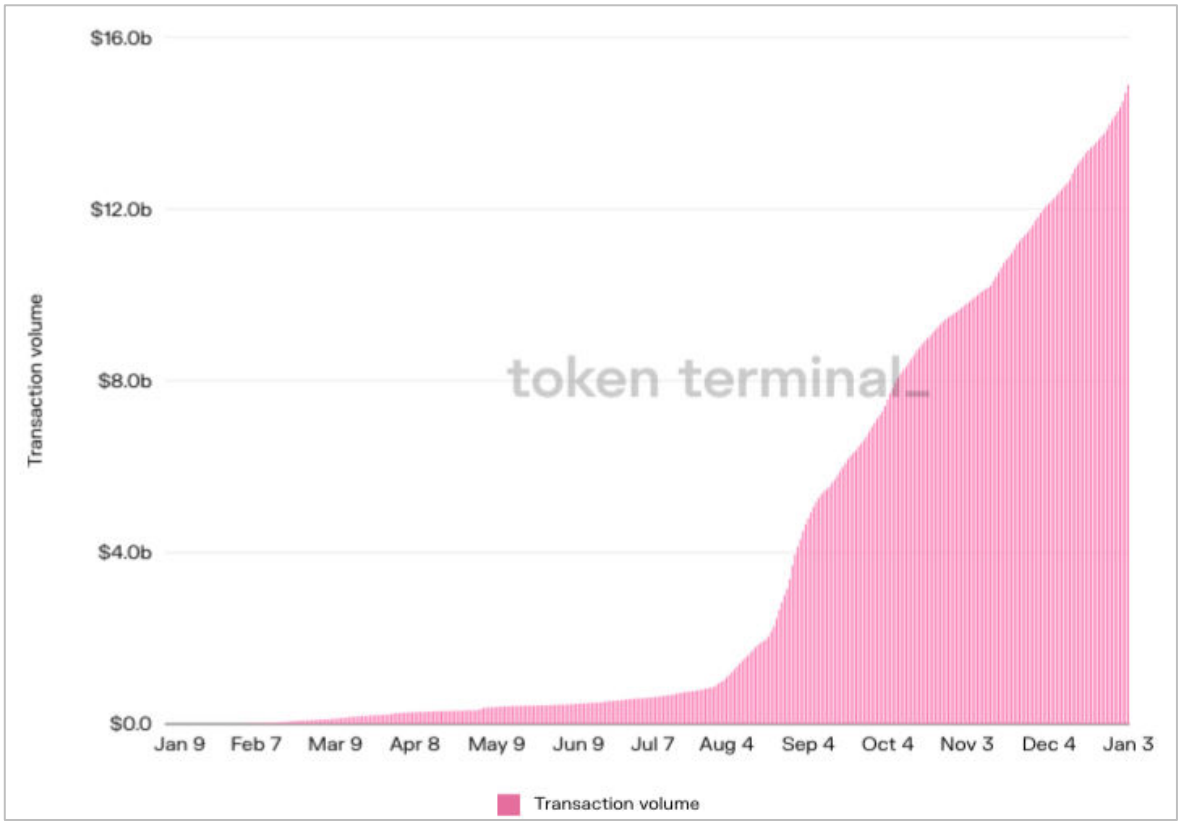
The rapid pace of NFT adoption by artists, celebrities, professional athletes and clubs, musicians and organisations, was one of the defining trends of 2021 and is currently playing a pivotal role in cryptocurrency adoption. Unlike the like-for-like interchangeability – or fungibility – of bitcoin and other crypto assets, NFTs are unique digital tokens that can be used to verify authenticity and represent digital ownership of virtually any work of art, document, or object.



Beeple's 'First 5000 days'; Source: *onlineonly.christies.com*

NFTs have mostly taken the form of digital art hitherto, with the most notable sale coming in March 2021 after the auctioning of the artist Beeple's 'First 5000 days' digital image for $69 million. Very soon, NFTs were being generated by artists, performers, celebrities – from Martha Stewart to Snoop Dog – as well as corporations like PepsiCo, Inc. This development is reflected in the explosive trading volume growth witnessed on OpenSEA, one of the largest NFT platforms, which rose 646-fold from a trading volume of $21.7 million in 2020 to finishing 2021 with a volume of $14 billion (Figure 5). But perhaps most importantly, NFTs have the potential to democratise how artists can actually go about monetising their works. They are also a vehicle that could introduce millions if not billions of people to the world of cryptocurrencies and fuel broader adoption in the space.

Figure 5: Cumulative transaction volume on OpenSea, 2021



NFT trading platform OpenSea saw a 646-fold increase in trading volume in 2021. Source: *Token Terminal*

Beyond the art world, sports memorabilia, ticketing, medicine, and even music have all provided additional scope for NFT expansion. However, it is the gaming industry that has the largest potential – particularly with the rapid rise of the metaverse and play-to-earn gaming. Here, NFTs can take on a wide array of different functionalities including rewards to gamers, special in-game characters and skins, as well as digital proof of ownership for land, property, and other in-game objects or elements. This utility of NFTs to streamline the valuation and monetisation of different kinds of property – including intellectual property such as patents – through the blockchain-based utility of self-executing contracts will undoubtedly have a large future impact on the legal industry.

Key Takeaways:

- In little over a year, NFTs have ventured from obscurity to becoming one of the most important driving forces for crypto mass adoption.
- Though high-profile collections from the likes of Gary Vee, Paris Hilton, and Snoop Dog have dominated the headlines, NFTs are increasingly becoming interwoven in the subculture across a broad section of human endeavour, democratising the monetisation of works.
- A theoretically limitless supply of NFTs raises questions on price discovery and the lack of clarity with respect to property and intellectual property rights enforcement have emerged as key issues for NFTs, going forward.

TREND #4: The Metaverse

The metaverse is simultaneously one of the most hyped and nebulous domains of the cryptosphere and represents a broad shift in how we interact with a patchwork of technologies, from VR and AR to NFTs and cryptocurrencies. Perhaps more important is what this shared virtual environment represents for the future of the trade, with blockchain purists and large corporations/investors alike seeing the potential opportunities to monetise virtual experiences, goods, and services in this evolved digital economy.

Although those involved in the crypto space have been very much aware of the hype and activity building around the metaverse in 2021, it was the announcement of Facebook's rebranding to 'Meta' that well and truly brought it to the wider public's attention. However, it is worth mentioning that Facebook's metaverse plans have caused considerable discomfort in the crypto community due to fears that a centralised, big-tech version of the metaverse could be fundamentally at odds with and negate the potential of the open, permissionless blockchain architectures that have so much transformative potential.

Unsurprisingly, Facebook's surprise announcement had a sudden and dramatic impact on the valuation of Decentraland, Sandbox, and other metaverse projects, as investors piled in on the news (Figure 6), with the former soaring over 500% in just three trading days. So, what is the metaverse and why is it so important?

Figure 6: Daily price action of Decentraland and Sandbox, October - December 2021

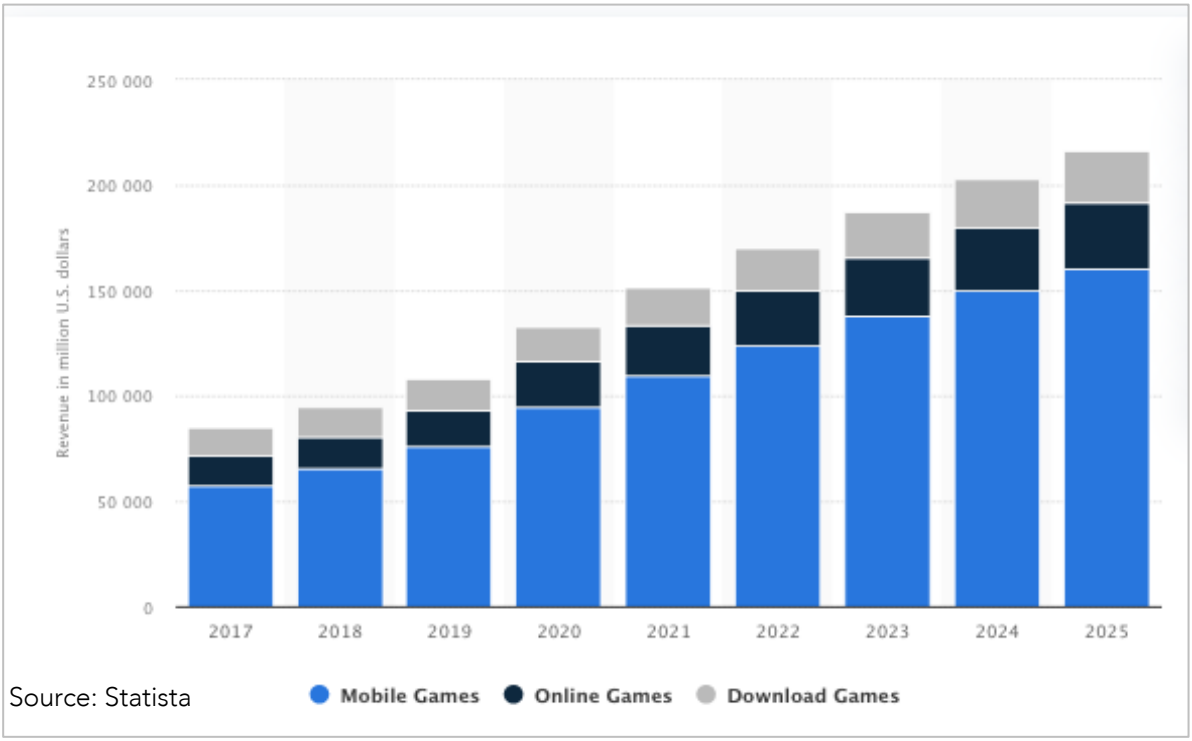
Major metaverse projects sky-rocketed on the news of Facebook's 'Meta' rebrand.

The Metaverse: Where Crypto meets Gaming

The metaverse is a simulated digital environment that uses augmented reality (AR), virtual reality (VR), and blockchain. Rather than construing it as a singular trend, the metaverse in many ways represents the sum total of the major developments that have occurred in cryptocurrencies and distributed technologies to date.

First, bitcoin was introduced as the first-distributed, peer-to-peer exchange of value and the genesis blockchain application, and this was followed by the DeFi revolution that enabled individuals to utilise staking/liquidity pools and have access to other decentralised financial products. Then came the sudden emergence of NFTs which further accelerated crypto adoption and represented the next evolution of the recognition of the value of the technology's data structure to forge unique digital signatures to represent both tangible and intangible items in the art world and beyond.

Figure 7: Forecast of video games revenue by segment in the world from 2017 to 2025



Not only is the metaverse an amalgamation and aggregation of these evolutionary steps, but these characteristics have also proven to be a natural symbiosis with what is arguably the world's fastest-growing economic sector. Indeed, with the gaming industry currently estimated to be worth in excess of $180 billion[v] and on track to become a $200+ billion dollar industry by 2025 (Figure 7), it is the gamefi and play-to-earn elements that represent a significant departure from traditional AAA (triple-A) games that are so central to the growth of the metaverse trend.

Unlike traditional AAA games, blockchain-based NFT games also allow users to purchase virtual land and in-game items/collectibles, to be traded on the open market. This means that players get actual ownership within the gaming industry via a unique NFT, and there is no equivalent mechanism for players to take real-world ownership of in-game objects or property in traditional games.

> Buying land today in virtual worlds feels a lot like buying land in Manhattan in 1750
>
> **–Janine Yori**
>
> *Head of Real Estate at **Republic Realm***

Decentraland allows its users to buy virtual property, and create their own unique virtual business.

As an all-encompassing virtual reality simulation that allows people to experience both the mundane and the limitless, it will only grow in importance, particularly among the younger demographic as more and more they look for additional sources of income and are increasingly priced out of real-world assets such as real estate. For example, it is estimated that land sales in the metaverse saw a year-on-year increase of 114% to November 2021, with over $100 million invested in a single week in November, according to crypto analytics site DappRadar.

Now firmly sitting at the intersection between VR and Web 3.0, the metaverse has been established as one of the key trends for the future, and is only in its infancy from an adoption standpoint. Additionally, there is no question that the COVID-19 pandemic hastened the rise of gaming in general, as lockdowns, travel restrictions, and social distancing measures forced greater numbers to live out more of their lives in the virtual space. With the broad acceptance that an open metaverse will not be possible without NFTs and blockchains, both will be inextricably linked with its long-term development and adoption.

Key Takeaways:

- The metaverse is a logical evolution of the inexorable digital transformation of our lives, and at once brings together a patchwork of technologies, decentralised and otherwise. These include NFTs, cryptocurrencies, online social communities, video calls, and more.
- It is too early to tell precisely how the metaverse could impact our daily interactions and our personal and professional lives, but major interest from the world of business, investment, and entertainment suggests that the metaverse is here to stay.
- Despite the hype, challenges remain with respect to data protection and privacy, with both developers and users at risk from potential identity theft, and other types of fraud. This will require early participants to self-regulate, while regulatory frameworks gradually mature.

TREND #5: Sustainability

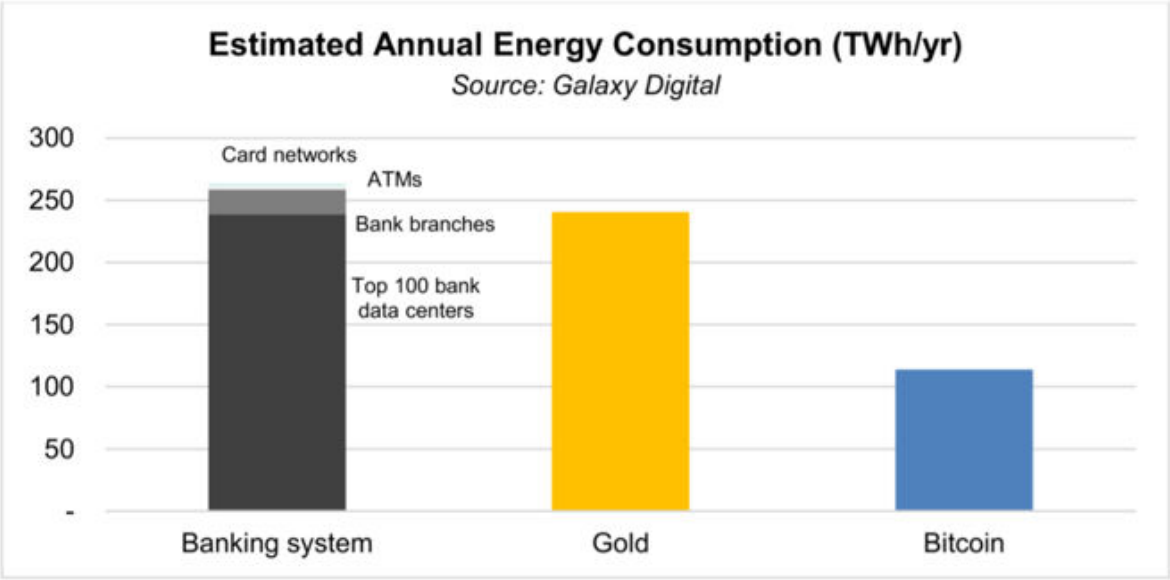
Much has been made about bitcoin's high energy expenditure, and a growing number of projects have looked to make its energy consumption as energy-efficient as possible as the quest to 'greenify' bitcoin gathers pace. However, there are several other ways blockchain technology has the potential to positively impact the environment and power sustainable development, from carbon capture to food supply chain tracking. This trend will only rise as the understanding of distributed systems' ability to provide superior data integrity, track and other benefits, becomes more deeply entrenched.

With Elon Musk himself impelled to curb his enthusiasm for bitcoin owing to a fundamental conflict between what is widely seen as a "dirty" asset and Tesla's sustainability mission, there is currently a growing interest in the different ways to improve the environmental credentials of cryptocurrencies. While it is undoubtedly true that bitcoin's electricity consumption is significant – in large part due to the energy-intensive proof-of-work consensus protocol it employs – many of the (often highly sensationalist) reports often fail to provide proper context around the power consumption data or explore the many solutions currently in development to make bitcoin more energy efficient.

Bitcoin's power output relative toother assets

According to a report from Galaxy Digital, bitcoin's electrical energy consumption stood at approximately 114 (TWh/yr) as of May 2021, and Figure 3 shows how this compares to gold and the banking system. As shown, the Bitcoin network's consumption sits at just under half that of the gold market and the banking sector (shown as being comprised of banking data centres, branches, ATMs, and financial card networks). Other reports have also estimated the gaming industry's power consumption at approximately 160 (TWh/yr) in 2020, so significantly more than bitcoin, but without the media scrutiny. Not only are these relative comparisons important for providing additional context for bitcoin's energy consumption, it also underscores that, ultimately, the level of power consumption that is considered acceptable will depend on its perceived value and will, therefore, be largely subjective.

Figure 8: Comparing the energy consumption of bitcoin to gold and the banking sector



Source: Galaxy Digital: On Bitcoin's Energy Consumption

Bitcoin's path to sustainability

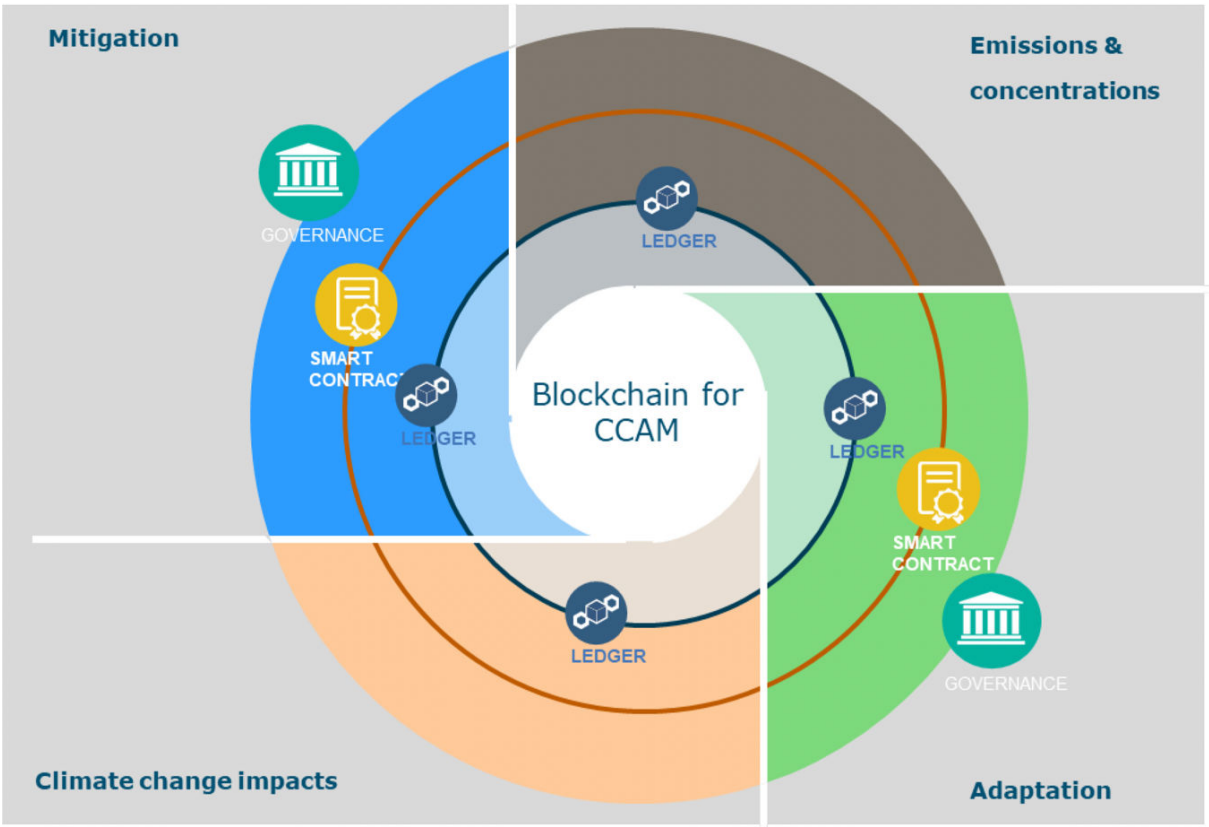
Irrespective of one's view on the power consumption of any of the aforementioned sectors, there is no question that greater efficiency is needed, and this has spurred efforts to 'greenify' bitcoin. In addition to achieving more environmentally-friendly transactions, using the Lightning Network or sidechains such as Liquid and Drivechain, there are a rising number of initiatives that are looking into changing how the energy for bitcoin mining is sourced. For example, in March 2022, Investment giant Aker ASA launched SeeTree, a venture dedicated to investing in the bitcoin ecosystem.

Part of the goal is to establish mining operations that “transfer stranded or intermittent electricity without stable demand locally – wind, solar, hydropower – to economic assets that can be used anywhere,” according to Seetee CEO, Snorre Lorgen. Although it remains to be seen exactly how bitcoin mining's constantly-increasing energy demands can be effectively load-balanced against other, higher-priority power demands for social or economic needs, situating bitcoin mines to maximise low-cost, zero-carbon zones means that mining operations increase clean energy consumption, while providing economic benefits to wind or solar farms.

Blockchain has potential to overcome sustainability challenges

Though gradual progress is being made to improve the Bitcoin network's scalability and carbon efficiency, this is only one small part of the wider drive towards sustainability in the digital assets space. Indeed, the potential of blockchain technology to provide a layer of trust, tracking, and data integrity within decentralised systems is why its capacity for positive environmental impact – from carbon capture to food supply-chain tracking – will prove to be an enduring trend. For example, with businesses under increasing pressure to improve existing methods of emissions reduction and implementing new ways of measuring carbon emissions, blockchain-based projects such as Nori have created carbon credit platforms, where rewards are paid out for the removal of CO_2 from the atmosphere, thus helping to eliminate the “double-counting” that plagues the carbon offset market. Others such as Dovu are building a distributed audit trail for carbon offsetting, allowing for enhanced data security and integrity to be achieved for the carbon-counting process in order to minimise data manipulations.

Figure 9: Three layers of blockchain application for Climate Change Adaptation & Mitigation



Source: *Applying blockchain for climate action in agriculture: state of play and outlook FAO*

At the same time, blockchain is rapidly emerging as a key tool in Climate Change Adaptation and Mitigation (CCAM) in agriculture, and a recent study from FAO and Wageningen University identified three layers of blockchain application (regulatory frameworks, standardisation, and capacity development) and developed a framework to map them to activities aiming at reducing emissions and concentrations as climate mitigation, and those aiming at addressing climate change impacts as climate adaptation[vi]. The DLT/blockchain layer sits at the centre of all applications, where emissions and concentrations and climate change impacts are registered and monitored.

Outside of climate mitigation efforts, distributed technologies are increasingly being deployed to improve agricultural supply chains and circular economic systems. For example, it is estimated that some 4.8 million tonnes of food are wasted in the UK supply chain every year, and as much as 1.4 billion tonnes globally. Here, blockchain could become a universal standard for providing agricultural supply chain transparency, traceability, and provenance/certification data, as well as a market platform for linking producers with consumers. Blockchain/DLT companies such as Agriledger not only provide a complete framework of integrated services for tracking and monitoring transactions along the agricultural supply chain, but also deliver a more even playing field to farmers and co-ops.

> Blockchain can address not only the challenges of provenance, but it can be used to track the obligations that are created by a product and/or commodity while supporting an efficient distribution of revenue to all participants.
>
> – **Genevieve Leveille**
>
> *CEO,* ***AgriLedger***

Key Takeaways:

- While there is no denying that the bitcoin network consumes significant amounts of energy, nuanced analysis reveals that there is a case to be made that it is not outsized relative to its ascendant role in the global financial system.
- Both Layer 2 protocols to improve transaction efficiency and initiatives to increase renewable energy consumption are putting bitcoin on a more sustainable path.
- Blockchain's capacity to provide a layer of trust, tracking, and data integrity is increasingly being used in sustainable systems to achieve positive environmental impact – from carbon capture to food supply chain tracking.

TREND #6
Blockchain in Industry 4.0

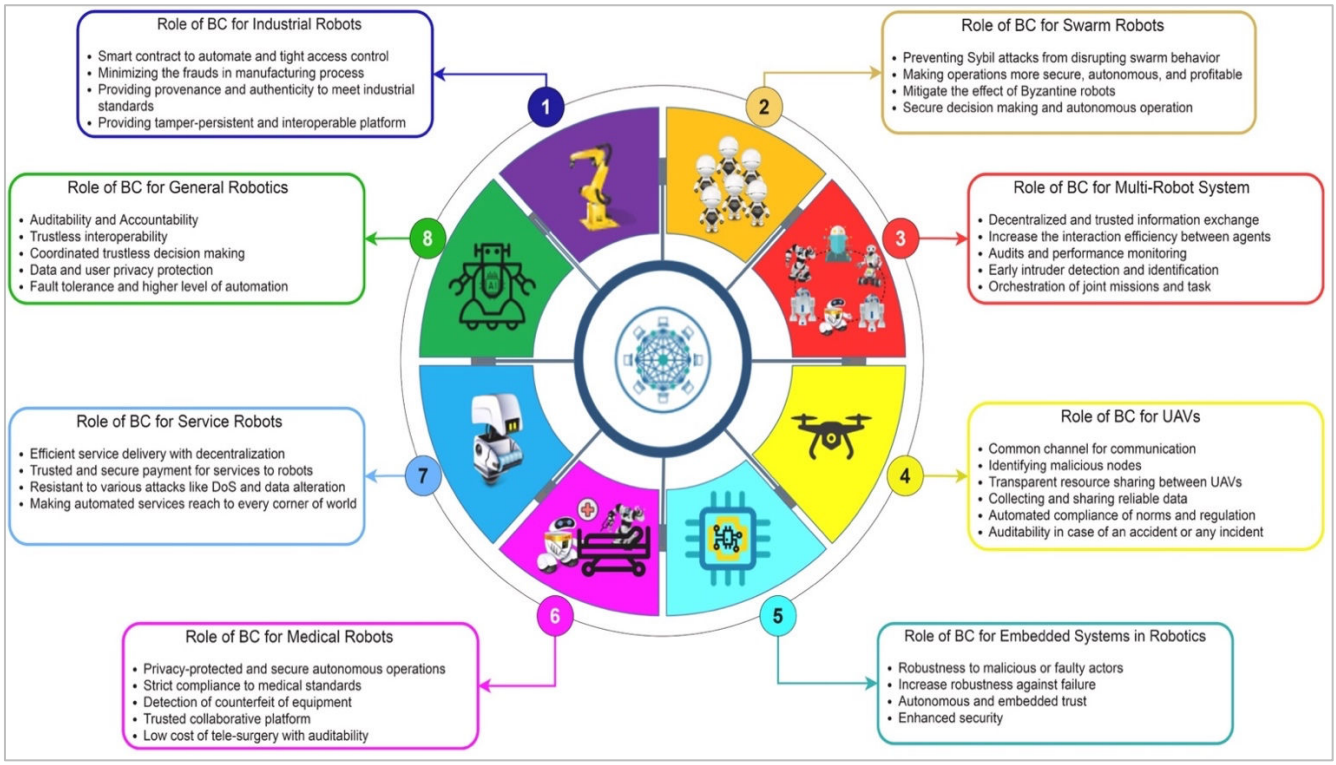
Industry 4.0 refers to the automation of traditional manufacturing and industrial practices through the adoption of smart equipment. These technologies not only enable improvements in the efficiency, speed, and cost of manufacturing, but also make it possible to gather and analyse micro-level data across machinery. Despite comprising a wide diversity of technologies, blockchain can become a central pillar for the industry 4.0 by helping to secure trust, transferring value, and providing an immutable data store for the tracking and safeguarding of objects and property across multiple applications.

Another key trend gathering pace in the blockchain space is its integration and implementation with other technologies of the fourth industrial revolution. Known collectively as the industry 4.0, there is a growing body of work showing that industries deploying these foundational technologies which include 3D printing, Robotics, the IoT, and several others, are evolving their understanding of blockchain use cases. Consequently, we are seeing greater investment and R&D to develop solutions around the core utilities of distributed systems for the securing of trust, the transfer of value, process automation, and secure data storage. Further, the functional specificity and diversity of the technologies that comprise industry 4.0 mean that each application is developing in a highly specialised fashion.

Blockchain's integration with robotics

Though the integration of robotics with blockchain is still in an early prototype stage, the use cases are becoming increasingly clear to a large swathe of large businesses – in particular when it is deployed in conjunction with artificial intelligence (AI). And, as the technology matures and more operational blockchain systems are launched, a greater diversity of applications are being explored and evaluated (Figure 10). For example, blockchain technology can serve as a mechanism for transmitting information between different robots and have action triggers coded in smart contracts, improving both their efficiency and inter-connectivity. For example, Aitheon, a company that offers businesses access to automation via robots as a service (BaaS) platform, has adopted blockchain technology based on the ERC-20 standard. Their blockchain-powered platform allows businesses to leverage AI and robotics that can provide automation for specified business workflows across five different modules.

Figure 10: Potential roles of blockchain for different fields of robotics



Source: A Survey on Blockchain in Robotics: Issues, Opportunities, Challenges and Future Directions; Journal of Network and Computer Applications, Volume 196

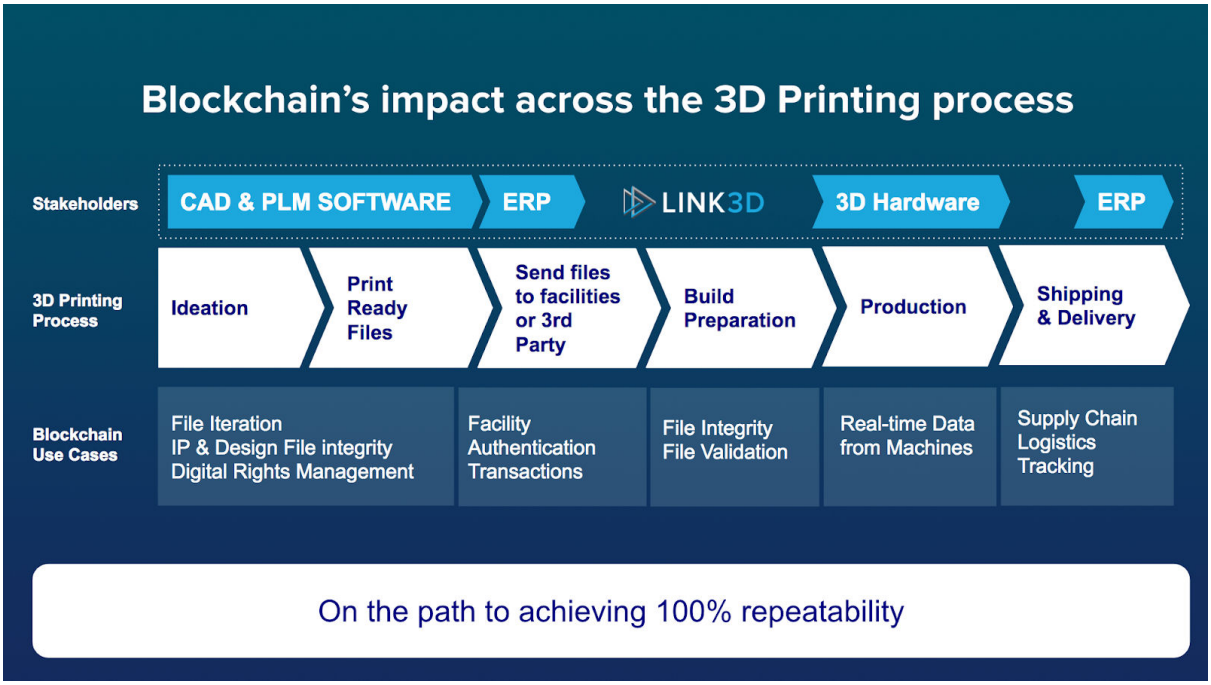
Additionally, of particular relevance to robotics is the improvement in managing large fleets, or swarms of robots, that must work cooperatively in a closed, industrial environment. Here, blockchain technology can provide benefits in relation to scaling entire fleets of robots as well as providing the necessary data integrity and data security. These advantages come from the fact that members of these swarms are distributed, with each robot used as a node in a network which lends itself particularly well for the industrial sector where secure data transfer between robots is key to achieving higher productivity.

Equally, blockchain integration with these systems can both provide robots with global (over merely local) information to expand application functionality and improve the speed of how the system changes the behaviour, since having global information allows the whole system to quickly modify behaviour to address specific robots' needs[vii].

Proof-of-Print: 3D Printing meets blockchain

At the same time, there is growing evidence also that blockchain solutions are becoming increasingly integrated with other domains in the fourth industrial revolution. For example, in 3D printing, underdeveloped digital licencing models and digital rights management have emerged as some the biggest pain points in a rapidly-growing industry. This has made the resulting rise of intellectual property theft a serious are concern, and a growing number of firms are seeing the potential to leverage blockchain as a potential solution (Figure 11).

Figure 11: Blockchain's end-to-end application potential in 3D Printing



Source: Link 3D; link3d.co

One example of this is from PrintParts, a 3D printing services provider that is developing a blockchain-based 3D printing solution that enables cryptographic protection of 3D design files. This industry-wide authentication and traceability solution, SmartParts, will serve as an authentication and traceability solution for additive manufacturing by embedding a unique signature within a part, to make it serialised, scannable, and cloud-connected.

– Ashley Kerth

Chief Product Officer
PrintParts

"Traceability and part serialization is a challenge that has yet to be solved for additive manufacturing. Working on a ground-breaking technology project like SmartParts is a unique opportunity to truly scale to production and unlock the Additive Manufacturing 2.0 era

Providing a complete overview of blockchain application is beyond the scope of this analysis, but it is clear from the examples presented here that blockchain's role at the intersection of industry 4.0 technologies will expand considerably in the years ahead. Key to this growth will be establishing complementary standards for platforms, both within and between industries and technologies that have the capacity to achieve high levels of interoperability and interconnectivity.

Key Takeaways:

- As the understanding of blockchain continues to mature, more data is coming online as to its utility and ROI for a multitude of industry 4.0 applications.
- Blockchain's data structure makes it particularly well suited for technologies that require a high degree of intellectual property management, data, encryption, and supply chain tracking such as 3D printing, IoT, and robotics.
- Due to innovation risk, undefined standards, and interoperability challenges, industry 4.0 business and stakeholders are placing greater emphasis on value co-creation through consortia.

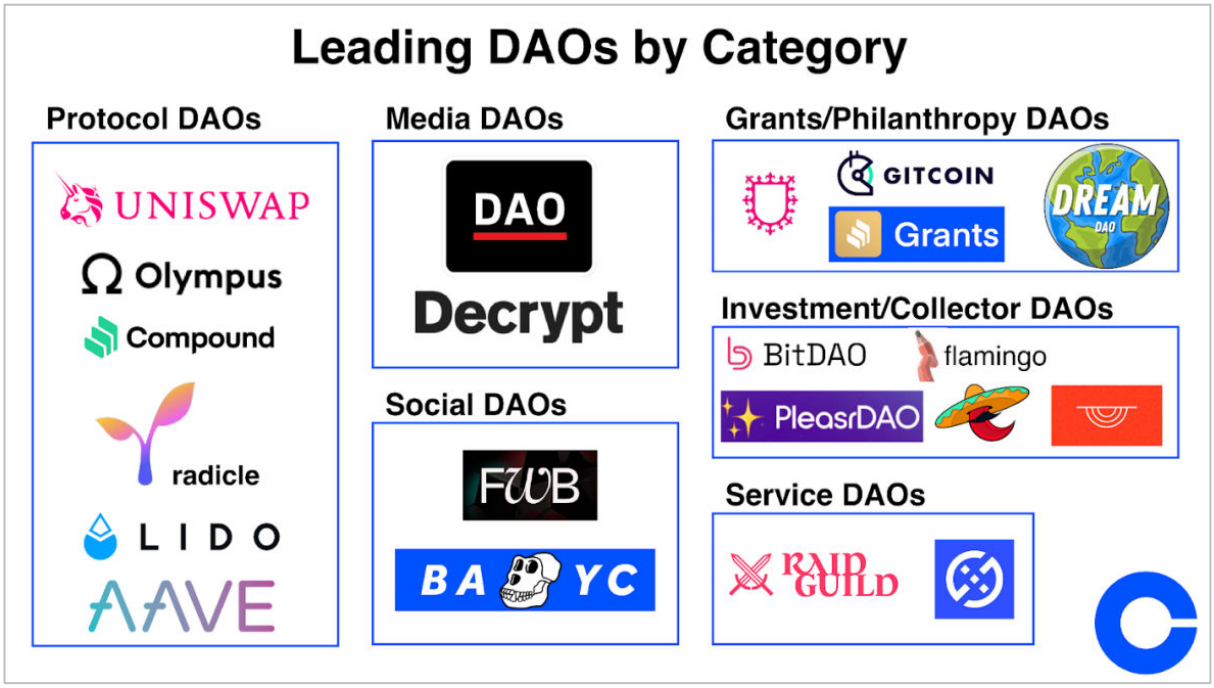
TREND #7: DAOs

Though slightly under the radar compared to some of the more headline-grabbing trends in 2021, the interest around Decentralised Autonomous Organisations (DAOs) is garnering more interest as their potential to become a transformational instrument in how we organise human collaborative and productive capacity becomes more apparent.

Just as the original concept of bitcoin was to distribute the operational power of a payments network to its participants via a cryptographic consensus mechanism in order to remove central authorities, the DAO applies this concept to the organisation. Originally developed by Ethereum co-founder Vitalik Buterin in 2013, DAOs, or Decentralised Autonomous Organisations, are hierarchy-less organisations whose governed rules and structures are auto-enforced on blockchain smart contracts and voted on by participating stakeholders (i.e., the token holders). This provides increased visibility and transparency on how decisions are made – a form of digital direct democracy of sorts.

After a fairly inauspicious start for many reasons, these cryptofied versions of cooperatives have come a long way since their maiden voyage, the ill-fated “The DAO” launched in 2016 by Slock.it, and DAO treasury war chests showed rapid growth in 2021. Now valued in the billions of dollars, they are not only expanding into every segment of the digital assets space (Figure 12), they are increasingly been perceived as real companies with cashflows and assets under management. For example, the top five DeFi DAOs (Uniswap, Lido, Radicle, Compound & Olympus DAO) alone control over $45 billion in assets, so this is definitely not a sector that can be ignored.

Figure 12: Leading DAOs by Category



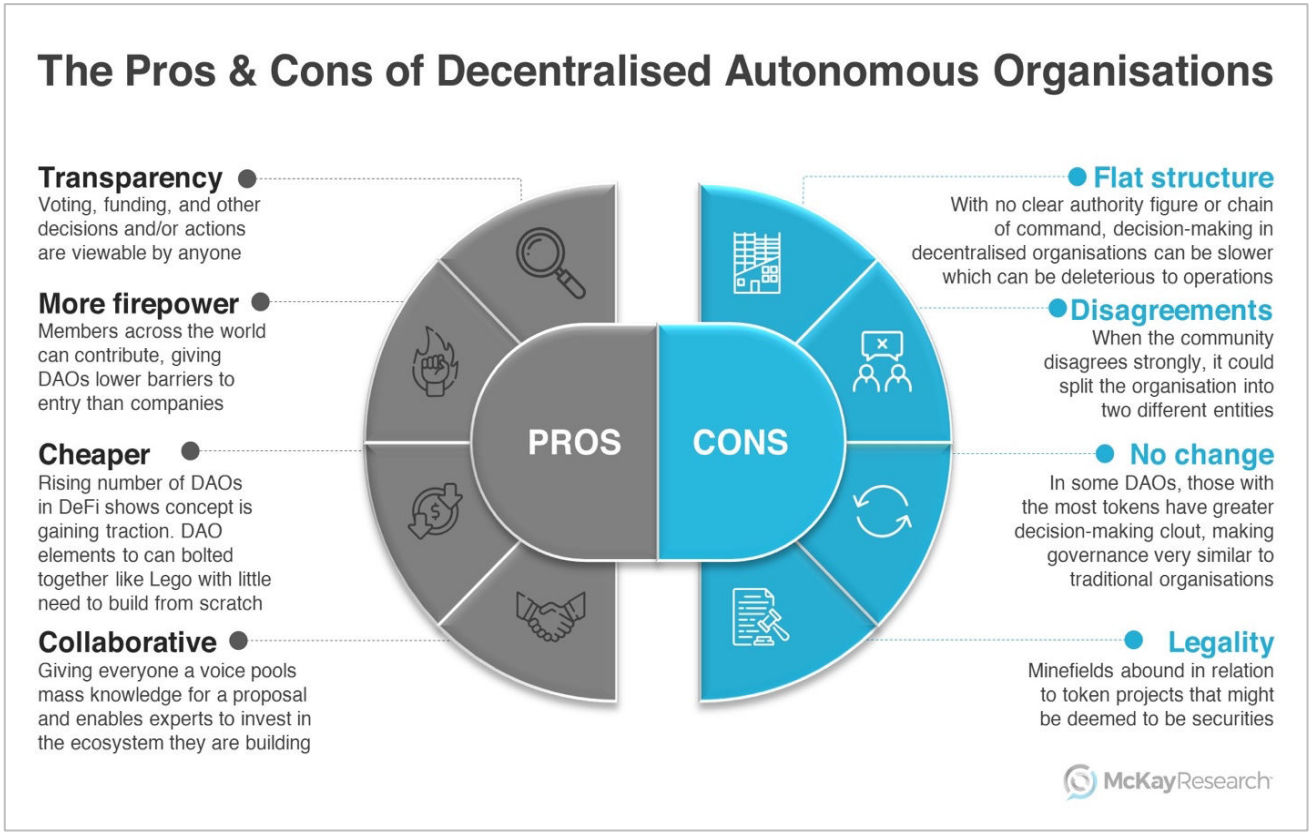
Source: Coinbase.com

DAOs to be transformative, but not a cure-all for organisational complexity

Because power is distributed to the participants, and operations are essentially carried out in a machine-like, automated fashion, automated DAOs can have certain fundamental advantages over traditional organisational structures. For example, the low barriers to entry and borderlessness of DAOs can make them more cost-effective than traditional company structures and with a broader pool of human capital. Additionally, rather than the control by special or ordinary resolution being conferred on shareholders of a traditional company, token holders of a DAO have control over the organisation's collected assets, based on the number of governance tokens owned.

However, even though DAOs have real potential to help mitigate some of the age-old, human-centred pitfalls that often plague traditional hierarchical organisational structures (e.g., corruption, greed, poor risk management, etc.), it would be naive to think that they hold the keys to remedy these issues. As can be seen in Figure 13, the distributed nature of decision-making power can be both a blessing and a curse: although there are more stakeholders in governance, the lack of an executive decision-making authority can lead to conflict, can slow down operations, and even result in the DAO splitting into separate units, in the event of extreme disagreement.

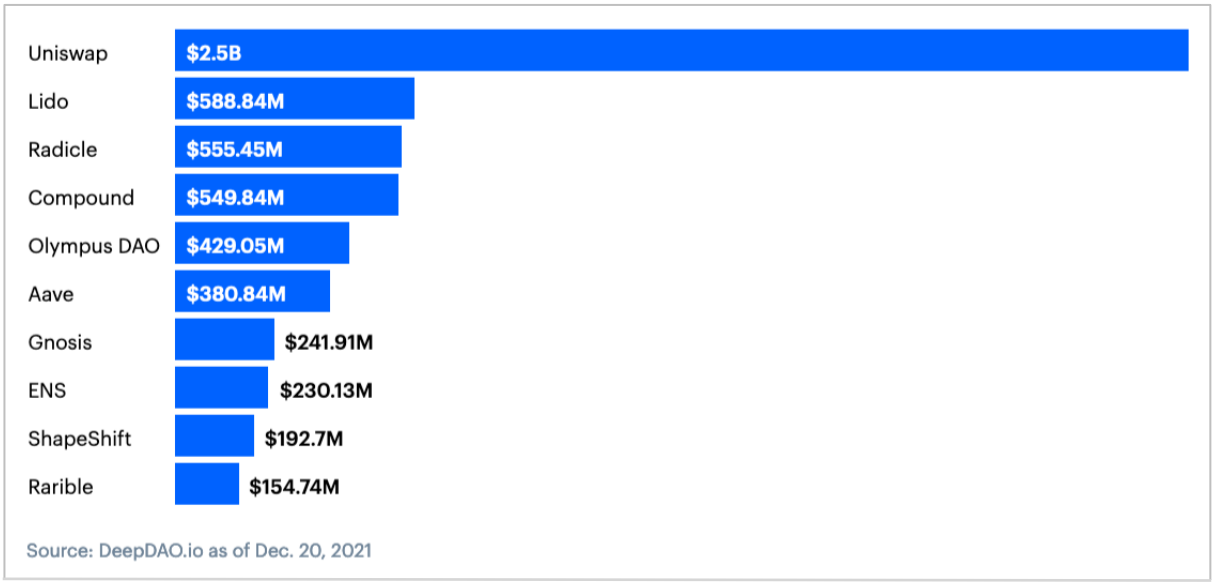
Figure 13: The Pros and Cons of DAOs



DAOs are gaining in traction and importance

Despite their shortcomings, recent developments suggest that DAOs are gaining traction and may well be a dark horse trend for 2022 and beyond, with governments and regulatory bodies moving to establish legal frameworks to recognise DAOs. This is a critical step, given that their lack of legal personhood prevents them from owning property or entering into contracts in most jurisdictions, thus limiting their use for typical corporate purposes.

Figure 14: The top protocol DAOs by assets in treasury



For example, in 2021 Wyoming became the first state in the US to officially recognise DAOs as a new form of LLC[viii]. This creates a state-sanctioned regulatory scheme for registering a DAO LLC with specific requirements such as, for instance, requiring DAO LLCs to be domiciled in the state. Should more states, and indeed countries, follow suit, this could see increased interest in DAOs, as entrepreneurs explore ways to circumnavigate regulatory intervention. Added to the fact that the total combined AUM of DAO treasuries increased 40x between January and September of 2021, from $380 million to approximately $16 billion (Uniswap alone accounting for $2.5 billion), then we have a clear signpost that DAOs will continue to be developed and become a legally-recognised and -regulated part of the corporate and organisational structure over the long term.

Key Takeaways:

- DAOs encapsulate the two primary crypto elements of programmability and decentralisation applied to an organisational setting, allowing for a more equitable distribution of decision-making power and greater transparency.
- DAOs' rapidly growing AUM and the first signs of frameworks for the legal recognition of DAOs suggests that they will increasingly be recognised as an organisational structure.
- Despite their potential to change corporate governance and human interaction within an organisation, it remains to be seen how effective the DAO will be at resolving issues around accountability, productivity, and efficiency.

Conclusion

The trends outlined in this report are but a handful of the critical developments that are shaping the current rapid maturation of the digital assets space. When added to the coming resurgence of DeFi, the inexorable rise of Central Bank Digital Currencies (CBDCs), the increasing use of blockchain-based systems by governments, and other trends, a clear picture emerges of a paradigm shift in the making, where distributed systems will merge with legacy systems, or replace them outright.

Even while some doubt remains on the precise degree blockchain-based technologies will ultimately come to bear on the world of investment, business, and our daily lives, the overall trend of increasing adoption of these open digital, decentralised technologies and assets is on the rise globally.

At the same time, just as regulatory clarity has become a key factor for attracting more investment to cryptocurrency markets, sector-specific regulation will be required to develop appropriate governance, organisational, and participatory models for the successful deployment of blockchain solutions that meet the particular functional requirements across industrial, gaming, and other spheres. In turn, this will help to overcome the challenges around security, scalability and sustainability that are so critical for the further maturation of cryptoassets and industrial blockchain applications.

References

[i] Demand for Cryptocurrencies anticipated to grow. CivitasPost, 1 February 2022.
[ii] Why institutional investors are ready to shake up crypto markets. McKayResearch,
[iii] Bitwise/ETF Trends 2020 Benchmark Survey of Financial Advisor Attitudes Toward Cryptoassets. Bitwise, January 2020.
[iv] Widening the Aperture: Family Office Investment Insights. Goldman Sachs, 21 July 2021.
[v] The Games Market and Beyond in 2021: The Year in Numbers. NewZoo.com, 22 December 2021.
[vi] Applying blockchain for climate action in agriculture: state of play and outlook. FAO and Wageningen University, 2021
[vii] A Survey on Blockchain in Robotics: Issues, Opportunities, Challenges and Future Directions; Journal of Network and Computer Applications, Volume 196, October 2021.
[viii] Wyoming Paves Way for DAO Legal Company Status. Lexology, 2 August 2022.

About McKayResearch

McKayResearch is an independent market intelligence consultancy specialising in trend analysis and custom research solutions. Informed by our multi-sector expertise spanning consumer, technology, and investment, our mission is to deliver broader data, deeper perspectives, and richer insights on which to base decision-making.

McKayResearch combines the agility and personal attention of a consultancy, with the reach and breadth of a larger market intelligence firm. When working with us, expert guidance will never be more than a call or email away, and you will benefit from a personalised service throughout the project journey.

- For more information on this Special Briefing Report, please contact **consult@mckayreserch.com**, on +44 (0)20 3519 0790
- For custom research enquiries, please contact: **james@mckayresearch.com,** on +44 (0)7854 214 830
- For more information on McKayResearch, please visit **www.mckayresearch.com.**

About this publication

This publication contains general information only, and McKayResearch is not, by means of this publication, rendering professional advice or services. This is an independent report produced by McKayResearch, no commercial relationships or partnerships exist with any of the technology providers, manufacturers, or suppliers herein.

McKayResearch

www.mckayresearch.com