Thematic Research

Metaverse: the Digitization of Everything?

6 December 2021

Key Takeaway

The digitization of everything will create a new world that we can all move in and out of. The metaverse can be viewed as a new platform for the digital age. We see it as a wrapper that will roll up other digital platforms. It will not replace the internet, but instead build on top of it and, when combined with other technologies and interfaces, will allow us to essentially step into, and perhaps live in it.

The biggest disruption humans have ever experienced, but will take time. A single metaverse could be more than a decade away, but as it evolves it has the potential to disrupt almost everything in human life that has not yet already been disrupted. The pandemic accelerated the adoption of various technologies. Many people were forced to spend even more of their lives online from socializing to working, from education to entertainment. This shift to an online world will continue.

A single source of truth - The metaverse will consist of numerous different layers and technologies, but it will ultimately result in a single shared source-of-truth that all stakeholders in the metaverse will recognize. The metaverse will be made up of objects, and all those objects must know that all other objects exist. There will be a ledger of all objects in the metaverse that will show their history of interactions and ownership.

The metaverse will start with immersive gaming experiences. Games, entertainment and social media will be the first, it will then expand to cover all aspects of human activity including socializing, education, and work. Using the evolution of video games as our guide, the mixing of physical and virtual seems as the natural next step in the way we think about the use of the internet. Evidence is widespread: Video games replacing social interaction, physical experiences shifting to the virtual, and normalization of digital ownership.

Digitization of everything. Currently only a small amount of objects in the world are connected to the internet. The move to a metaverse will accelerate the digitization of everything. Many physical objects in the real world might end up with a digital twin in the metaverse, for example buildings and even appliances and cars may end up being digitized.

Digital twins will represent us. We will be represented in this new world by a digital twin or virtual identity. We call it a twin as this identity will become interchangeable with our physical self. A whole series of economic activities will begin to emerge around this immersion into virtual/augmented realities. For example our digital twin will be able to represent us at work and through the use of AI solve complex problems on our behalf.

Blockchains and crypto currencies will play a key role. There will be a need for some form of money in this new world. While it's not clear what that currency will be there are already some emerging cryptocurrencies competing alongside the more obvious Bitcoin.

Investors should view the build out in a similar way to the internet. Focus initially on the hardware needed to lift the internet to become the metaverse. Then look at the software that will design and host it, and ultimately the businesses that create use cases on it.

FRANCHISE REPORT

Relevant other research:

"Going Outside is Highly Overrated": Metaverse Primer

Crypto, Metaverse, and NFTs Oh My

Jef U: Exploring the Metaverse With An Expert

Metaverse Experts - Key Takeaway

Gaming Addiction - Risk of a Tech-lash?

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^Prior trading day closing price unless otherwise noted.

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Executive Summary

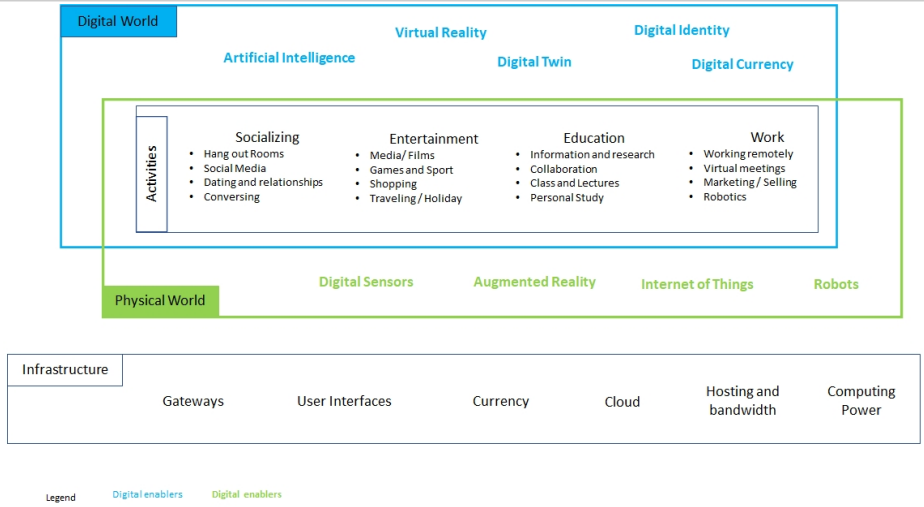
A single metaverse could be more than a decade away, but as it evolves it has the potential to disrupt almost everything in human life that has not yet already been disrupted. The recent pandemic accelerated the adoption of various technologies that took us some of the way towards a metaverse. Many people were forced to spend more and more of their lives online from socializing to working, from education to entertainment. This shift to an online world will continue.

The metaverse will consist of numerous different layers and technologies, but it will ultimately result in a single shared source-of-truth that all stakeholders in the metaverse will recognize. The metaverse will be made up of objects, and all those objects must know that all other objects exist. From this foundation, we can create a ledger of all objects in the known metaverse, as well as their shared history of interactions and ownership.

We identify 5 key findings

The greatest transformation the world has seen - The metaverse is the next step in disrupting what is yet to be disrupted. The way that investors should think about this is to figure out what are all the key human activities that we engage in, and then to imagine how those activities will migrate to the online world. As the exhibit below highlights almost all human activity can move from the physical world to the online world. Perhaps in the activity of work we might see the greatest disruption. We believe that through significantly improved artificial intelligence many people will be able to have a digital twin represent them for many work functions.

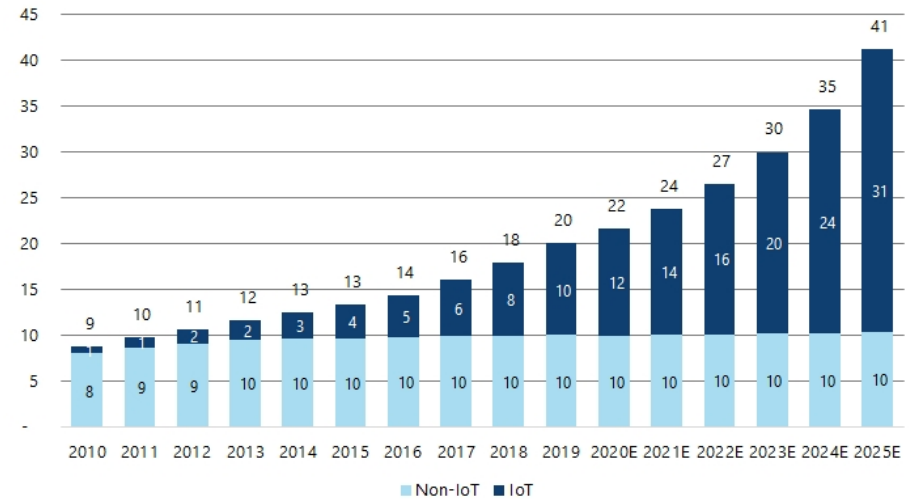
Exhibit 1 - Which activities can move into the Metaverse?



Source: Jefferies

Will result in the digitization of everything - Currently only a small amount of objects in the world are connected to the internet. The move to a metaverse will accelerate the digitization of everything. Many physical objects in the real world might end up with a digital twin in the metaverse, for example buildings, furniture and even appliances and cars may end up being digitized. We can envisage a world where almost all assets become digitized. Once digitized and recorded on a blockchain the transfer of ownership of these assets becomes quicker and more transparent.

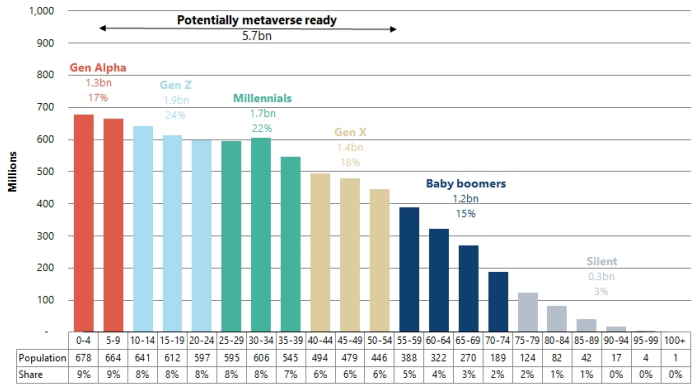
Exhibit 2 - Worldwide IoT and non-IoT connected devices, in billions, 2010-2025



Source: IoT Analytics. Note: IoT connections include connected cars, smart home devices, connected industrial equipment, etc. Non-IoT connections include smartphones, laptops, computers, etc.

More than 40% of the world is already metaverse ready - Gen Z is going to be the population that will drive the significant early adoption of the metaverse/ Web 3.0. This will initially take the form of crypto backed gaming and play to earn, but this will likely expand into almost all other forms of human activity. They will become a significant consumer base that want everything to be digitized. Millennials have driven the build out of the internet / Web 2.0 spending much of their time online; they eventually became digital natives and have embraced blockchain as a form of currency/ wealth. Gen X ushered in the creation of the internet and will be very receptive to the shift to this new world.

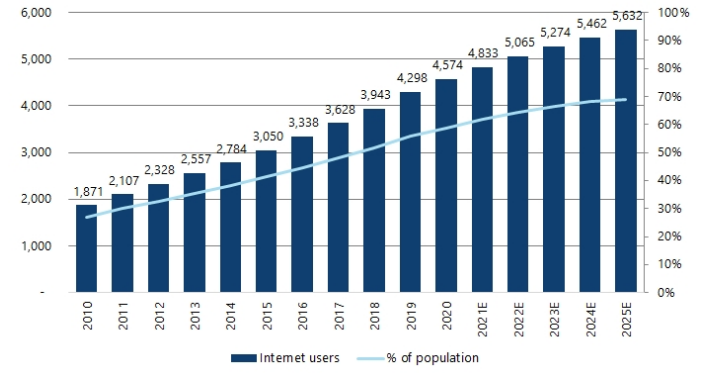
Exhibit 3 - World population by generation group, 2020, in millions



	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85-89	90-94	95-99	100+
Population	678	664	641	612	597	595	606	545	494	479	446	388	322	270	189	124	82	42	17	4	1
Share	9%	9%	8%	8%	8%	8%	8%	7%	6%	6%	6%	5%	4%	3%	2%	2%	1%	1%	0%	0%	0%

Source: United Nations, Jefferies

Exhibit 4 - Number of worldwide internet users and internet penetration rate, 2010-2025, in millions



Source: Statista, International Telecommunication Union, United Nations

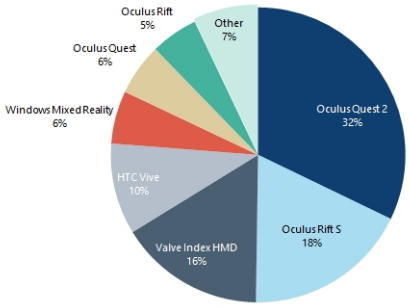
Digital twins will be a key enabler - Digital identities will be a key part of the virtual world and will likely take many forms, such as that of an individual or institution. A user can have different digital identities under different scenarios (such as a workplace identity and personal identity), but they are ultimately all based on the user's real-world identity.

Singularity will accelerate this move. Technology Singularity describes the concept where computers become so advanced that their embedded artificial intelligence can transcend human intelligence. If singularity is reached, an explosion of intelligence will significantly impact human civilization. This point has the potential to turbo charge your digital twin in the metaverse. For example, humans could potentially teach AI to

represent them almost identically in external interactions. This could lift our personal productivity to almost unimaginable levels

Investors should initially look at Games, Crypto and AR/VR devices - Gaming companies have been creating multiplayer games that have rapidly become rich social networks. The Sandbox and Decentraland highlight a recent development, blockchain platforms focused on creating the metaverse for games players, developers and even merchants of tokenized assets. Blockchain technologies will bring real value and proven ownership to the metaverse. And AR/VR devices can create an immersive experience which is essential to metaverse.

Exhibit 5 - VR headset share in the gaming platform "Steam" by device as of August 2021



Source: Steam

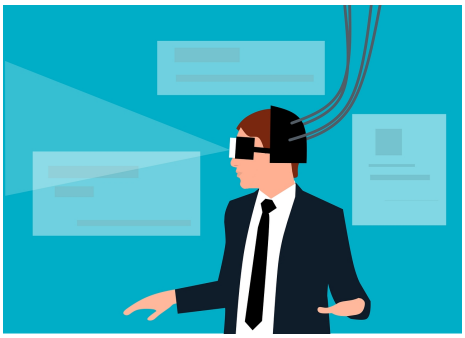
Exhibit 6 - Top cryptocurrencies dedicated to metaverse by market cap as of 12 November 2021

Total ranking	Cryptocurrency	Market Cap in USD'million
23	Axie Infinity	9,601
50	Mana	4,133
68	Enjin	2,922
80	Sandbox	2,399
102	Radio Caca	1,484

Source: CoinGecko

The metaverse will happen - more than 40% of the world is ready for it

The metaverse was first mentioned in *Snow Crash*, a science fiction novel by Neal Stephenson, in 1992. In the book, metaverse is a combination of virtual reality (VR), augmented reality (AR) and the internet. People can work, study, go shopping, go to concerts, and interact with each other in an immersive environment. Clearly Neal was way ahead of the rest of the world

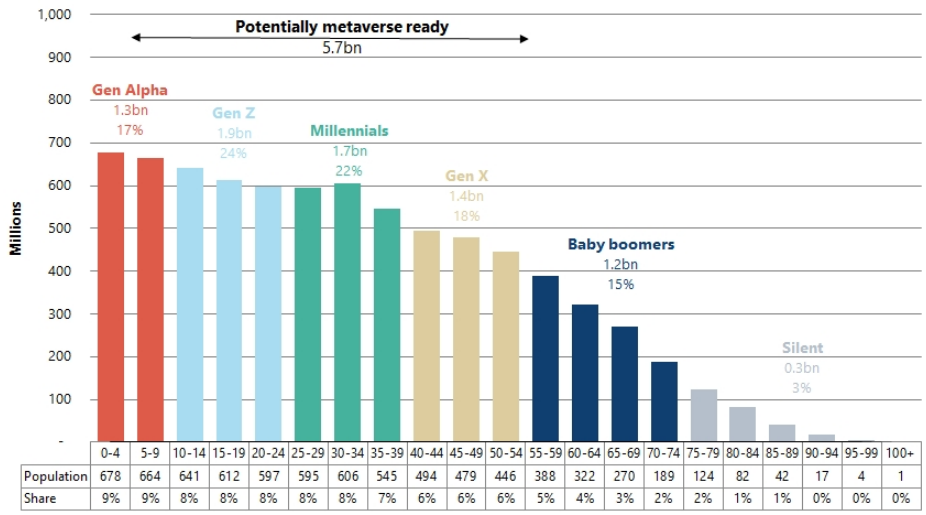


Source: Pixabay

Internet users have increased exponentially since the 1990s when the internet became a global commercial network. Number of internet users in 2020 more than doubled compared with 2010, and is expected to reach 70% of the global population by 2025.

Perhaps almost half of the world's population is likely very supportive of this shift. Gen Z is going to be the population that will drive the significant early adoption of the metaverse/ Web 3.0. This will initially take the format of crypto backed gaming and play to earn, but will expand into almost all other forms of human activity. They will become a significant consumer base that want everything to be digitized. Millennials drove the build out of the internet / Web 2.0 spending much of their time online; they eventually became digital natives and have embraced blockchain as a form of currency/ wealth. Gen X ushered in the creation of the internet and will be very receptive to the shift to this new world.

Exhibit 7 - World population by generation group, 2020, in millions



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Population	678	664	641	612	597	595	606	545	494	479	446	388	322	270	189	124	82	42	17	4	1
Share	9%	9%	8%	8%	8%	8%	8%	7%	6%	6%	6%	5%	4%	3%	2%	2%	1%	1%	0%	0%	0%

Source: United Nations, Jefferies

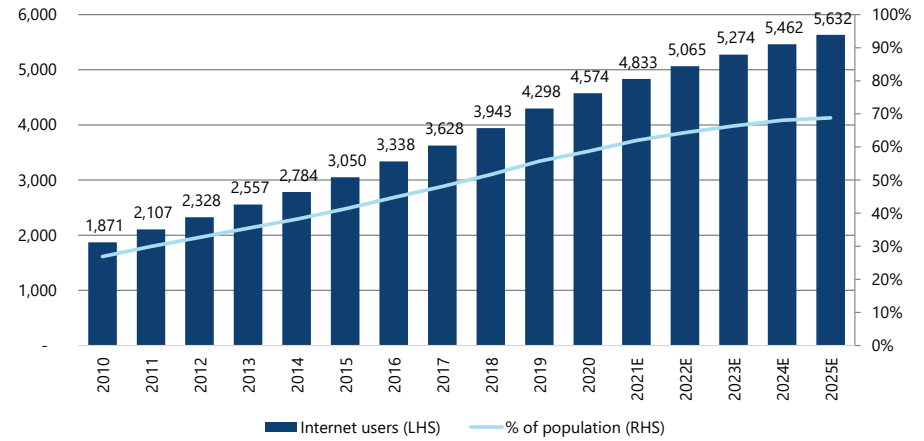
The metaverse could be the greatest transformation ever seen

None of us know what the metaverse is or can become. But we believe it can become a digitally fluid world somewhere where we can move around, exist, work, earn etc. It can be a world where physical and digital things can co-exist.

If you conceptualize the metaverse as an end state, it allows you to envisage how the following things will co-exist and work together to unlock value:

- A digital financial system (DeFi)
- A digital system of Decentralized Autonomous Organizations and corporations (DAOs)
- A system of money - Social tokens / Crypto currency
- Digital identifiers of assets and stores of value (NFTs)
- Smart contracts on the blockchain
- Ownership of the web (Web 3.0)

Exhibit 8 - Number of worldwide internet users and internet penetration rate, 2010-2025, in million people and in percentage



Source: Statista, International Telecommunication Union, United Nations

We are less than 10 years away from almost full penetration of the web

Is Web 3.0 the metaverse?

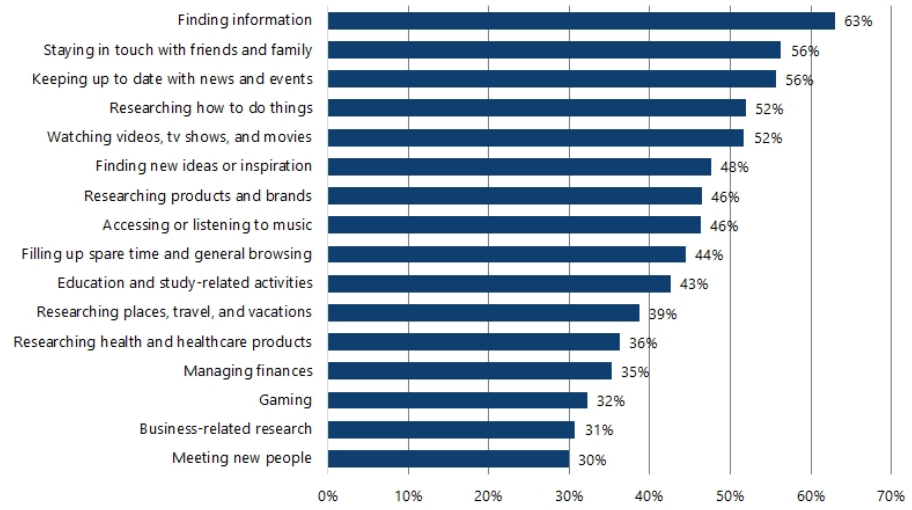
The metaverse could be described as the next stage in the evolution of the internet. Web 1.0 was simple fulfilling a commercial function of displaying basic information on what a company did and where it was located. The usefulness of Web 1.0 sites was enhanced by adding forums, comment sections, and basic chats to offer basic interactions.

Web 2.0 breathed new life into the internet. All the popular websites and social networks we know today emerged and flourished under Web 2.0. However, what we now cherish as a comfortable and rather cramped online environment falls short of even brushing the surface of the possibilities that Web 3.0 has to offer.

Web 3.0 could be described as an internet owned by the builders and users and increasingly orchestrated by digital tokens. It is increasingly an internet that is decentralized and open sourced.

Web 3.0 allows individuals to own parts of the internet - that's a key building block to the metaverse

Exhibit 9 - Top reasons for using the internet, in percentage



Source: We Are Social, Hootsuite

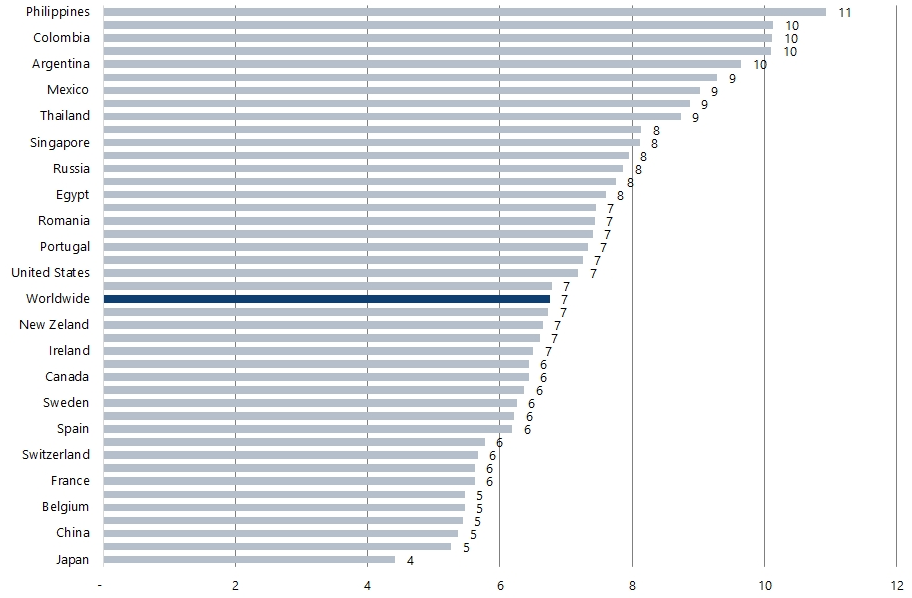
Increasingly people can carry out multiple daily tasks online

We already spend a lot of our waking hours online

The amount of time people spend online continues to rise, and with the pandemic comes a push to spend even more time online. A recent report from our tech team Going Outside

is Highly Overrated suggested that people are already moving into the early stages of the metaverse

Exhibit 10 - Daily time spent online by country, 2020, in hours



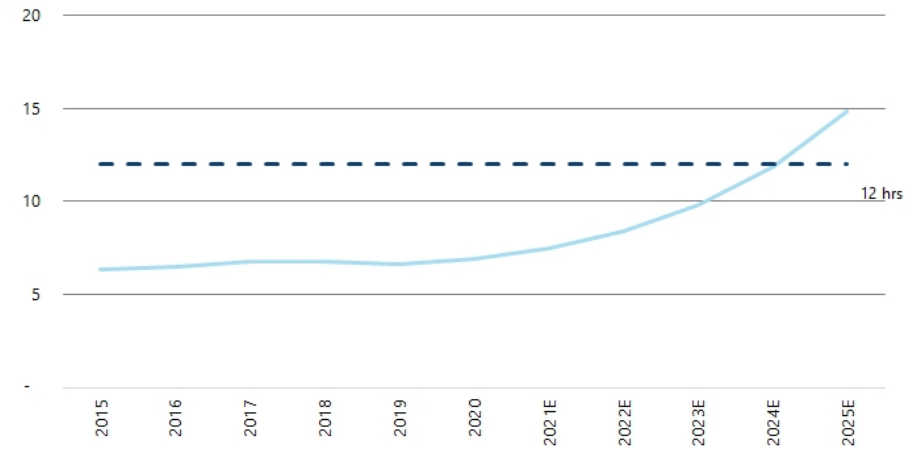
Source: We Are Social, Hootsuite

On average, internet users currently spend 7 hours a day online.....

The Pandemic accelerated the digitization of work by a decade

COVID19 has completely transformed how many companies conduct business. Pre the pandemic not showing up to the office for a long time might lead to being fired by your employer. The pandemic shifted that thinking where many people were asked not to show up to work and now many companies conduct meetings, discussions, meet clients/regulators etc. all in the digital world.

Exhibit 11 - Daily time spent using internet, in hours

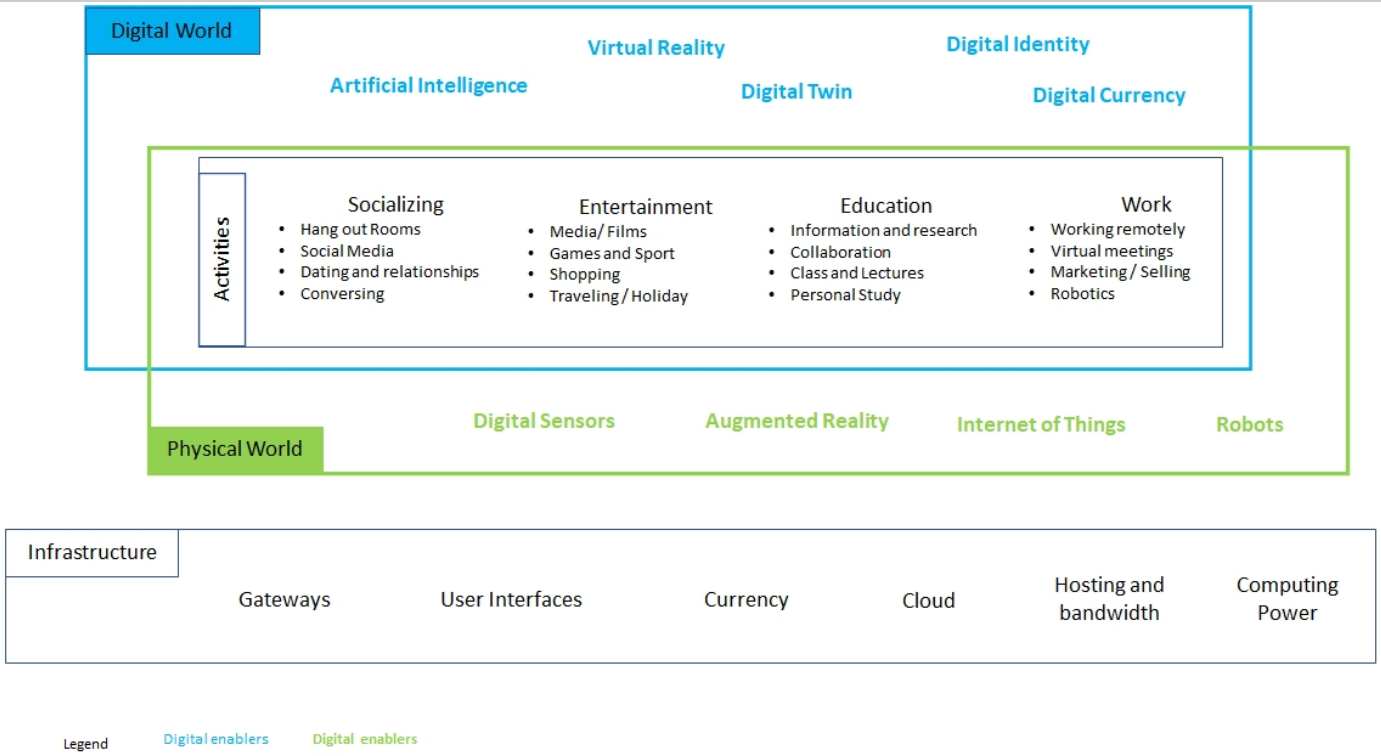


Source: Jefferies, Global Web Index, We Are Social, Hootsuite

....and by 2025 we predict that could be more than 12 hours

Interfaces already have us connected 24x7 so it's a short hop to us beginning to live our lives in the metaverse. As the schematic below shows we need to think about how the main activities that we engage in today might take place in a more digitized world. Investors need to figure out which activities will be first cab off the rank.

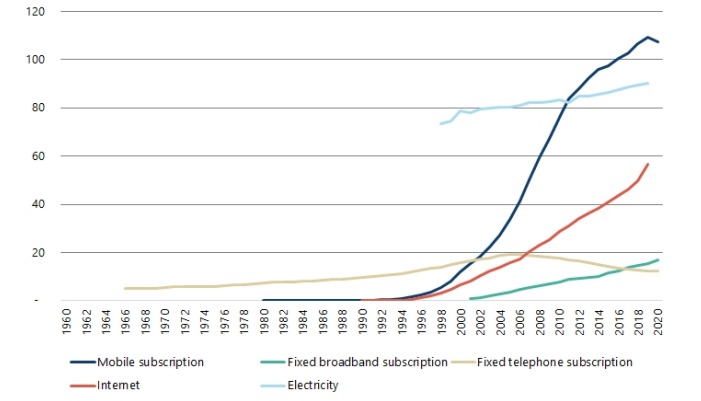
Exhibit 12 - Which activities can move into the metaverse?



Source: Jefferies

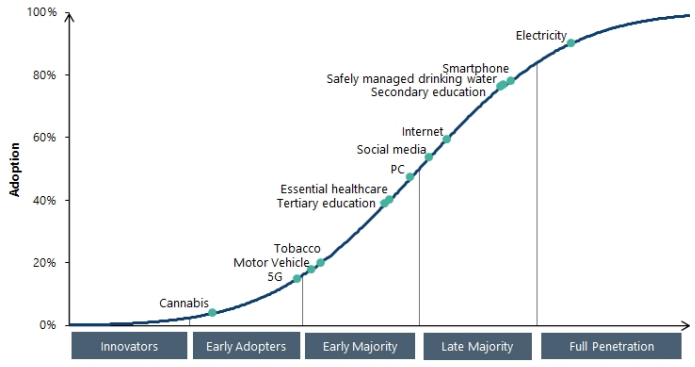
The internet is already a long way up the adoption curve along with the hardware that people use to spend time on it. The next step will be Web 3.0 and the merging of augmented and virtual reality to deliver the metaverse.

Exhibit 13 - Global technology adoption, 1960-2020, adoption per 100 people



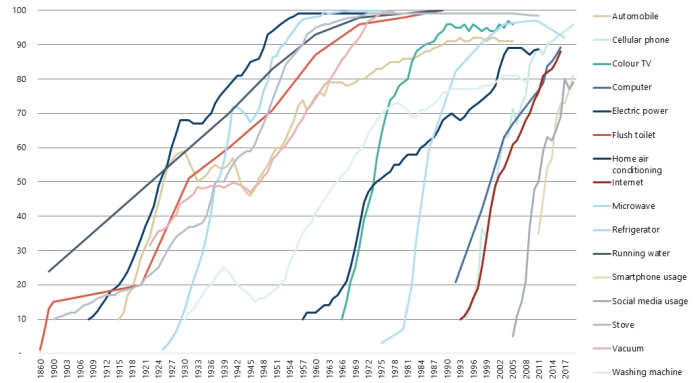
Source: World Bank

Exhibit 14 - Current adoption stage, in percentage



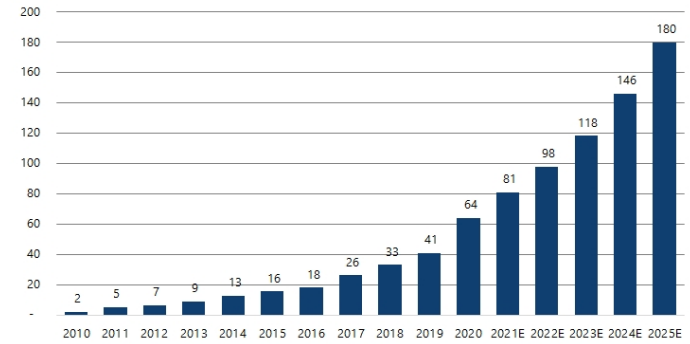
Source: Jefferies

Exhibit 15 - Technology adoption in US households, 1860-2019, in percentage



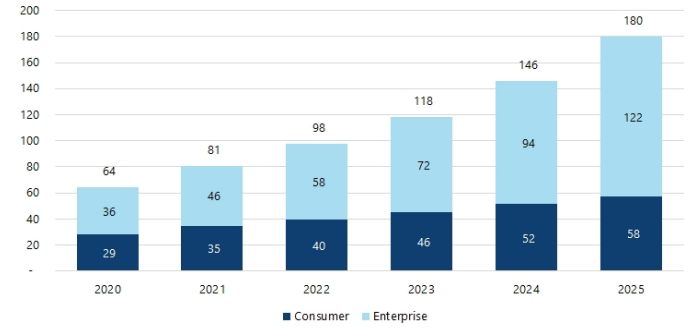
Source: Our World in Data

Exhibit 16 - Global amount of data created, consumed, and stored, 2010-2025, in zettabyte



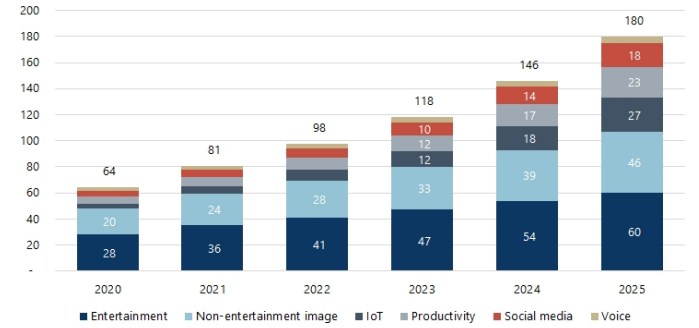
Source: Statista, IDC, Seagate

Exhibit 17 - Global data creation by consumer and enterprise, 2020-2025, in zettabyte



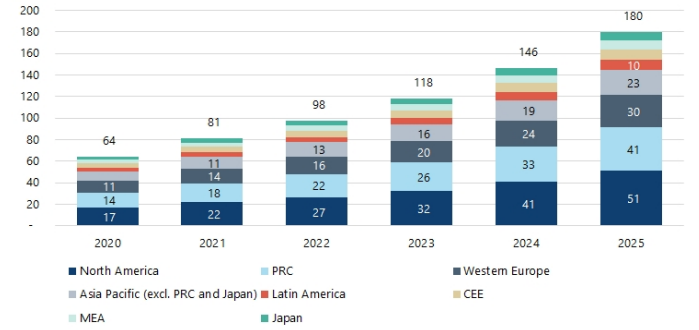
Source: Statista

Exhibit 18 - Global data creation by type, 2020-2025, in zettabyte



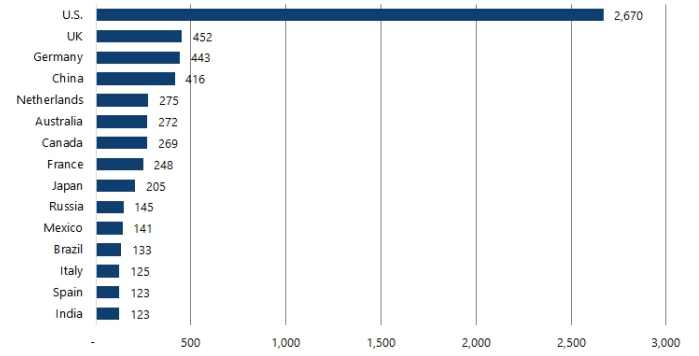
Source: Statista

Exhibit 19 - Global data creation by region, 2020-2025, in zettabyte



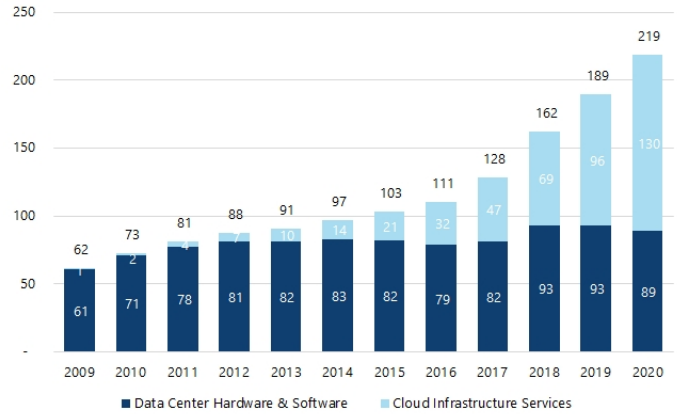
Source: Statista

Exhibit 20 - Global number of data centres by top country



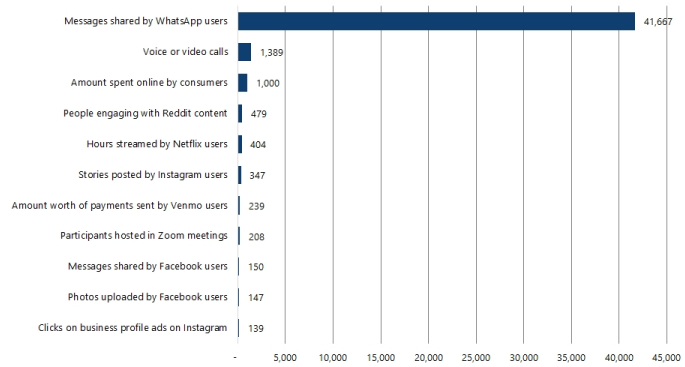
Source: Cloudscene

Exhibit 21 - Global spending on cloud and data centres, 2009-2020, in billion US dollars



Source: Statista, Synergy Research Group

Exhibit 22 - Media usage in an online minute, 2020, in thousands per minute

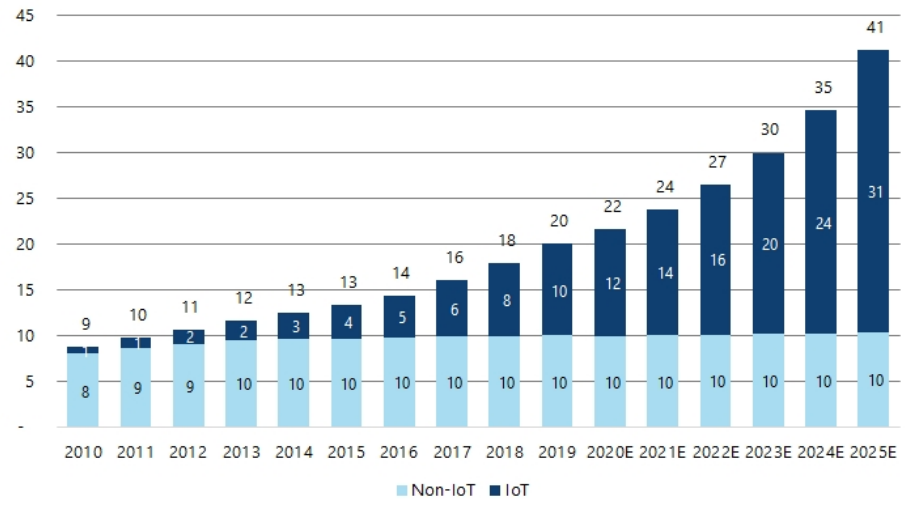


Source: Domo

The Internet of Things (IOT) will be subsumed by the metaverse

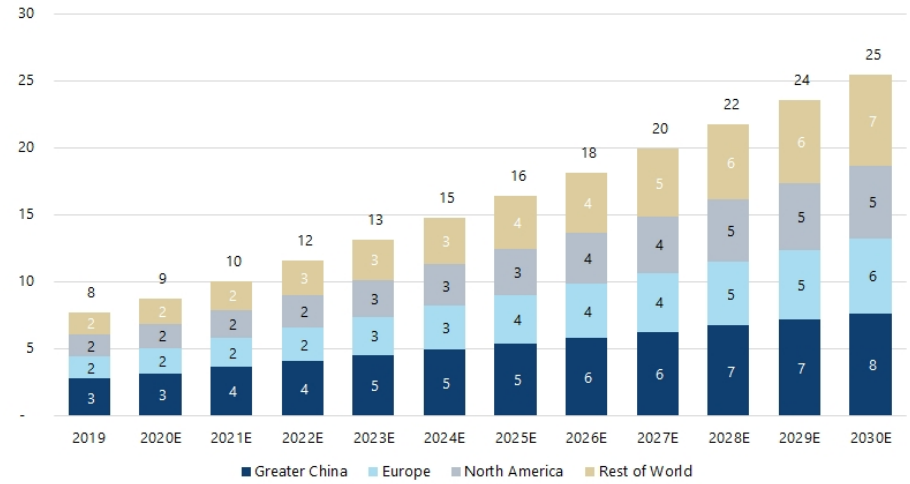
Currently, only a small amount of objects in the world are connected to the internet. The move to a metaverse will accelerate the digitization of everything. Many physical objects in the real world might end up with a digital twin in the metaverse, for example buildings, furniture and even appliances and cars may end up being digitized.

Exhibit 23 - Worldwide IoT and non-IoT connected devices, in billions, 2010-2025



Source: IoT Analytics. Note: IoT connections include connected cars, smart home devices, connected industrial equipment, etc. Non-IoT connections include smartphones, laptops, computers, etc.

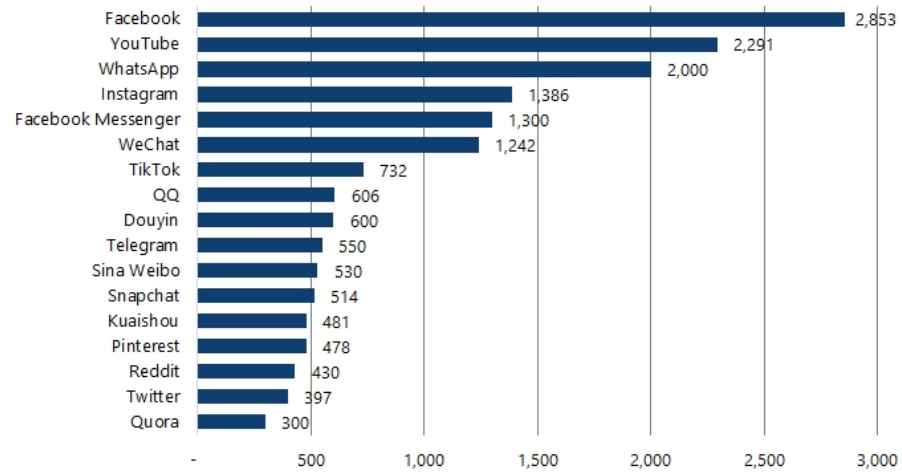
Exhibit 24 - Number of worldwide IoT connected devices by region, in billions, 2019-2030



Source: Transforma Insights

Big social media companies have a head start over others because they can potentially transfer their sophisticated user base to the metaverse. According to a survey conducted by Pew Research Center in February 2021, 78% of US citizens with annual income over USD75,000 are using social media, highest among all income groups; and 79% of US college graduates are using social media, highest among all education groups.

Exhibit 25 - Top social medias by number of active users, 2021, in millions



Source: We Are Social, Hootsuite

Three of top four social medias are controlled by the same company, including Facebook, WhatsApp and Instagram.

From 2D to 3D - how the metaverse will change how we behave online

On a recent earnings call the CEO of Unity Software said:

*"'I'd argue **the metaverse is already here** it's just really just another word for the internet. But better.....There'll be millions of endpoints in the metaverse and these will include shopping sites, games, social networks, messaging apps, **3D conferencing**, and job sites and constructions augmented by real-time 3D in the form of Unity reflect. We can get all these websites going millions of endpoints or destinations are the metaverse and it will expand in huge ways in years to come"*

Some executives believe that the metaverse has already arived

Exhibit 26 - Key shifts from the internet to the metaverse

Internet	Metaverse	Use-case
2D	3D	• Shopping for clothes – a virtual model (possibly yourself) will walk in front of you wearing the item(s) before you make a decision to buy • Houses – spend the day living in a virtual house before you buy it • Virtual meetings where peoples digital twins meet
Static	Real time	• Instead of looking at old information / products / data you can view and experience the current model / release • Current environments such as weather, travel etc are factored into the space
Individual	Group Experience	• Typically, we enter the web on our own – this moves to spending the day visiting locations along with our family / friends
Centrally controlled	Decentralized	• Managed by large corporations who design the look and feel, and set the entry and exit rules – shifts to environments designed built and managed by the community
Fiat $	DeFi	• Current arrangements require USD , credit cards and electronic payments – Shifts to crypto currency payments with individual tokens for different metaverse locations • Earning crypto in the metaverse – e.g. the current play to earn arrangement

Source: Jefferies

New methods of identify verification will emerge to help support the digital twin

Digital identities will be a key part of the virtual world and will likely take many forms, such as that of an individual or institution. A user can have different digital identities under different scenarios (such as a workplace identity and personal identity), but they are ultimately all based on the user's real-world identity.

The question of personal identification is reasonably straightforward when it comes to the real world. For the metaverse, what will really be the elements that make up one's identity and how you can prove its you? Will facial recognition be suitable as one could imagine there being ways to fake a face in the metaverse. We expect that a user's digital identity and reputation will be protected by the blockchain.

Users can establish a reputation through digital identities, value is exchanged through digital signatures, requests for verification and transactions; these transactions then allow a user to gradually build a reputation which can be inspected and verified by other digital identities and value intermediaries.

Augmented reality and virtual reality will merge

We can do almost everything online nowadays, but they are mainly on a 2-dimensional screen (phone, laptop, etc.) and they fail to give us an immersive experience. In a metaverse, we should be able to interact in a 3-dimensional way. Virtual and augmented reality can connect the gap. Recent application has been mainly focusing on gaming, which is usually seen as a simulation or testing of new technology before broad adoption for other uses.

Virtual Reality - skepticism has some merit, given history

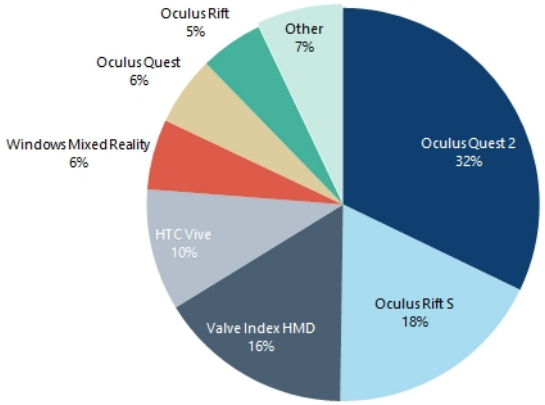
VR headsets for mass use didn't get off to a good start, but may be getting better

If you haven't used any VR technology, it makes sense to be a skeptic. Over the years we have been promised some big things by virtual reality vendors. We were supposed to be able to visit hyper-realistic virtual worlds, feel like we're there in far removed places, and have other people feel like we're there with them, too, but until recently, VR technology has been very disappointing. Big clunky helmets, lots of heavy wires, and crude graphics plagued even the best of what the industry had to offer in the early days. Nintendo's Virtual Boy promised to be cool in that it gave a form of 3D vision, but the crude graphics, low resolution, and eye strain issues made it a huge disappointment to anybody who actually tried it.

In 2015 the Samsung Gear VR emerged which was basically a set of goggles that you clicked a phone into. Half of the phone's screen ended up working for your left eye, and half for your right eye. The phone's motion sensors, GPS, and compass all worked to make sure the virtual environment moved with your head. But it didn't perform well and Samsung ended its support in 2020. It relied on a smartphone, and smartphones just aren't really made to provide a good VR experience, and shoehorning them into that role gives you an experience that falls pretty far short of expectations and wants. Smartphone resolutions are also too low when you magnify them with headset glasses, so the experience is just too blurry for most users to really appreciate it. Even worse, the Gear VR would drain cellphone batteries too quickly.

The more recent Meta built Oculus Quest looks similar to the Gear but is actuality different, built from the ground up rather than trying to leverage a smartphone. With the Quest 2, each eye gets 1832×1920 resolution, placed in a much better way, and with up to 120-Hz refresh rates. It uses cameras to track objects around you in the environment. This allows for wireless "room-scale" experiences where you walk around in virtual space like a real room instead of just standing in one place.

Exhibit 27 - VR headset share in the gaming platform "Steam" by device, 2021, in percentage



Source: Steam

Meta produced Oculus currently accounts for over 60% of the VR headset market

Exhibit 28 - Retail price of selected VR headsets

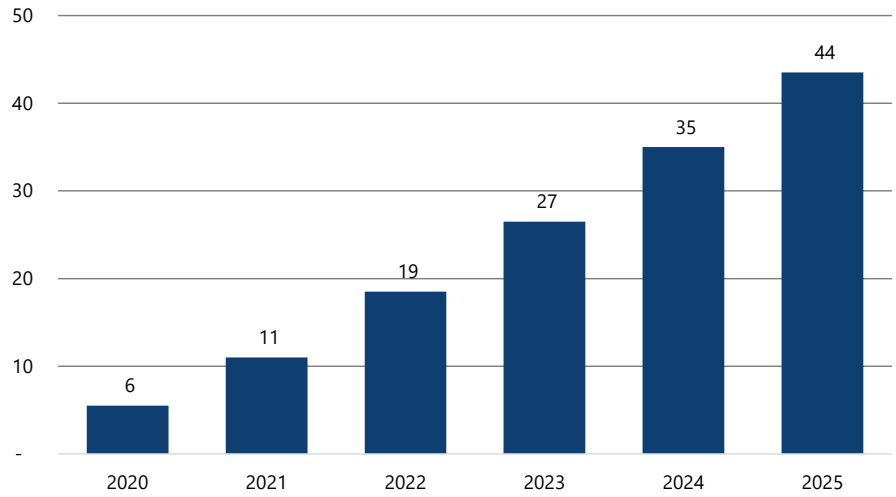
Company	Ticker	Release date	Model	Retail price in USD
Meta	FB-US	1-Aug-12	Oculus Rift	399
Meta	FB-US	1-Aug-12	Oculus Rift S	399
Meta	FB-US	1-May-18	Oculus Go	199
Meta	FB-US	21-May-19	Oculus Quest	399
Meta	FB-US	24-Aug-21	Oculus Quest 2	299
HTC	2498-TW	8-Jan-18	Vive Pro	599
HTC	2498-TW	15-Apr-19	Vive Focus Plus	799
HTC	2498-TW	6-Jun-19	Vive Pro Eye	1,599
HTC	2498-TW	3-Oct-19	Vive Cosmos	700
HTC	2498-TW	1-May-20	Vive Cosmos Elite	899
HTC	2498-TW	3-Jun-21	Vive Pro 2	799
HTC	2498-TW	27-Jun-21	Vive Focus 3	1,300
Valve	NA	28-Jun-19	Valve Index	999
Sony	6758-JP	13-Oct-16	PlayStation VR	300

Source: Jefferies

Oculus Quest II

Source: Wiki Commons

Exhibit 29 - Global AR and VR headset unit sales per annum, 2020-2025, in million units



Source: TrendForce, Statista

Haptic gloves and suits are quickly being developed

Virtual reality aims to create a feeling of actually being there, a feeling that events are actually happening and the feeling that you are actually inhabiting the virtual body. As a result we expect that haptic gloves and suits will emerge that will complement VR head sets to enable users to fully experience the metaverse. These suits and gloves will enable many use cases including enabling training for dangerous activities.

The industry is currently in its infancy. There are few industrial-grade products in the market and fewer consumer-grade products available. Most haptic gloves and suits are developed by private companies or research institutes, where the latter is for research purpose only (e.g. Synesthesia Suit by Keio University in 2016). Many projects started some years ago were aborted mainly due to lack of funding (e.g. Hardlight VR Suit and Rapture VR Vest). But increasing interest in metaverse will attract more industry participants and more funding for R&D. In Nov 2021, Meta announced the prototype of its own haptic gloves, making it a pioneer among listed companies.

Exhibit 30 - Price and status for selected haptic gloves and suits

Haptic gloves and suits	Developed by	Status
TeslaSuit	VR Electronics Ltd.	Auctioned on OpenSea in July 2021
TeslaSuit Glove	VR Electronics Ltd.	In development and prototype released in 2019
TactSuit X	bHaptics Inc.	Debut in Jan 2021
Meta Reality Labs Gloves	Meta	In development and prototype released in Nov 2021
Hardlight VR Suit	NullSpace VR	Crowfunding started in 2017, but project discontinued in 2019 due to lack of funding
ForceBot Suit	HaptX, University of Florida, Virginia Tech	In development since Sep 2020, with USD1.5 million grant from National Science Foundation
HaptX Gloves	HaptX	Debut in 2017 as a development kit for research professionals
Rapture VR Vest	The VOID	Prototype released in 2016 but company closed in 2020 due to loan default
Synesthesia Suit	Keio University	A research project in 2016

Source: Jefferies

Mainly private companies are developing the technology

Who and how will we police this new space ?

Regulators will need to write code rather than laws

The build out of the metaverse raises the question of legislation and regulation. The metaverse will bring large numbers of users together, making it a place of great opportunity to connect and exchange, at the same time it will make users vulnerable to fraud, exploitation and other issues. It will be a significant challenge to identify jurisdiction as well as a set legislation that can ensure the space is safe and secure for its users.

The centralized architecture of the current version of the internet/ cyberspace means that governing bodies are able to enforce the rules of law on key companies that essentially run the web. If we shift our commercial and social activities into a Web 3.0 / decentralized world this will reduce regulators ability to enforce the rule of law. There is a high risk that in the early days of the metaverse an almost "wild west" kind of world will emerge. Over time regulators will need to shift their approach from enforcing laws towards writing computer code since the virtual decentralized world will be governed by code. Laws will need to rise to the challenge of ensuring that code driving the metaverse reflects the rules that currently manage the physical world and conventional cyberspace. There is a risk that alternative code may rise to become the prevalent future order in the metaverse, and that code may lack any link back to established legal frameworks. Such a shift could see private actors exerting control over metaverse activity, and depriving users of protections developed by regulators.

Ultimately, the question may no longer be whether code or law will regulate activity in the metaverse, but rather whether law can align with code or be replaced by code.

Regulating digital asset transactions will be the first order of business

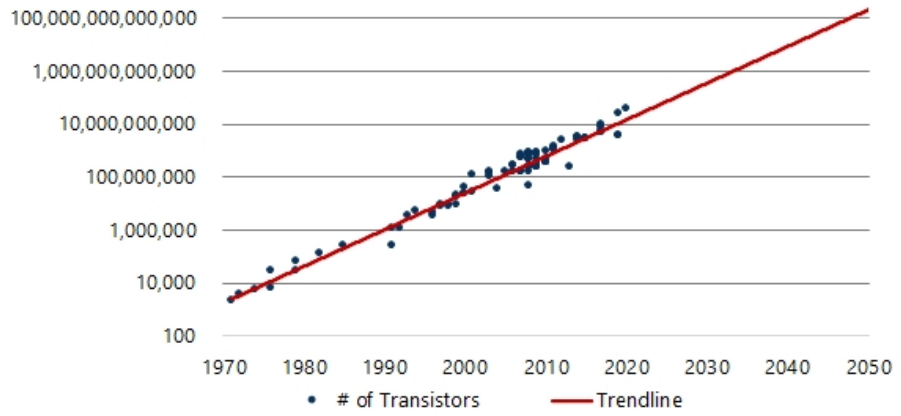
Transacting in digital assets will create a significant challenge for authorities. Non-fungible tokens ("NFTs") – are digital assets that represent ownership of an item or content. NFTs representing music or art, for instance, may involve royalty payments that are automated on the token being transferred between users. Law should ensure that the ownership and transaction in NFTs can be enforceable, as virtual users may be able to evade enforceability depending on their location or identity settings.

Can existing computers power the metaverse?

CPU processing power grew exponentially in the past decades. It is decided by multiple features and one of the most important factor is how many transistors there are in a CPU. More transistors in a CPU means the computer can run more instructions at the same time, which lead to a faster processing speed. Transistor counts in a CPU increased from 2,300 in the first microprocessor Intel 4004, to multiple billions in the latest CPUs. Transistor counts on an affordable CPU will double in about every 18

months according to Moore's Law, and Moore's prediction has been verified in real life since 1970s.

Exhibit 31 - Number of transistors in an integrated circuit, 1970-2050



Source: Jefferies

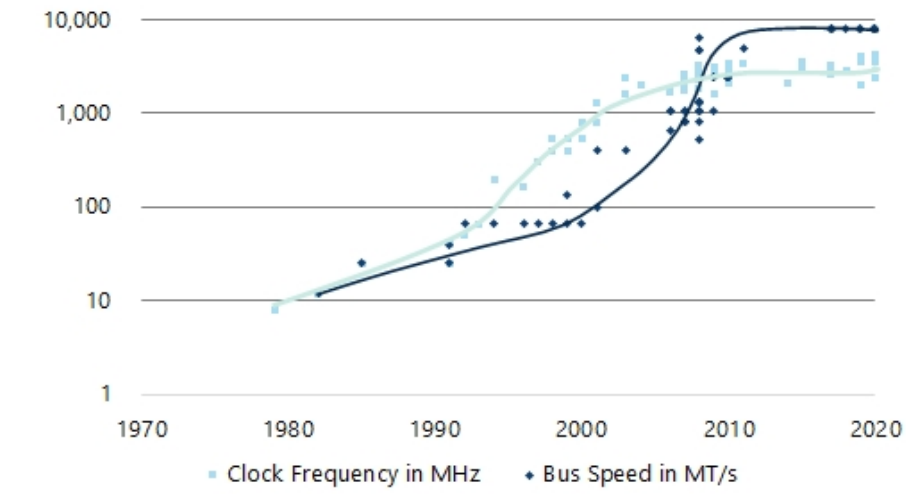
Recent models record more than 10 billion transistors, and we anticipate that CPU will have more than 100 trillion transistors by 2050.

Clock speed refers to the rate at which a processor can complete a processing cycle, and one megahertz equals to one million cycles per second. Higher clock speed means the computer is able to load and interact with application quickly. Bus speed refers to the speed of front side bus, which carries data between CPU and a memory controller hub. Higher bus speed also means faster processing speed.

The clock frequency and bus speed of a CPU appears to have hit a plateau, mainly because computers find it harder to cool the high temperature created by high processing speed. Thermal design power of a CPU (maximum amount of heat generated by CPU that the computer cooling system can dissipate) did not have exponential growth. Investors need to consider if developments in Quantum computing can help to overcome these limitations?

Take the game Flight Simulator for example. The game has a sophisticated weather simulation feature, and can download real-time weather data. It requires a CPU in a clock frequency of at least 3.7GHz (Intel i5-9600K), one of the fastest in current consumer grade CPUs. In a metaverse where people can freely communicate with each other and interact with their surroundings, it requires way more than what current CPUs can provide.

Exhibit 32 - Selected CPUs' clock frequency and bus speed, 1979-2021, in MHz and in mega transfers per second



Source: Jefferies

Technology Singularity - an explosion enabler of the digital twin

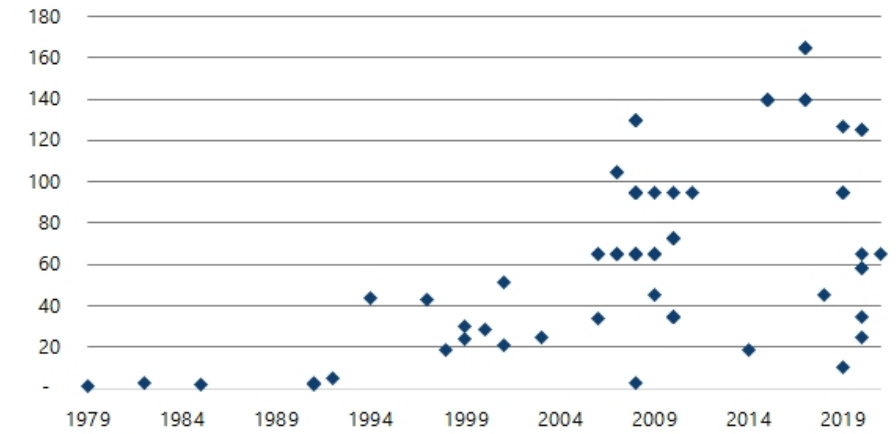
If Singularity is achieved the resulting explosion of new intelligence will transform the world

Singularity describes the concept where computers become so advanced that their embedded artificial intelligence can transcend human intelligence. This has the potential to eliminate the the boundary between humanity and computers. From there computers running AI will turn into super intelligent machines with cognitive capacity. Nanotechnology is perceived as one of the key technologies that will make singularity a reality.

If singularity were able to be reached, this explosion of intelligence will significantly impact human civilization. For example we could reach a point where computers begin to drive inovation and technological improvements.

This point has the potential to turbo charge your digital twin in the metaverse. For example, humans could potentially teach an AI to represent them almost identically in external interactions. This could lift our personal productivity by 100%+

Exhibit 33 - Thermal design power for selected CPUs, 1979-2021, in watts



Source: Jefferies

The metaverse doesn't exist yet, but video gaming will be where it starts

Gaming companies such as Roblox, Minecraft owner Microsoft, and privately held Fortnite creator Epic Games have all been creating multiplayer games that have rapidly become rich social networks. Other traditional game makers such as Activision Blizzard with its Call of Duty franchise; Electronic Arts with Battlefield; and Take-Two Interactive Software with Grand Theft Auto with their virtual worlds are also taking their place in the future metaverse.

A new development - games based on Blockchain Technology

The Sandbox and Decentraland highlight a recent development in blockchain platforms focused on creating the metaverse for games players, developers and even merchants of tokenized assets. What is groundbreaking here is the idea that assets won or created in the games can be taken from the game and used elsewhere either in the physical or digital world. These games are challenging the closed loop nature of many other multiplayer games where assets can't leave the game.

The Sandbox is a game based on the public Ethereum blockchain that allows a metaverse where players can play, rent virtual properties, develop their own creations and spend ERC-20 tokens in the game. Sandbox uses the 3D Voxel style showcased in popular games such as Roblox and Minecraft.

Decentraland is the first virtual world based on Ethereum where users create, experiment and monetize their content and applications. It is a decentralized virtual reality world that allows players to monetize the content created. In April 2021, a plot of land on the platform sold for more than $500K.

Blockchain technologies will bring real value and proven ownership to the metaverse.

The metaverse could give meaning to many digital assets

For many the arrival of NFT's in 2020/21 was perplexing and the payment of large sums to purchase and own those tokens, be they digital art etc. was even more perplexing. Why would someone pay so much money to buy a digital image? The answer may be that in a new metaverse that asset has greater meaning and potentially greater value. We can envisage a day where owners can display that art for others to view, possibly even charging to view.

...and we are heading to the digitization of all assets

Investors should consider the amount of digital assets that they currently own, likely photographs, some music / films and perhaps a small amount of crypto currency. Imagine a future where all your assets become digitized. How do you digitize a home that you own? Most likely markets will start to tokenize physical assets.

We used to collect baseball cards, rare autographs of stars, statuettes and figurines, but now there are other toys that are more expensive. Everything is going digital, cryptocurrency. Art has gone digital.

Exhibit 34 - The 50 biggest NFT sales worldwide as of March 16, 2021, in USD thousand

NFT	Sales date	USD'000
Beeple Everyday: The First 5000 Days	11-Mar-21	69,346
CryptoPunk 7804	11-Mar-21	7,821
CryptoPunk 3100	11-Mar-21	7,574
Beeple CROSSROADS	25-Feb-21	6,600
CryptoPunk 6965	19-Feb-21	1,546
CryptoPunk 4156	18-Feb-21	1,199
CryptoPunk 2140	2-Mar-21	1,069
CryptoPunk 6487	22-Feb-21	1,052
hairy #1/1	14-Mar-21	1,036
CryptoPunk 3393	13-Mar-21	884

Source: Statista. Note: The transaction values were in ETH, and have been been converted to USD by using the average ETH price of that particular day.

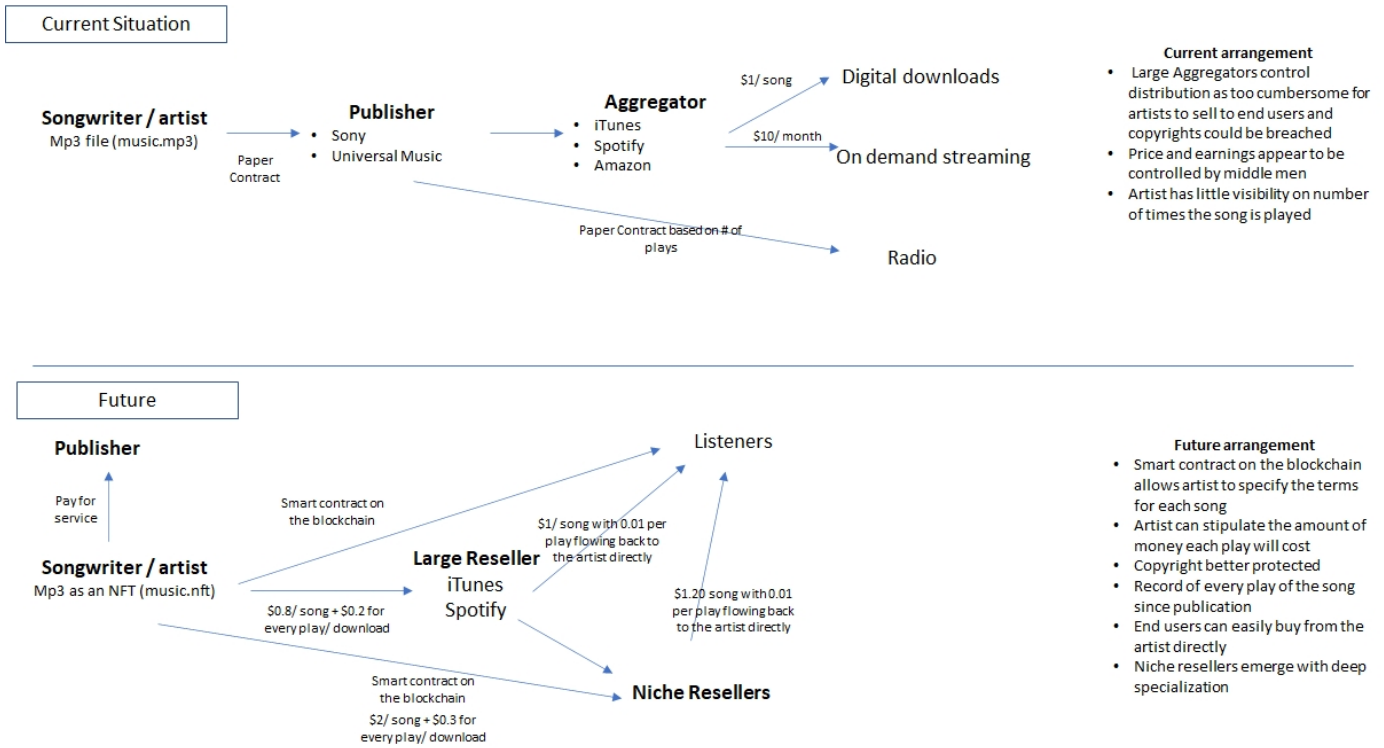
The aggregators of assets could be dis-intermediated

A move to ecommerce in the metaverse has the potential to significantly disrupt today's aggregators , intermediaries and various middlemen. Take the example of digital assets such as music.

We could envisage a future where artists release their music as an MP3 with a smart contract stapled to it on the blockchain. That contract could specify the price of the song and a payment each time its played. It could also specify that if the song gets resold again that the artist be paid a cut of the reseller's revenue. The blockchain will protect the copyright and will even tell the artist when ever the song is played.

Imagine a world where all the music on your library is on the blockchain. Your library will indicate whose music you own or are renting and micro payments will be made. It's likely that almost all assets from films to books to houses etc. could be treated in a similar way

Exhibit 35 - Schematic view of the digital music industry - Current and potential future



Source: Jefferies

Exhibit 36 - Industries that could be disrupted by blockchain

Sector	Details
Banking	Blockchain has the opportunity to disrupt the $5T+ banking industry by disintermediating the key services that banks provide, from payments to clearance and settlement systems.
Real Estate	Using blockchain, all of the documents and transaction records can be stored securely with measurably less work and less cost Real estate blockchain applications can help record, track, and transfer land titles, property deeds, liens, and more, and can help ensure that all documents are accurate and verifiable. The technology can create smart contracts that release funding only when the conditions are met
Loans and Credit	Alternative lending using blockchain technology offers a cheaper, more efficient, and more secure way of making personal loans to a broader pool of consumers. With a cryptographically secure, decentralized registry of historical payments, consumers could apply for loans based on a global credit score.
Legal	Blockchain technology is poised to disrupt some areas of the legal industry by being able to store and verify documents and data. Records (including wills) stored on the blockchain will be quickly and securely verified. Any changes to the
Insurance	Using a blockchain to create a single source of truth for transactions between parties has the potential to significantly drive down processing time and costs for insurance companies.
Stock exchanges	Credit Suisse, partnered with New York-based startup Paxos to use blockchain tech to settle US stock trades in March 2020. Meanwhile, JPMorgan Chase has entered the blockchain space with the JPM Coin, which it intends to use to facilitate transactions between institutional accounts. Other banks like Goldman Sachs and Citigroup have also experimented with blockchain.
Education	Academic credentials must be universally recognized and verifiable. In both the university environment verifying academic credentials remains largely a manual process Deploying blockchain solutions in education could streamline verification procedures, thereby reducing

Source: Jefferies

Crypto may simultaneously be transforming money property and energy

We are witnessing the digital transformation of gold, property and energy. We can take energy and turn it into a form of value and transmit that value in the metaverse. There is a chance that cryptocurrencies could become the platform on which we build the metaverse

There has been a surge in the number of listed companies holding bitcoin on their ballance sheet. Since the start of 2020 more than 20 companies now hold the digital currency on their balance sheets.

Exhibit 37 - Top 10 public companies by bitcoin held in balance sheet

Ref.	Ticker	Company	BTC holdings as of 1 Nov 2021	BTC market value as of 1 Nov 2021 in USD'mil	Company market cap as of 1 Nov 2021 in USD'mil	BTC as % of mkt cap
1	MSTR	MicroStrategy Incorporated	114,042	7,003	7,624	92%
2	TSLA	Tesla	38,300	2,352	1,213,739	0%
3	GLXY-CA	Galaxy Digital Holdings	14,932	917	8,536	11%
4	SQ	Square	8,027	493	117,828	0%
5	MARA	Marathon Digital Holdings	4,813	296	5,531	5%
6	COIN	Coinbase Global	4,502	276	69,815	0%
7	HUT	Hut-8 Mining	2,271	139	2,023	7%
8	3659-JP	Nexon	1,717	105	15,317	1%
9	BTBT	Bit Digital	1,595	98	649	15%
10	RIOT	Riot Blockchain	1,569	96	2,695	4%

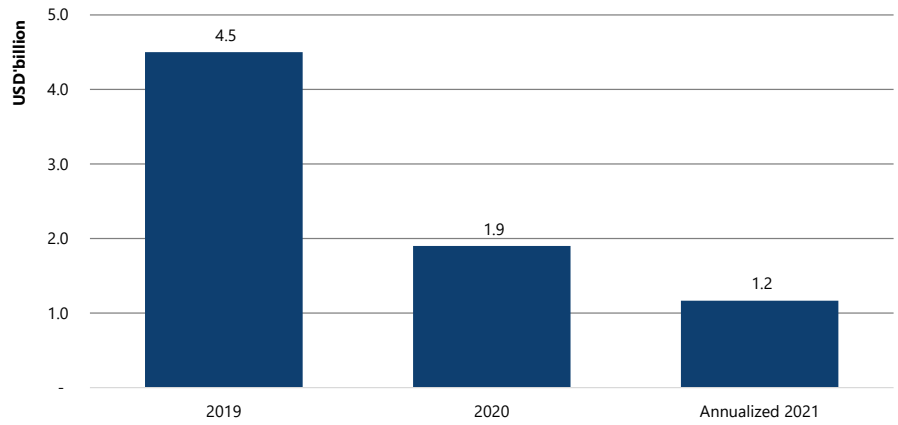
Source: Jefferies, FactSet, CryptoTreasuries

Exhibit 38 - Top cryptocurrencies dedicated to metaverse by market cap on 12 November 2021

Total ranking	Cryptocurrency	Market Cap in USD'million
23	Axie Infinity	9,601
50	Mana	4,133
68	Enjin	2,922
80	Sandbox	2,399
102	Radio Caca	1,484

Source: CoinGecko

Exhibit 39 - Crytocurrency lost due to thefts, hacks, frauds and misappropration, 2019-2021, in USD'billion



Source: CipherTrace Cryptocurrency Intelligence. Note: 2021 data is annualized based on Jan-Jul 2021 data.

As Chris Wood recently highlighted in his note GREED & fear: Crypto revisited very few people in the world own bitcoin. Specifically it's likely that very few of the millionaires in the world currently hold the asset, and as bitcoin moves more into the mainstream then those HNWI will need to start to place some of their wealth into the asset.

People are more conscious of cybersecurity when dealing with crypto.

Exhibit 40 - Bitcoin distribution in November 2021

Balance of BTC	Number of Wallets	% of Wallets(Total)	Total Coins	Currrent USD Value
[100,000 - 1,000,000)	3	0.00%	573,336	37,077,911,135
[10,000 - 100,000)	85	0.00%	2,103,202	136,015,126,808
[1,000 - 10,000)	2,065	0.01%	5,235,486	338,581,506,672
[100 - 1,000)	13,961	0.04%	3,987,779	257,891,664,158
[10 - 100)	131,592	0.34%	4,290,894	277,494,256,389
[1 - 10)	660,208	1.70%	1,684,195	108,917,747,692
[0.1 - 1)	2,443,228	6.29%	760,106	49,156,437,404
[0.01 - 0.1)	5,927,504	15.27%	192,073	12,421,462,890
[0.001 - 0.01)	9,675,640	24.92%	36,868	2,384,283,424
(0 - 0.001)	19,967,114	51.43%	4,100	265,119,692

Source: BitInfoCharts

Blockchain requires significant power consumption, and consequently currently generates significant greenhouse gas emissions

Metaverse may potentially be built on blockchain that depends on decentralized operation. It requires significant electricity consumption. In order to authorize a blockchain transaction between users, participants in the network have to validate the transaction by solving a complex math problem (also called the mining process). Once the math problem is solved, the transaction is verified, the record is stored publicly and cannot be changed. Miners are then rewarded for their work in cryptocurrency. Currently, it takes about 10 minutes to mine one bitcoin, and about 7-8 days to mine one ethereum.

But it will be more difficult to mine with more miners because the difficulty level of mining will increase to keep the production at a stable rate, which then leads to higher electricity consumption. According to Cambridge Bitcoin Electricity Consumption Index, global bitcoin mining currently consumes about 117 TWh electricity per year, which is more than annual electricity consumption of the Netherlands (111 TWh). Consequently, it contributes significantly to greenhouse gas emissions as only 29% of global electricity was generated from renewable energy in 2020. Most mining activities used to take place in China, where 60%-70% electricity is generated by coal. China banned cryptocurrency mining in June 2021, and later banned cryptocurrency transactions in October 2021, possibly due to their huge energy consumption. As growing attention to carbon-neutral around the world, there is a chance that other countries might follow China's practice to crack down on mining activities. One solution can be renewable power generation in mining areas, which requires more hydro, solar, wind and nuclear plants.

Exhibit 41 - Annual greenhouse gas emission from selected sources, in equivalent tonnes of CO2

Emission source	GHG emission estimates in tonnes
United Kingdom	370,000,000
Global beef supply - from land use to packaging	59,600,000
Bitcoin mining	56,712,000
Standby power in US residential appliances	28,700,000
Formula 1	256,551
A typical passenger vihicle in US	5
Passenger plane flying LHR - LAX return	2

Source: Jefferies, Global Carbon Project, Cambridge Bitcoin Electricity Consumption Index, American Council for an Energy-Efficient Economy, Formula One, US Environmental Protection Agency, The Guardian, Our World in Data

Implemented correctly the metaverse could bring benefits to society

While there are some potential issues, there could be some benefits:

Reducing travel - Virtual reality can provide a richer version of a Zoom call today, but even in-person physical work could come to be replaced by it.

Reducing manufactured goods - Manufacturing is going to be another thing that we can do less of if the metaverse takes off. Instead of building factories worldwide to make

mass produced goods and things we use once or twice and then throw away, many of these items can just exist in the virtual world for us to play with. Many physical toys, games, and other items can just not be made.

Safer work environments - Many accidents occur during training to perform dangerous tasks. The more you do a task, the more you'll be able to do it safely. The metaverse can allow people to safely experience a realistic version of the dangerous tasks and get some experience before they step are in harm's way.

Who will be the winners

There will be some significant winners - we just don't know exactly who those winners are yet. It's hard to even bet on some current names as there is a risk that too many organizations are working on too many solutions. For example saying that Facebook is going to build and own the metaverse is like saying that Apple built telecommunications infrastructure

Investors should look at the enablers of the build out and those involved in digitization of physical things. An initial bet could be on some of the social tokens that look set to help digitize assets to make them ready for the metaverse. Buying NFT's now may not be a good idea as there has already been an explosion of the formation of NFT's; instead investors should look at platforms that help create the NFTs.

Think about the build out of the metaverse the same way we built out the internet

When we look back at the tech cycle that ran from the 1980's to the mid-2000s what we see is that in the beginning the leaders were hardware companies, HP, Compaq and BlackBerry and Cisco. In the second half of the cycle, the leaders/ winners were the software companies. The Googles and Facebook, and Amazon. Then from the mid 2000's and the advent of the smartphone we saw that the world became all about the software (apps) that ran on that hardware, and how that was leveraged to build new business models to buy and sell services, the hardware companies that were well managed were still players.

We believe that the metaverse will follow a similar cycle. Investors should focus initially on the hardware needed to lift the internet to become the metaverse. Then the software that will design and host it, and ultimately the businesses that create use cases on it.

View from our N American gaming analyst - Andrew Uerkwitz

We see 5 key elements of technology that will accumulate over time to get us to our utopian definition of metaverse: **technical infrastructure; platforms; interoperability; virtual pick and shovels; and user behavio**r. This ranges from the hardware side: faster network/chip speeds and better consumer hardware; to new software services like payments and virtual asset management; to standards on software interoperability and user behavioral codes. And everything in between. Each are in varying states of advancement and each open up new near opportunities and markets on their own.

Coverage Implications: As we look across JEF coverage in North America, we include a selection of companies that will benefit... **FB (Meta) /SNAP** are both working on hardware to access the metaverse while having social platforms with significant reach. **Roblox (RBLX)** is the closest to being an early stage metaverse. **TakeTwo (TTWO**) is currently running three games that arguably could be early stage metaverses. **Electronic Arts (EA**) has several IPs that would be ripe to be turned into walled garden metaverses: Skate, Sims, SimCity, and even its sports franchises. **Activision Blizzard (ATVI)** has one of the innovators in early metaverse with World of Warcraft in its library. Moreover, Call of Duty could use many of the tools in building a metaverse to better monetize and engage users (cross platform, cross universe, single currency economy). Music will likely play a role along the way from here to there...**Warner Music (WMG)** already sees this as it has invested in several start ups that are building tools/platforms in the metaverse.

Jefferies

EQUITY RESEARCH
USA | Interactive Entertainment

Interactive Entertainment

"Going Outside is Highly Overrated": Metaverse Primer

September 29, 2021

FRANCHISE REPORT

Key Takeaway

Welcome to the Metaverse. We take a look at what it is - why it's not here - how it will eventually be everywhere - and who is best positioned to benefit. We believe the accumulation of technology in the video game industry will eventually lead to a fuller, more robust internet that we call the Metaverse. The profound impact will be felt well beyond any single industry. Its final form is decades away, but in the meantime, expect many near term disruptions.

Our definition: the Metaverse is the convergence of physical and digital in a way that is persistent, real-time rendered and infinite in its ability to offer shared experiences allowing for total sense of presence to the point where it embodies us. Your virtual identity will become interchangeable with your physical and true economies will form around this immersion into virtual/augmented realities.

The Five Elements to Build: We see 5 key elements of technology that will accumulate over time to get us to our utopian definition of metaverse: technical infrastructure; platforms; interoperability; virtual pick and shovels; and user behavior. This ranges from the hardware side: faster network/chip speeds and better consumer hardware; to new software services like payments and virtual asset management; to standards on software interoperability and user behavioral codes. And everything in between. Each are in varying states of advancement and each open up new near opportunities and markets on their own.

Why it starts with video games: The very idea of being able to build whatever you can imagine and then to experience these fantastic worlds alone or with others has been at the heart of video games from the very beginning. Technology has thus been pushing forward to reach the edges of the imagination and to overcome the uncanny valley. With each breakthrough the industry has found new ways to reach a wider audience with deeper engagement. Or put another way, advancing technology has made virtual worlds more accessible and acceptable.

Why it will end up everywhere: As video games, social media, and broader media shape new social norms around virtual experiences, technology will advance and enable the convergence of the physical world with the virtual. Using the evolution of video games as our guide, the mixing of physical and virtual seems as the natural next step in the way we think about the use of the internet. Evidence is widespread. Video games replacing social interaction, physical experiences shifting to the virtual, normalization of digital ownership, and virtual self expression seeping into the virtual is all happening. The economic opportunity is too large to ignore by legacy and new players as the internet is set to evolve one more time.

Coverage implications: We see broad medium to long term implications across our coverage. Starting on page 18, we include impacts on the following covered companies: ATVI, EA, RBLX, TTWO, and WMG. We include commentary from our fellow analysts on tickers FB, SNAP, FNKO, HAS, TOY CN and MAT.

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Please see analyst certifications, important disclosure information, and information regarding the status of non-US analysts on pages 24 to 29 of this report.

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View from our Asian gaming analyst - Atul Goyal

In our view, video game sector is ripe for sustained long-term growth. The industry is fairly consolidated (approximately 10-12 major publishers; 2 graphics processing unit (GPU) makers; 2 independent game engine cos) and generates healthy margins and returns. Given these long-term prospects, almost all the largest companies want to participate. In 2022, we expect Gen 9 console cycle (started Nov'20) and digitization to shareholder returns. Our top pick is Sony.

Gen 9 consoles and Digitization: Sony's PS5 and Microsoft's XBsX are called Gen 9 consoles (PS4, XBO were Gen 8 consoles). At the beginning of Gen 8 (around 2012), the proportion of digital sales in total game/ software sales was around 10%. By the end of Gen 8, that had reached c. 50% plus. Gen 9 consoles were launched in Nov'20 and have faced C19 delays to their game pipeline. However, that pipeline is coming together now, and we expect 2022 to be a very busy year for gamers. This is likely to drive one of the fastest YoY revenue growth in the industry. The operating leverage from this growth combined with increasing digital sales proportion (we expect digital sales to approach 80-90% by 2025) is likely to result in rapid earnings growth for companies that are well positioned. In our view, there is no other company better positioned that Sony in that regard.

Beyond 2022: Metaverse optionality: metaverse or deeply immersive virtual worlds? Some of the world's biggest companies are attempting to have an exposure into gaming. That list includes Apple (Apple Arcade), Microsoft (Xbox), Google (Google Stadia), Amazon (Amazon Games), Netflix (as part of subscription), Facebook/ Meta (AR/ VR via metaverse). All these companies are trying to either (a) be a part of game industry ecosystem (b) build their own respective ecosystems/ platforms. We believe that the game industry is likely to enjoy sustained (and sometimes explosive) demand growth in the long-term, and it is likely that these large companies also see the same. What some called deeply immersive virtual worlds, others term it as metaverse. Or perhaps metaverse of metaverses. We expect different companies to build different layers for metaverses (some exclusive, others not). It could be software companies (Unity, Epic), hardware companies (GPU makers, VR device makers etc.), content companies (Game developers, publishers) or platforms. Within our coverage, we believe Sony's Game, Music, Movie and sensor businesses are all positioned to benefit.

What needs to happen for 'metaverse' to materialize? Over the last 15 years we have witnessed several fads (1) cloud-gaming in 2008 (On-Live); (2) social games (Zynga's Farmville on Facebook) 2008-10; (3) VR (Oculus by Facebook and other VR devices); (4) AR Mobile-games (Pokemon Go); (5) e-Sports from 2018-2020; (6) Cloud-gaming again in 2019-20 (Google Stadia). Now metaverse. Will this also end up as a fad? We hope not. But it will depend on what customer need does metaverse fulfill? Is it an attempt to bring entertainment together with productivity/ efficiency? There is a lot of conceptualization but little clarity. What will users do inside the metaverse, what will keep them in? Will it appeal to all age-groups?

Our view: Within the gaming space, our top pick remains Sony, which is one of the most attractive stocks offering the best growth optionality with the least expensive valuation. Earlier in 2021, we had flagged the potential of 2-3x in 3-4 yrs. And for 2022, we feel increasingly confident for Nexon (Buy). We rate Nexon, Capcom, Konami and SqEnix as Buys. We have a Hold rating on DeNA and UNPF rating on Nintendo.

View from European gaming analyst - Ken Rumph

The European listed video games sector has grown organically and through IPOs (which appear set to continue into 2022) but is largely focussed on software/games versus hardware. Companies are grouped into developers (Ubisoft, CD Projekt down), indie publishers (Team17, Devolver, etc., parts of Embracer) and outsourcers/external service providers.

Playing Metaverse and Digitization Themes in Europe

Ubisoft explores the Frontiers (UBI FP, Buy, PT EUR60)

Among the European majors, and versus traditional US peers, Ubisoft has been most willing to explore and provide content/support to new platforms. This was seen in new consoles (Nintendo Wii, Switch) and with Google's abortive Stadia streaming foray (*Assassin's Creed: Odyssey* was the lead demo game) – a strategy with low downsides and significant upsides (ACO on Stadia covered by Google, lead non-Nintendo titles like *Mario+Rabbids* Switch exclusive highly profitable).

In metaverse/digitization terms, Ubisoft has been an early supporter of VR/Oculus Rift etc. (arguably too early, but which may soon begin to pay off in experience gained) and most has been working internally as well as incubating companies such as Dapper Labs (behind NBA Top Shot and Cryptop Kitties), Sky Mavis (makers of Axie Infinity) and Sorare (Ethereum based fantasy soccer game) and is a minority investor in Animoca Brands (in turn an investor in Sky Mavis). This VC-type approach makes sense alongside internal R&D around blockchain gaming, NFTs and play to earn gaming. It also addresses investor concerns/preferences that Ubisoft should focus on near term projects in free-to-play (FTP) games.

As we were preparing this report, Ubisoft's Nicolas Pouard, VP at its Strategic Innovation Lab, published an article in Venturebeat entitled *Blockchain is only a game changer if players are stakeholders* in which he discusses Ubisoft's interest and approach. Nicolas notes that *individuals, and communities have evolved as co-creators and stakeholders of digital worlds and experiences, now expecting that their content, data, or time could produce value they too can benefit from* and that this applies strongly to free to play and games as a service model, multiplayer games where user-generated content is not currently recognized or rewarded.

However to achieve trust and fair outcomes, given scams and other speculative mechanics, he proposes three pre-requisites: 1) that established industry actors act as gatekeepers to create trust in familiar (game) environments. 2) Environmental requirements for 'clean' NFTs/blockchain protocols such as proof-of-stake vs the emissions- and energy-intensive proof-of-work protocols. 3) Decentralization means granting players more control over games, and their assets within games: *including selling them and reaping the benefits and value born from the time and skill required to build them or to obtain them. We see this "play-to-earn" — and ultimately "create-to-earn" model — as a way to establish players as stakeholders of their experiences*

He ends the article: *"This is what opens the door for a true "metaverse," a notion that spreads far beyond a single company's strategy, and that can't exist without a natively digital economy and decentralized, community-driven technology. Yes, blockchain is a game changer, but only if used the right way and with players at its core will we collectively harness the true potential of this innovation."*

Ubisoft's evident desire to be a pioneer in building trust, backed up by a longer history than most, is striking.

Overall, our non-consensus upgrade in October [link] to Buy on Ubisoft reflects the levels of pessimism towards the stock – where estimates and valuation ignore the gradual progress with traditional premium games (evolving into games as a service model) and amplify the challenges of FTP – where estimates imply not merely ongoing, but indefinitely growing losses. This combination means that various upside options are free: success in mobile (effectively outsourced to Tencent for the West & China), anything less than disaster in FTP, M&A targeting the company amid sector consolidation and a content grab, and finally the lead albeit nascent, in NFTs/metaverse investments/R&D. Even small commitments could generate outsize returns (for a company valued under $10bn, several times smaller than its major peers) and also positivity for a stock mired in pessimism.

Keywords Studios – a Content/Resource Provider (KWS LN, Buy, PT 3700p)
KWS is a LT preferred play in video games – a provider of services, such as 3d art content and programming, to the sector. Outsourcing is still relatively untapped in video games, and the entrance of major tech companies only adds to the adoption growth. KWS activities have naturally crossed over into film and TV using computer graphics tools and techniques. KWS thus becomes a recipient of spill over demand wherever explosive growth occurs (as when Fortnite boomed) – and conversely it avoids the hit risk and workplace toxicity/crunch issues of the sector inhouse teams.

If blockchain gaming and play-to-earn take off, expect KWS to gain from the content demand.

Other names: Tobii, Mercia AM, Embracer
Among companies outside our coverage we would highlight three.

Tobii, (TOBII OME) a Swedish world leader in eye-tracking technology which is key to the performance of VR headsets and reducing nausea – Tobii has just spun off its assistive tech arm to focus on the eye-tracking use cases in meta etc. Tobii spoke at our November conference and we recently hosted a management roadshow.

Mercia AM (MERC LN) is a UK VC firm whose portfolio includes NDreams, a leading VR developer.

Embracer (EMBRACB OME), an acquisitive Swedish based video game conglomerate, is unusual in having a profitable foothold in VR game publishing through its Vertigo acquisition – although the weight is <5% of revenues.

Exhibit 42 - Selected stocks leveraged to each sector (1/3)

Company	Ticker	Market cap. ($mn)	3M ADTV ($mn)	2020 P/E	2021E P/E	2022E P/E	2020 P/B	2021E P/B	2022E P/B	2020 ROE (%)	2021E ROE (%)	2022E ROE (%)	Net debt to EBITDA	Jefferies analyst	Current rating
Gaming															
Tencent Holdings Ltd.	700-HK	577,798	24.57	23.96	24.48	23.74	5.32	4.21	3.60	22.21	17.20	15.17	(0.17)	Thomas Chong	BUY
Sony Group Corporation	6758	155,110	2.83	14.26	21.77	18.88	3.10	2.47	2.22	21.71	11.34	11.75	0.48	Atul Goyal	BUY
Sea Ltd. (Singapore) Sponsored ADR Class A	SE	105,365	15.97	#N/A	#N/A	#N/A	38.70	24.97	32.36	(41.10)	(26.67)	(24.21)	#N/A	Thomas Chong	BUY
NetEase, Inc	9999-HK	77,863	2.16	33.62	27.97	23.29	5.75	5.06	4.41	17.10	18.09	18.95	(4.51)	Thomas Chong	BUY
Roblox Corp. Class A	RBLX	59,824	4.31	213.31	#N/A	#N/A	540.05	135.82	204.34	253.17	(95.68)	(103.86)	(0.11)	Andrew Uerkwitz	HOLD
Nintendo Co., Ltd.	7974	58,250	4.25	12.82	15.01	15.02	3.32	3.07	2.77	25.90	20.46	18.42	(1.97)	Atul Goyal	UNDERPERFORM
Activision Blizzard, Inc.	ATVI	44,615	5.71	16.55	15.04	15.02	2.96	2.52	2.20	17.85	16.74	14.65	(1.45)	Andrew Uerkwitz	BUY
Electronic Arts Inc.	EA	34,002	2.55	20.91	17.11	15.83	4.45	4.30	3.93	21.30	25.14	24.81	(1.96)	Andrew Uerkwitz	BUY
Take-Two Interactive Software, Inc.	TTWO	18,488	1.58	23.17	32.86	23.94	5.55	4.93	4.12	23.97	15.02	17.22	(2.83)	Andrew Uerkwitz	BUY
NEXON Co., Ltd.	3659	17,708	0.48	35.38	21.57	17.81	2.83	2.50	2.22	8.01	11.59	12.48	(3.32)	Atul Goyal	BUY
PearlAbyss Corp.	263750-KR	7,170	2.45	71.61	123.18	26.90	11.48	10.41	7.40	16.03	8.45	27.51	(1.49)	-	-
Kakao Games Corp.	293490-KR	6,124	1.08	78.81	54.08	25.30	6.82	5.62	4.54	8.66	10.38	17.94	(6.00)	-	-
Warner Music Group Corp. Class A	WMG	5,249	0.43	54.52	41.77	32.99	493.10	20.88	9.83	904.38	50.00	29.81	2.75	Andrew Uerkwitz	HOLD
Ubisoft Entertainment SA	UBI-FR	6,033	0.27	17.15	19.73	16.77	3.15	2.75	2.43	18.40	13.92	14.48	0.17	Ken Rumph	BUY
Tobii AB	TOBII-SE	828	0.04	#N/A	#N/A	146.31	12.73	12.56	11.54	(22.65)	(19.67)	7.89	1.30	-	-
Embracer Group AB Class B	EMBRAC.B-SE	10,108	0.79	29.94	25.65	17.25	2.99	2.76	2.81	9.99	10.77	16.28	(3.28)	-	-
Mercia Asset Management PLC	MERC-GB	215	0.00	4.69	62.44	64.73	0.93	0.85	0.82	19.72	1.37	1.26	(2.67)	-	-
Software (1/2)															
Microsoft Corporation	MSFT	2,478,234	63.92	41.42	36.00	31.34	17.57	13.18	11.79	42.43	36.61	37.61	(0.50)	Brent Thill	BUY
Amazon.com, Inc.	AMZN	1,746,474	141.34	82.33	83.34	66.45	18.66	13.18	10.16	22.66	15.81	15.29	(0.09)	Brent Thill	BUY
Alibaba Group Holding Ltd. Sponsored ADR	BABA	349,854	56.77	12.14	14.78	12.65	2.21	1.95	1.71	18.24	13.16	13.48	(1.67)	Thomas Chong	BUY
Adobe Inc.	ADBE	312,796	9.34	65.09	52.70	46.05	23.94	20.95	17.50	36.78	39.76	38.01	(0.27)	Brent Thill	BUY
Meituan Class B	3690-HK	171,286	20.13	268.47	#N/A	#N/A	12.75	13.01	12.52	4.75	(21.54)	(8.03)	(2.65)	Thomas Chong	BUY
Shopify, Inc. Class A	SHOP	165,871	9.87	366.76	228.31	237.67	36.77	15.91	16.31	10.03	6.97	6.86	(9.65)	Samad Samana	BUY
Prosus N.V. Class N	PRX-NL	175,400	4.10	25.33	22.83	18.43	3.35	2.49	2.18	13.23	10.91	11.84	#N/A	Ken Rumph	HOLD
JD.com, Inc. Class A	9618-HK	117,145	2.47	54.06	58.56	42.31	4.43	4.21	3.89	8.19	7.18	9.20	(5.09)	Thomas Chong	BUY
Snowflake, Inc. Class A	SNOW	93,580	11.99	#N/A	#N/A	#N/A	17.84	19.70	20.91	(4.44)	(1.33)	(0.65)	#N/A	Brent Thill	HOLD
Square, Inc. Class A	SQ	77,640	11.83	231.55	114.39	108.91	32.80	29.89	25.06	14.16	26.13	23.01	(1.72)	Trevor Williams	BUY
Adyen N.V. Unsponsored ADR	ADYEY	84,505	0.61	135.24	80.56	57.01	29.08	21.41	15.46	21.50	26.58	27.11	(4.61)	Paul Kratz	BUY
MercadoLibre, Inc.	MELI	55,717	6.57	#N/A	406.14	145.31	33.25	98.73	58.67	(0.24)	24.31	40.37	(9.97)	John Colantuoni	BUY
Autodesk, Inc.	ADSK	54,892	10.56	61.65	49.79	36.05	56.94	38.42	22.55	92.36	77.16	62.56	(0.18)	-	-
Atlassian Corp. Plc Class A	TEAM	50,159	2.87	255.15	221.11	170.85	307.69	259.55	88.27	120.59	117.38	51.66	(1.30)	Brent Thill	HOLD

Source: Jefferies, FactSet

Exhibit 43 - Selected stocks leveraged to the theme (2/3)

Company	Ticker	Market cap. ($mn)	3M ADTV ($mn)	2020 P/E	2021E P/E	2022E P/E	2020 P/B	2021E P/B	2022E P/B	2020 ROE (%)	2021E ROE (%)	2022E ROE (%)	Net debt to EBITDA	Jefferies analyst	Current rating
Software (2/2)															
NAVER Corp.	035420-KR	53,619	2.60	61.82	3.71	34.60	8.10	2.65	2.47	13.11	71.47	7.13	(1.07)	-	-
Unity Software, Inc.	U	51,450	3.57	#N/A	#N/A	#N/A	14.90	31.26	32.88	(3.23)	(4.17)	(2.45)	#N/A	-	-
Spotify Technology SA	SPOT	47,868	2.81	#N/A	#N/A	531.41	14.21	18.47	16.25	(21.09)	(6.93)	3.06	#N/A	Andrew Uerkwitz	BUY
Kakao Corp.	035720-KR	46,876	3.35	342.24	37.82	48.35	9.40	6.40	5.64	2.75	16.93	11.65	(3.59)	-	-
Baidu, Inc. Class A	9888-HK	42,969	0.41	15.82	18.96	17.03	1.87	1.61	1.48	11.83	8.50	8.69	(4.00)	Thomas Chong	BUY
Match Group, Inc.	MTCH	37,840	3.33	66.84	59.19	48.01	#N/A	215.60	47.32	#N/A	364.26	98.56	3.12	Brent Thill	BUY
Twitter, Inc.	TWTR	37,638	4.48	#N/A	163.78	53.73	4.70	5.87	5.51	(8.68)	3.59	10.25	(4.13)	Brent Thill	HOLD
Delivery Hero SE	DHER-DE	33,202	0.75	#N/A	#N/A	#N/A	18.97	10.56	17.72	(95.28)	(49.88)	(65.79)	#N/A	Giles Thorne	BUY
Roku, Inc. Class A	ROKU	27,680	17.49	#N/A	146.80	142.98	23.20	11.64	9.72	(1.38)	7.93	6.80	(6.65)	-	-
Yandex NV Class A	YNDX	22,622	0.98	82.06	159.84	63.62	5.42	6.06	5.72	6.61	3.79	9.00	(2.78)	Sebastian Patulea	HOLD
TCS Group Holding Plc Sponsored GDR Class A RegS	TCS-GB	17,993	0.19	30.10	21.95	18.48	10.63	7.59	5.62	35.32	34.58	30.40	#N/A	-	-
Teladoc Health, Inc.	TDOC	17,547	2.14	#N/A	#N/A	#N/A	0.61	1.08	1.11	(2.97)	(3.15)	(1.74)	4.20	David Windley	HOLD
MakeMyTrip Ltd.	MMYT	1,713	0.06	#N/A	#N/A	471.54	3.17	2.74	3.34	(6.19)	(2.81)	0.71	#N/A	-	-
Device															
Apple Inc.	AAPL	2,572,687	79.98	27.95	27.40	25.34	41.62	36.24	26.02	148.89	132.28	102.68	(0.55)	Kyle McNealy	BUY
Alphabet Inc. Class A	GOOGL	1,762,898	32.48	48.52	26.29	25.03	8.75	7.42	6.11	18.04	28.20	24.40	(1.78)	Brent Thill	BUY
Meta Platforms Inc. Class A	FB	788,254	32.10	33.01	23.91	23.36	7.46	6.45	5.32	22.59	26.97	22.79	(1.36)	Brent Thill	BUY
Snap, Inc. Class A	SNAP	67,449	16.05	#N/A	#N/A	#N/A	32.58	25.62	21.72	(42.56)	(21.53)	(9.85)	1.23	Brent Thill	BUY
Xiaomi Corp. Class B	1810-HK	49,737	9.94	19.30	18.03	16.19	3.32	2.79	2.40	17.22	15.50	14.80	(2.92)	-	-
GoerTek Inc. Class A	002241-CN	27,651	3.61	60.11	40.02	30.29	8.77	7.19	5.93	14.58	17.96	19.59	(0.02)	Edison Lee	BUY
Lenovo Group Limited	992-HK	11,873	0.37	10.52	6.74	7.11	3.27	2.36	1.90	31.06	34.94	26.74	0.30	-	-
Samsung Electro-Mechanics Co., Ltd	009150-KR	10,910	1.70	21.41	11.90	10.80	2.25	1.90	1.64	10.49	15.99	15.22	0.21	-	-
Foxconn Technology Co., Ltd.	2354-TW	3,309	0.10	19.54	13.34	11.23	0.70	0.64	0.62	3.59	4.83	5.53	(9.44)	-	-
HTC Corporation	2498-TW	2,291	0.06	#N/A	#N/A	#N/A	2.03	#N/A	#N/A	(19.90)	#N/A	#N/A	#N/A	-	-
Skyworth Group Limited	751-HK	1,649	0.03	8.28	10.11	8.15	0.65	0.62	0.59	7.85	6.13	7.25	#N/A	-	-
TCL Electronics Holdings Limited	1070-HK	1,304	0.04	5.27	#N/A	#N/A	0.60	#N/A	#N/A	11.33	#N/A	#N/A	#N/A	-	-
Vuzix Corporation	VUZI	722	0.18	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	(12.54)	-	-
Optical, Display & Other Components															
BOE Technology Group Co., Ltd. Class A	000725-CN	29,231	3.69	35.57	7.60	7.82	1.69	1.46	1.27	4.75	19.27	16.23	2.56	-	-
Zhejiang Quartz Crystal Optoelectronic Technology Co Ltd Class A	002273-CN	3,790	0.80	49.24	45.64	37.74	3.87	3.36	3.19	7.86	7.37	8.44	#N/A	-	-
GeniuS Electronic Optical Co., Ltd.	3406-TW	2,017	0.47	18.81	25.03	19.05	3.62	3.40	3.03	19.26	13.58	15.90	(0.03)	-	-
Phenix Optics Co., Ltd. Class A	600071-CN	2,008	0.17	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-	-
Suzhou Anjie Technology Co., Ltd. Class A	002635-CN	1,733	0.10	23.87	40.60	20.65	1.87	1.82	1.70	7.84	4.48	8.21	(2.20)	-	-
MicroVision, Inc.	MVIS	1,150	0.63	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-	-
INT TECH Co., Ltd.	6724-TW	95	0.00	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-	-
Jorjin Technologies Inc.	4980-TW	70	0.00	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-	-

Source: Jefferies, FactSet

Exhibit 44 - Selected stocks leveraged to the theme (3/3)

Company	Ticker	Market cap. ($mn)	3M ADTV ($mn)	2020 P/E	2021E P/E	2022E P/E	2020 P/B	2021E P/B	2022E P/B	2020 ROE (%)	2021E ROE (%)	2022E ROE (%)	Net debt to EBITDA	Jefferies analyst	Current rating
Semiconductor															
NVIDIA Corporation	NVDA	787,575	58.39	126.01	72.72	61.40	46.68	31.29	21.64	37.04	43.03	35.24	(0.42)	Mark Lipacis	BUY
Taiwan Semiconductor Manufacturing Co., Ltd. Sponsored ADR	TSM	555,418	12.94	32.79	28.77	23.77	9.01	7.77	6.57	27.48	27.02	27.63	(0.44)	-	-
Samsung Electronics Co., Ltd.	005930-KR	407,712	11.91	18.98	12.17	11.00	1.80	1.64	1.48	9.49	13.45	13.42	(1.47)	-	-
Broadcom Inc.	AVGO	224,985	5.84	24.67	19.56	17.52	9.77	9.17	8.32	39.62	46.90	47.47	2.45	Mark Lipacis	BUY
Intel Corporation	INTC	198,388	11.57	9.20	9.26	13.14	2.52	2.12	1.97	27.36	22.93	15.02	0.36	Mark Lipacis	HOLD
Qualcomm Inc	QCOM	196,829	10.80	20.58	16.34	15.36	20.18	12.06	8.17	98.08	73.81	53.23	0.34	Kyle McNealy	HOLD
Semiconductor Manufacturing International Corp.	981-HK	32,783	2.60	25.39	14.44	15.88	1.38	1.24	1.16	5.44	8.60	7.29	(1.95)	Edison Lee	BUY
Advanced Micro-Fabrication Equipment Inc. China Class A	688012-CN	15,620	2.79	173.65	154.80	124.04	19.74	11.74	10.73	11.37	7.58	8.65	(5.43)	Edison Lee	BUY
Blockchain															
International Business Machines Corporation	IBM	103,858	3.86	13.98	11.54	10.54	5.24	4.30	4.11	37.48	37.29	38.99	2.96	Kyle McNealy	BUY
Coinbase Global, Inc. Class A	COIN	47,068	8.47	201.92	23.34	41.97	49.92	12.04	9.47	24.72	51.59	22.56	(1.67)	-	-
MicroStrategy Incorporated Class A	MSTR	5,565	4.45	#N/A	#N/A	337.40	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	Brent Thill	HOLD
Marathon Digital Holdings Inc	MARA	5,049	3.21	#N/A	68.97	13.76	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-	-
Riot Blockchain Inc	RIOT	3,351	2.72	#N/A	36.95	20.86	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-	-
Galaxy Digital Holdings Ltd.	GLXY-CA	2,572	0.12	18.44	4.48	40.65	9.17	3.42	3.32	49.72	76.24	8.17	#N/A	-	-
Hut 8 Mining Corp.	HUT-CA	2,039	0.12	78.20	34.76	12.10	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-	-
HIVE Blockchain Technologies Ltd	HIVE-CA	1,447	0.05	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-	-
Argo Blockchain PLC ADR	ARBK	837	#N/A	#N/A	14.32	8.47	15.72	6.30	5.07	0.00	44.01	59.82	(0.35)	Jonathan Petersen	BUY
Consumer implications															
GameStop Corp. Class A	GME	15,277	14.41	#N/A	#N/A	#N/A	31.01	7.84	7.66	(33.23)	(4.32)	(0.81)	#N/A	Stephanie Wissink	HOLD
Hasbro, Inc.	HAS	13,622	0.42	26.40	20.29	18.29	4.64	4.02	3.76	17.57	19.80	20.55	3.72	Stephanie Wissink	BUY
Mattel, Inc.	MAT	7,697	0.32	40.69	20.25	15.93	12.79	6.13	4.45	31.44	30.29	27.94	3.23	Stephanie Wissink	HOLD
Spin Master Corp	TOY-CA	1,147	0.01	71.87	20.39	18.72	4.51	3.84	3.66	6.28	18.82	19.56	(1.64)	Stephanie Wissink	BUY
Funko, Inc. Class A	FNKO	668	0.20	45.86	13.35	11.85	2.74	2.18	1.95	5.97	16.32	16.46	2.03	Stephanie Wissink	BUY

Source: Jefferies, FactSet

Exhibit 45 - Selected ETFs leveraged to the theme

ETF	Ticker	AUM ($mn)	3M ADTV ($mn)	2020 P/E	2021E P/E	2022E P/E	2020 P/B	2021E P/B	2022E P/B	2020 ROE (%)	2021E ROE (%)	2022E ROE (%)	Net debt to EBITDA	Jefferies analyst	Current rating
Roundhill Ball Metaverse ETF	META-US	810	0.04	#N/A	43.10	40.60	#N/A	8.73	7.52	#N/A	20.26	18.51	#N/A	-	-
ARK Next Generation Internet ETF	ARKW-US	4,737	0.97	285.18	#N/A	#N/A	7.16	7.44	7.37	2.51	(7.97)	(0.05)	0.00	-	-
O'Shares Global Internet Giants ETF	OGIG-US	555	0.07	96.13	114.15	75.92	10.47	8.25	7.58	10.89	7.22	9.99	0.00	-	-
Fount Metaverse ETF	MTVR-US	8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-	-
FMQQ The Next Frontier Internet & Ecommerce ETF	FMQQ-US	9	#N/A	#N/A	38.31	54.17	#N/A	4.96	4.61	#N/A	12.95	8.51	#N/A	-	-
First Trust Dow Jones International Internet ETF	FDNI-US	93	0.01	64.86	44.81	46.18	6.12	4.91	4.49	9.44	10.97	9.72	0.00	-	-
Grayscale Bitcoin Trust ETF	GBTC-US	11,322	1.33	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-	-

Source: Jefferies, FactSet

Company Valuation/Risks

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Investment Recommendation Record

(Article 3(1)e and Article 7 of MAR)

Recommendation Completion	December 5, 2021 , 06:20 ET.
Recommendation Distributed	December 5, 2021 , 16:00 ET.

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Steven DeSanctis owns shares of Apple Inc. common shares.
David Lustberg owns shares of Amazon.com common stock. Steven DeSanctis owns shares of Amazon.com common shares.
David Lustberg owns shares of Activision-Blizzard common stock. James Heaney owns shares in Activision Blizzard.
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- Alibaba Group Holding Limited (BABA: $111.96, BUY)
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- Amazon.com, Inc (AMZN: $3,389.79, BUY)
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- Argo Blockchain plc (ARBK: $15.32, BUY)
- Atlassian Corp. (TEAM: $349.50, HOLD)
- Baidu Inc. (9888 HK: HK$143.00, BUY)
- Broadcom (AVGO: $558.12, BUY)
- Capcom Co. Ltd. (9697 JP: ¥2,787, BUY)
- Capcom Co. Ltd. (CCOEY: $12.31, BUY)
- CD Projekt SA (CDR PW: PLN181.46, UNDERPERFORM)
- Delivery Hero AG (DHER GR: €102.45, BUY)
- DeNA Co Ltd. (2432 JP: ¥1,705, HOLD)
- Electronic Arts Inc. (EA: $125.27, BUY)
- Facebook, Inc. (FB: $306.84, BUY)
- Funko, Inc. (FNKO: $15.82, BUY)
- GameStop Corp. (GME: $172.39, HOLD)
- Goertek Inc. (002241 CH: CNY51.97, BUY)
- Hasbro, Inc. (HAS: $98.37, BUY)

- Intel Corporation (INTC: $49.25, HOLD)
- International Business Machines Corp (IBM: $118.84, BUY)
- JD.com, Inc. (9618 HK: HK$284.00, BUY)
- Keywords Studios Plc (KWS LN: p2,648.00, BUY)
- Konami Holdings Corporation (9766 JP: ¥6,050, BUY)
- Konami Holdings Corporation (KNMCY: $62.22, BUY)
- Match Group (MTCH: $126.19, BUY)
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- Meituan (3690 HK: HK$241.20, BUY)
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- Microsoft Corporation (MSFT: $323.01, BUY)
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- Nintendo Co. Ltd. (7974 JP: ¥50,660, UNDERPERFORM)
- NVIDIA Corporation (NVDA: $306.93, BUY)
- Prosus N.V. (PRX NA: €70.26, HOLD)
- QUALCOMM Inc (QCOM: $176.51, HOLD)
- Roblox Corp (RBLX: $113.79, HOLD)
- Sea Ltd (SE: $253.44, BUY)
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- Shopify, Inc. (SHOP: $1,410.00, BUY)
- Snap, Inc. (SNAP: $46.79, BUY)
- Snowflake Inc (SNOW: $345.11, HOLD)
- Sony Group Corporation (6758 JP: ¥13,825, BUY)
- Spin Master Corporation (TOY CN: C$43.31, BUY)
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- Square Enix Holdings Co. Ltd. (9684 JP: ¥5,960, BUY)
- Square Inc. (SQ: $181.31, BUY)
- Take-Two Interactive Software, Inc. (TTWO: $165.78, BUY)
- Team17 Group PLC (TM17 LN: p685.00, UNDERPERFORM)
- Teladoc Health, Inc. (TDOC: $92.43, HOLD)
- Tencent Holdings Ltd. (700 HK: HK$462.60, BUY)
- Tesla, Inc. (TSLA: $1,014.97, BUY)
- Twitter, Inc. (TWTR: $42.07, HOLD)
- Ubisoft Entertainment S.A. ADR (UBI FP: €41.23, BUY)
- Warner Music Group Corp. (WMG: $41.87, HOLD)
- Yandex (YNDX: $69.40, HOLD)
- Zynga, Inc. (ZNGA: $6.11, BUY)

Distribution of Ratings

Distribution of Ratings						
			IB Serv./Past12 Mos.		JIL Mkt Serv./Past12 Mos.	
	Count	Percent	Count	Percent	Count	Percent
BUY	1955	63.66%	164	8.39%	30	1.53%
HOLD	989	32.20%	30	3.03%	7	0.71%
UNDERPERFORM	127	4.14%	1	0.79%	0	0.00%

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