



METAVERSE

EY Metaverse
Whitepaper

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Metaverse Introduction

“ Technology is now being adopted exponentially, and we are gradually coming to a concept of converging technologies, namely mutually supportive knowledge systems. We should, however, be careful, as while on one hand the Metaverse is making possible a considerable connection between the digital and the real world, on the other hand there is a risk of judging this technology negatively.

Luca Grivet Foiaia (EY Partner - Technology Consulting Leader Italy)

Contest

The term “metaverse” comes from the combination of two terms - “meta” meaning beyond and “verse” meaning universe. The term was coined for the first time in Neal Stephenson's 1992 science fiction novel Snow Crash. The novel envisioned the next internet iteration where lifelike virtual avatars connect with one another through virtual reality environments and realistic 3D buildings.

As a buzzword, the metaverse refers to a variety of virtual experiences, environments and assets that gained momentum during the everything-online shift of the pandemic.

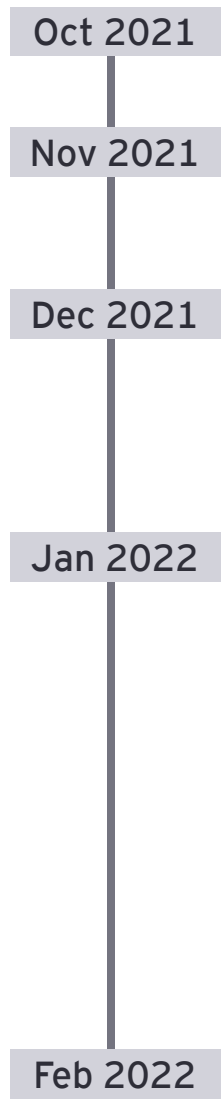
In the past year, the metaverse's economy has skyrocketed, reaching \$350 billion by 2021 with an exponential growth rate.

The three macro-environments of application of the metaverse are as follows:

- ▶ **Persistent ecosystems:** Representation of a shared and engaging virtual world where users, represented by avatars, can live their lives interacting with others and participating in experiences, using NFTs as objects or terrain.

- ▶ **Collectibles:** Collectibles or digital art of objects (products, photos, videos and video clips), in unique or limited-edition copies, of different values.
- ▶ **Gaming:** Games that allow the user to use NFTs in the metaverse through the buying and selling of digital clothing, virtual land, etc..

The metaverse is a trend that many companies have already adopted. This term has become a global trend since October 2021 when, during the company's virtual reality and augmented reality conference Facebook Connect, Mark Zuckerberg announced that Facebook would be changing its corporate name to Meta. The name change aligns with its growing focus on the metaverse, which refers to efforts to combine virtual and augmented reality technologies in a new online realm. Then, Facebook company, now Meta, said it would hire 10,000 people in Europe to build out this concept. But Meta isn't the only major tech company that is taking this route, below are the most important events in the last six months:



Facebook CEO

- ▶ Mark Zuckerberg launched Meta and released his plans to build metaverse.

Seoul

- ▶ The South Korean capital announced that it will become the first city in the metaverse;
- ▶ A new model of interaction open to citizens and visitors.

Nike, Inc.

- ▶ Nike announced the acquisition of RTFKT, a virtual brand of sneakers and collectibles to launch the next generation of collectibles.

Walmart

- ▶ Walmart unveiled new brands that showcase the trend of creating and selling virtual assets, cryptocurrencies and NFTs.

PandG Beauty

- ▶ PandG Beauty entered the metaverse with the Consumer Electronic Show (CES) debut of a virtual world called BeautySphere.

Samsung

- ▶ Samsung opened a Samsung 837X virtual store on the Ethereum-based virtual reality platform Decentraland.

Australian Open

- ▶ Australian Open replicated the sports village in Decentraland and offered for sale NFT Art Balls linked to real-time match data.

Microsoft

- ▶ Microsoft acquired Activision Blizzard in a \$68 billion deal to build the world's largest dedicated gaming hub in the metaverse.

JP Morgan

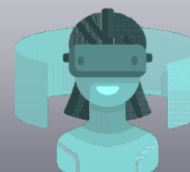
- ▶ The american bank opened its virtual branch called "Onyx Lounge" on Decentraland.

These are just a few examples, though so many firms have already invested and are still investing in the metaverse, in any field, from gaming, sports, fashion, culture, health care, tourism, and much more. Founders, investors, futurists, and executives have all tried to stake their claim in the metaverse, leveraging its potential for social connection, experimentation, entertainment and, crucially, profit.

Of course, technology must not only be invented and refined, but also deployed. A full-fledged metaverse might be years, if not at least a whole decade away. There are still plenty of technical hurdles to overcome, starting with the fact that the world doesn't have an online infrastructure that could sustain millions (or even billions) of people using the metaverse at the same time. Adding to that, uninterrupted and reliable internet connection is a key building block of the metaverse because a “loading” virtual world scenario is a far cry from what a metaverse is supposed to look like. Technologies like 5G and edge computing are still under development, and currently unable to meet the demands of a complex infrastructure like a metaverse. There are also issues associated with data privacy and security.

What is the metaverse?

A digital iteration on the internet, a **virtual reality space** where users can interact with others in a **computer-generated environment**, for entertainment or commerce.



Internet has evolved rapidly. It started with web 1.0 then came the social touch and developed it into web 2.0 and now, it is moving to the web 3.0 phase or what we call the metaverse.

In a nutshell, web 1.0 was just an information portal with minimal interaction between the user and the site. The users accessed the internet to receive the information, and they were not even given the chance to post comments or reviews about the content they had read.

The next stage in the evolution of the internet is web 2.0. At this stage, more focus is given to the website interaction and user experience. As we said, the previous era was known as the “read-only era”, while the web 2.0 era is called the “read and write era”. Web 2.0 also allows the users to interact with one another on its platform and the best example of it is the social media sites. This version of the internet allowed the users to make virtual content and share it on social media.

Our current contemporary internet experience is two-dimensional, where you scroll through and browse everything on a screen. The metaverse on the other hand is a three-dimensional reality, allowing you to “walk” in a virtual world via connected glasses or headsets that allow you to build or participate in any universe you desire.

The metaverse is a shared virtual space that is hyper realistic, immersive, and interactive thanks to the use of augmented reality (AR) and virtual reality (VR) technology.

In simpler terms, instead of browsing through an apparel store or an online shop, the website is transformed into a three-dimensional mall or building where users can interact as in-game characters or avatars. The metaverse does not necessarily refer to a specific type of technology, but rather to the shifting interaction we have with it to make our virtual spaces smoothly integrated with our real ones. The core of the metaverse, also known as web 3.0, is the evolution and progression of our current internet, including how users control their online identities and digital assets through blockchain and cryptocurrencies.

Thus, web 3.0 would effectively break the data silos of centralized service providers and put the users back in control. Google and Facebook would no longer have ownership of their user's sensitive and personal data because the data would be encrypted and decentralized. For the first time, a person on the internet can have a self-sovereign identity, no longer relying on a centralized entity (corporation or government). However, at the same time, the decentralization of the network could be a disservice to the user, as he or she would be the owner of the access keys to his or her wallet (or, more generally, to his or her data placed on a blockchain) and in case of loss of credentials there would be no central entity to recover them. Another advantage of web 3.0 is to create network effects. Web 3.0 is related to the concept of open source already present in web 1.0, which provides for the development of protocols that are accessible, adaptable and can be improved by users. This logic has been replicated and adopted for the development of major web 3.0 applications, leading to rapid growth of the ecosystem resulting in network effects. In addition, thanks to web 3.0 technologies, data provided on the web is more secure than in the past, thanks to advanced mathematical encryption systems. Another advantage of web 3.0 is the possibility of having more immersive interaction than web 2.0 thanks mainly to virtual reality. Since there will be no single platform for accessing the metaverse, but there will be interoperability among platforms, there will be strong competition among platform providers. The use of "cross-platform" digital assets, the development of non-provider-owned applications, and the use of standards enables users to migrate their assets from one platform to another, as well as improved service offerings and fewer technological lock-ins that characterize cases where a single provider is present. Finally, navigation is also more efficient in web 3.0, as artificial intelligence makes it easier to find the desired information on search engines.

As for the challenges that web 3.0 will face, these are mainly of three types. The first is of an IT nature, since current computer systems are not yet capable of handling huge volumes of data and, more generally, the development of web 3.0 technologies requires significant human and financial resources. The second is related to a potential limitation to the adoption of web 3.0 technologies. In fact, new tools (such as, for example, blockchain wallets), new resources (such as blockchain explorers), and new applications, would entail the inevitable enablement of new user experiences, and, currently, the presence of unfamiliar and complicated user experiences is a possible barrier to mass adoption of web 3.0. The third is social in nature. Indeed, there is much ideological debate about the ratio of advantages to disadvantages regarding the use of current social networks that characterize web 2.0. The fake news circulating on social, the addiction it creates especially in the younger generation, and many other factors, are an obstacle toward a general acceptance of social media. What could be the social impact and level of acceptance of a new social media based on 3D virtual reality that is both an evolution and a revolution of social itself? In any case, despite the ongoing challenges, the phenomenon of web 3.0 – as well as the technologies that comprise it – is growing strongly. An analysis carried out on 'Google trends' in December 2022 shows how key elements of web 3.0 (Blockchain, Cryptocurrencies, Metaverse and NFT) are the new trends toward which web users are moving.

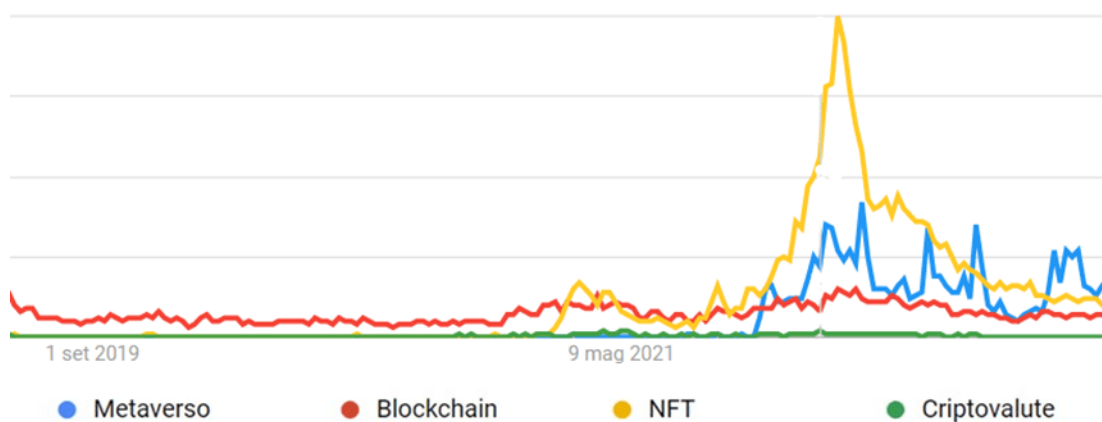


Chart 1: Search frequency on web search engines of the terms Blockchain, Cryptocurrency, Metaverse and NFT from September 2019 to December 2022

Sources: Google trend

The seven layers of the metaverse

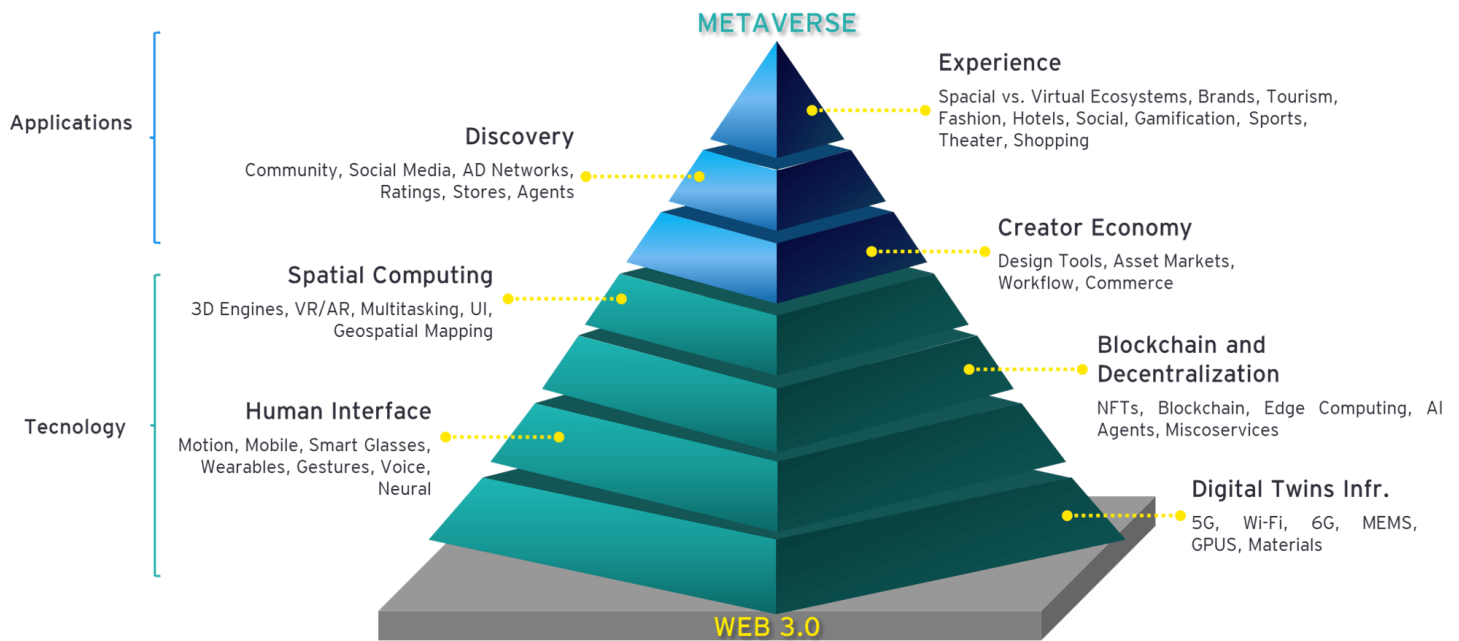


Figure 1: The seven layers of the metaverse

▶ Experience

All conversions of physical space, distance and objects, including gamers, VR software, virtual assistants, virtual events.

▶ Discovery

Layer which introduces people to new experiences, inbound, like community driven content, and outbound, including advertisements and notifications.

▶ Creator economy

All the technologies that creators use (editors, tools, templates, and marketplaces) in order to create the immersive experiences in the metaverse. The enjoyment of content becomes interactive, immersive and three-dimensional precisely because of the innovative devices and their functionality.

▶ Spatial computing

Technology to enter and manipulate 3D spaces or to augment the real world with more information and experience (3D engines, geospatial mapping, object recognition, voice and gesture recognition, data integration from devices and biometric from people).

- ▶ **Blockchain and decentralization**

The blockchain is a chain of transactions, where each block contains several. Each transaction is tracked and transparent and has a chronological order: the set of transactions allows for a decentralized digital ledger that bases its accuracy on the fact that all nodes in the network report the same information that is easily verifiable and searchable by all users in the chain. Another aspect that characterizes the blockchain is cybersecurity; in fact, the blockchain is based on the system of mathematical cryptography and all users can access the data contained in it. Thus, the data contained in the blockchain is intact and immutable, as it cannot be changed without the consent of the other users belonging to the network. The role of the Blockchain in the Metaverse is crucial therefore: the transparency and cybersecurity that this technology offers can be a guarantee tool for any transaction carried out in the virtual world.

- ▶ **Human interface**

All the hardware enabling interaction with the metaverse, phones, VR sets, AR sets, wearables.

- ▶ **Digital twin infrastructure**

Digital Twin is a technology that enables the creation of a virtual replica of any object that actually exists, or a prototype of an object yet to be made. It seems clear, then, that the world of design-and the subsequent stages of product production-will become increasingly efficient as a result of the development of this technology.

Main features of the metaverse

- ▶ **Creative**

A catalyst for creativity and inspiration, where people actively engage with content, rather than passively consuming it.

- ▶ **Decentralized**

Ownership will be distributed. The metaverse isn't owned by a corporation or a single platform, but by all its users, who can also take control over their private data. Blockchain technology is a big part of this (more details later) because it ensures that all transactions within a virtual world are public, easily tracked and safe at all times.

- ▶ **Integrated**

Seamlessly woven into our everyday activities and engagements.

▶ **Interoperable**

Not tied to a single platform - experiences, possessions and identities will travel unchanged across platforms.

▶ **Limitless**

There is no cap to the number of users, experiences, or worlds. As a 3D virtual space, the metaverse removes all types of barriers, physical or otherwise. It's an endless space where there are no limits to how many people can use it at the same time, what types of activities can take place, what industries can enter it, etc..

▶ **Persistent**

A place of perpetual and continuous existence; life will continue whether people are online or offline. A metaverse can't be unplugged, reboot or reset. Users can join the metaverse freely at any time, from anywhere in the world, and in doing so there's always continuity to their experience. The metaverse will evolve over time basing on the shared contributions of its users, like the content and experiences designed by them.

▶ **Reactive**

The virtual environment and the people inhabiting it will respond and react to users' actions in real-time.

▶ **Social**

A place to socialize, meet new people, strengthen existing relationships, and create new communities.

▶ **User-defined**

Owned and shaped by the people living, connecting, creating, and participating in it. The beating heart of the metaverse boils down to its users. Every participant in a virtual world takes part in co-experiences and helps co-create the future of the metaverse through user-generated content, from virtual creations to personal stories and interactions with AI-driven avatars.



**Welcome to the metaverse,
a place where digital and physical
lives converge**

“

People go into the metaverse for all the activities they can do ... but they stay in the metaverse for all that they can be. “

Mark Zuckerberg

“

In the future, every man will have 2 homes: a physical and a digital one.“

Bill Gates



Components of Metaverse

“ The metaverse is already here, it is not just about viewing a new type of 3D content such as models or digital twins but encompasses a new way of interacting and living hybrid (virtual and physical) experiences that are increasingly interactive and integrated with everyday reality.

Antimo Musone (EY Senior Manager - Digital and Emergency Technology)

Devices and platforms

Anyone can access the metaverse. In fact, no special computer skills are required to enter, but a few tools are needed, including:

- ▶ An **internet connection**;
- ▶ An **account** on one of the metaverse platforms;
- ▶ An **augmented reality viewer** (nice to have) to make the experience more immersive. Depending on the viewer, you should also need a PC or a cell phone.

There are different types of viewers on the market: those that keep the price low by using the cell phone display to enter virtual worlds and the Oculus all-in-one. **Quest 2** is the **next generation Oculus all-in-one virtual reality headset**. It does not require the use of a smartphone or cables to work but thanks to the oculus link cable, you can connect it to your PC in order to access all the games and experiences already available for Oculus Rift and Rift S.

The latest headset developed by Oculus for PC is a headset with an oled screen 2160 x 1200 pixels (1080 x 1200 pixels per eye) and a viewing angle of 110 sensors that record movement and allow you to use the glasses standing, sitting or moving. There is a microphone and an earpiece that plays 3D audio based on a technology from visisonic called realspace 3D audio. In general terms, the metaverse is a network of 3D virtual worlds that takes advantage of technologies like VR and AR to build social connection and is powered by a digital economy. Recently, Facebook committed \$10 billion to build its metaverse, electrifying the conversation around the topic.

However, Facebook (now renamed as Meta) is not the only game in the metaverse city. There are many platforms through which a virtual world could be built. Below are the main ones:

Decentraland

In 2015, Ari Meilich and Esteban Ordano founded Decentraland, an open-source 3D virtual world platform. It is powered by the Ethereum blockchain that allows users to create, experience, and monetize content and applications. Decentraland is a single-layered metaverse platform divided into equal grids. Every single coordinate is called “land”: the territory of Decentraland is made up of 90,601 lands and each land represents a non-fungible token (ERC-721). The supply of land is limited, and only the community has the mandate to create more land through Decentraland DAO (a decision-making tool for LAND and MANA holders).

The purchase of lands can be made in the Decentraland Marketplace or on OpenSea. The value of an area depends heavily on its proximity to popular attractions or busy streets and squares. All transactions are recorded on the Ethereum blockchain as proof of the transfer of ownership.

Lands, items and game transactions are based on the native cryptocurrency MANA. It can be purchased using current currency on exchange platforms such as Binance or Uniswap and on the Decentraland marketplace using Ethereum. The value of the currency fluctuates according to supply and demand, therefore also depending on the popularity of the digital world and in the beginning of February 2022, the MANA was worth around €2.

The platform was opened to the public in February 2020 and is overseen by the Decentraland foundation, which collaborated with Samsung and Australian Open (AO).



Figure 2: Decentraland

Samsung has opened 837X, a replica of the New York store with three rooms dedicated to sustainability, personalization and connection.

On the occasion of the Australian Open, the “AO Metaverse” has been created in Decentraland.

In addition, the “Art Ball” collection was launched, made up of 6,776 NFTs, represented by algorithmically created tennis balls. Each ball has been assigned a unique point on the real field and a particular technology has associated the victory point on the ground with the corresponding NFT, updating its metadata (this should drive up the price). The proceeds from this sale were over \$ 750,000.

The Sandbox

Sandbox, founded by Arthur Madrid and Sébastien Borget, started its life as a game in 2012. Animoca Brands acquired the company in 2018 and introduced 3D and blockchain into the game. The metaverse shift happened in November 2021. The currency on Sandbox is the SAND.



Figure 3: The sandbox

The Sandbox is a community-driven metaverse: there are users who populate it, territories to buy, places to visit and items to use. Players can create digital assets, in the form of NFT, upload them to the marketplace or integrate them into a game, thanks to Game Maker.

The world within The Sandbox is made up of plots of virtual land called lands, where you can build structures and create virtual experiences.

Roblox

Roblox is a massively multiplayer online game, and its mission is to bring the world together through play.

Roblox is driven by a global community of millions of developers who produce their own immersive multiplayer experiences each month using Roblox studio.

Nike announced a

collaboration with Roblox to offer a free virtual gaming space called Nikeland. "Sport has no rules here at Nikeland", says the provocative slogan of the presentation video, in which 3D characters appear. Of course, everyone in Nikeland is wearing Nike tracksuits, shoes and caps. The company's goal is to launch shoe prototypes and let users try them on in the virtual world, before starting mass production in the real one. A sort of laboratory where users' interests can be analyzed.



Figure 4: Roblox

Sources: <https://assets.ovr.ai/download/whitepaper/whitepaper%203.0.pdf>

OVR

OVR is an AR, NFT and metaverse platform powered by the Ethereum blockchain. As mentioned in the OVR world website, "it is the decentralized infrastructure for the metaverse, merging physical and virtual world through Augmented Reality, creating a new dimension".



Figure 5: OVR

It is an ecosystem that provides users, investors and businesses with tools to create their own interactive augmented reality in the real world. The OVR ecosystem is underpinned by a grid of hexagons covering the whole earth's surface. The hexagons are called OVR Lands, have specific geographic positions and a standard dimension of 300 square meters. The total number of OVR Lands is 1,660,954,464,112. To date, over 800,000 OVR Lands have been sold. OVR is up and running with half-million users.

Of those users, some 60,000 are actively mapping (<https://arpost.co/2022/02/16/ovrs-take-on-world-scale-metaverse/>).

OVR app users can now view all user-generated content in OVR Lands. You can explore published content in your current OVR Land location or choose any other location in the OVR world.

It proves experiences for B2B and B2C, through mobile device or smart glass to live interactive augmented reality.

Altspace VR

AltspaceVR is the leading platform for live, virtual events, empowering artists, brands, and businesses to easily design meaningful experiences that foster community and connection. It was founded in 2013 and launched its initial product in May 2015. In 2017 it was acquired by Microsoft and is now part of the mixed reality division.



Figure 6: AltspaceVR

Sources: <https://assets.ovr.ai/download/whitepaper/whitepaper%203.0.pdf>

It is available on Oculus Quest 2, desktop mode, HTC Vive and Windows mixed reality. It's also available in 2D mode on PC. Likewise, it is currently piloting macOS support for AltspaceVR.

The platform largely consists of user-generated spaces called "worlds", which can be visited by other users. Some large worlds, such as the "Campfire", are built and maintained by official developers as places for users to meet and interact. Live virtual events are frequently held. In addition to these events, AltspaceVR is a social platform where individuals can gather, talk, collaborate, and be co-present in small to large groups.

Horizon

The company formerly known as Facebook finally released Horizon worlds, its virtual reality (VR) world powered by Oculus. It was released in the US and Canada to people 18 years or older on December 9, 2021, after an invite-only beta phase.

The virtual world can be accessed only with an Oculus Rift S or Oculus Quest 2 virtual reality headset, and it uses full 3D motion via the motion capture system of the headset and two handheld motion controllers, which are required to interact with objects.

In Horizon worlds, users of Facebook's Oculus virtual reality headsets can create a legless avatar to wander in the animated virtual world.

When you enter the app for the first time there will be a short tutorial, after which you will be able to choose 3 options from the menu: play (video games), participate in events, or walk around Horizon worlds freely. In Horizon there are thousands of different worlds, created by both Meta developers and users.

The Plaza, a place created by Meta, is one of the first meeting spaces already open. It is a pleasant experience, which takes a futuristic scenario and allows you to listen to others talking, as if you were in a real square.



Figure 7: Horizon World

Plaza is also a good place to find a live person (Meta calls them "community guides" and their avatars have a clear label above their heads) who can assist you if you have questions or need help.

There are so many other worlds with so many other scenarios in which to travel. For example, another world that Meta built and has been promoting is Arena Clash, which is a multiplayer laser tag game. As well as a world called Retro Zombies where you can shoot zombies in what appears to be a vacant mall.

A minor "drawback" is that Horizon worlds limits capacity to 20 people per world before automatically placing users in another replica of that world; so, if you want to meet a friend in a certain world, which is very populated, it is not certain that you will be in the same replica. According to data presented during a company meeting by Meta's Chief Product Officer, Chris Cox, since Horizon worlds was rolled out to all Quest users in the US and Canada in early December, its monthly user base has grown by a factor of 10x to 300,000 people.

Enabling elements of access and transaction

The new concept of economics in metaverse is called metanomics. When you think about the economics of the metaverse or metanomics, there are opportunities in almost every market area. Imagine you have an online avatar, and you want to change what you are wearing, you will be able to buy limited-edition, digitally branded clothing that you pick after browsing a virtual showroom. Or you may start your own small business, such as an art gallery where you display your latest and greatest collections, or a virtual private club.

Metanomics is not a new term or concept. Its origins lead back to 2007 when a Cornell professor, Rob Bloomfield, hosted a course on the subject in Second Life. Many of the themes Bloomfield covered resonate today, including drawing parallels between the physical and digital real estate markets. However, a key difference today is the ownership economy, driven by the advent of web 3.0. If you want to personalize a virtual home, you can purchase an original piece of art, tokenized as a digital asset. You can even own the land the house is built on. Ethereum-based platforms like Decentraland, for example, are already selling virtual plots that people can develop. Virtual real estate is a growing market. The average price of a parcel of land doubled in a six-month window in 2021. It jumped from \$6,000 in June to \$12,000 by December across the four main web 3.0 metaverses. Partly this growth has been because brands have been buying up space, so they can create virtual stores and other experiences. In June 2021, one land package in Decentraland was sold for \$913,000, with the partner Everyrealm turning it into an entire shopping district, Metajuku (inspired by Japan's Harajuku shopping district).

If in web 2.0 we use gmail credentials to identify ourselves, in web 3.0 we will use the address of our wallet.

Anything published on social networks is not really in our possession, it belongs to the platform. at any moment, a content could be removed by the platform managers. while with web 3.0 apps we are really owners of "pieces of the Internet", in fact, to take full advantage of the potential of web 3.0, it is necessary to open a wallet, a digital "portfolio" in which to deposit and "preserve" our digital assets.

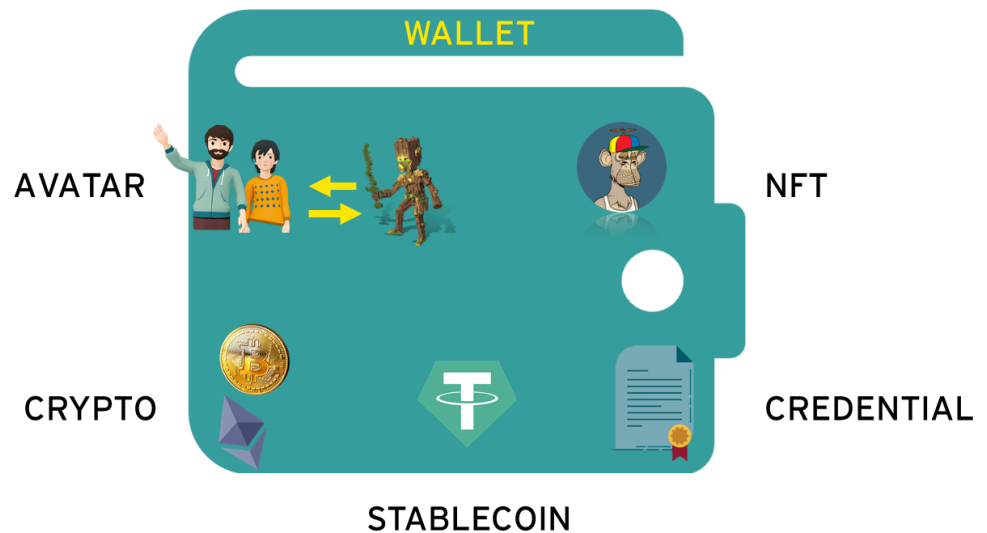


Figure 8: Elements of Metanomics

► Avatar

Inside the wallet we find the different avatars we have in the various metaverses. Moving from Decentraland to Sandbox, our digital avatar will change aspect, according to the skin that we have set on that metaverse.

► Crypto

The first digital asset, cryptocurrency, was conceived as an alternative currency, but it turned out to be fundamental for the development of the blockchain technology itself because it allow to remunerate those who maintain the infrastructure. Several cryptocurrencies originated as a metaverse's own currency.

► Stablecoin

Inside the wallet you can also keep some amount in FIAT currency or in stablecoin, special cryptocurrencies pegged to the value of the US dollar, or other national currencies.

Sources: VISA Engaging Today's Fans in Crypto and Commerce available
<https://usa.visa.com/content/dam/VCOM/regional/na/us/Solutions/documents/visa-nft-whitepaper.pdf>

▶ **Credential**

In the wallet, each user will also find all his credentials. Credential means any certificate, patent in possession of the user, which, thanks to the digital wallet, will be available at any time.

▶ **NFT**

In the metaverse, the concept of digital property is fundamental. NFT (Non-Fungible Token) are a special type of cryptographic token that represents the deed and certificate of authenticity written on blockchain of a unique asset (digital or physical).

Therefore, to be able to buy in the metaverse, you need to open a wallet, a sort of digital "wallet" in which to deposit and "store" your cryptocurrencies that allow you to buy a land or have limited-edition products using cryptocurrencies and NFT.

Sources: VISA Engaging Today's Fans in Crypto and Commerce available
<https://usa.visa.com/content/dam/VCOM/regional/na/us/Solutions/documents/visa-nft-whitepaper.pdf>

Cryptocurrency and NFT

“The decentralized metaverse enables a token economy mechanism capable of promoting greater transparency, enabling the transition to Web 3.0 through virtual and augmented reality applications and ensuring a better customer experience.

Giuseppe Perrone (EY Partner - Digital and Emergency Technology)

Cryptocurrency and NFT

Cryptocurrency is a form of digital currency created by solving a complex set of cryptographic equations. Once issued, a cryptocurrency exists in a public database maintained by what is called a blockchain. No single entity owns or controls the database, and anyone can access the database, prove ownership, and transfer cryptocurrency via the private keys associated with their crypto wallet.

Examples of cryptocurrencies are Bitcoin and Ethereum.

Shown in the figure are the ten cryptocurrencies with the highest market capitalization (May 2022)

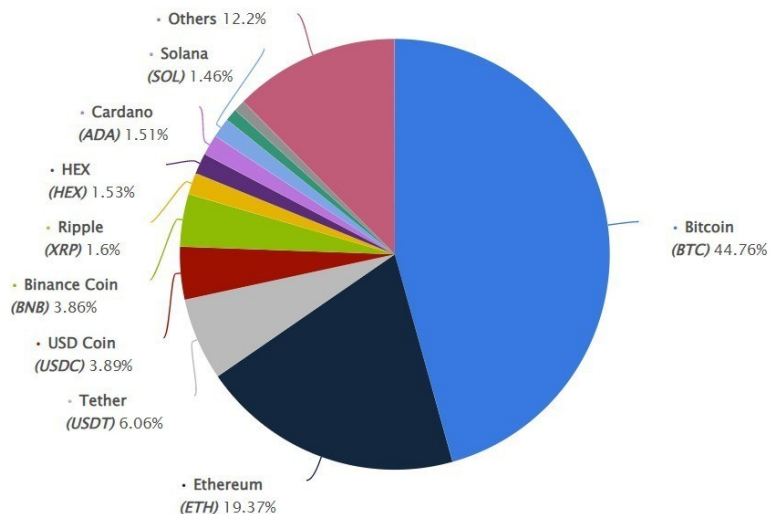


Figure 9: Cryptocurrencies with the highest market capitalization

Sources: Statista.com

When COVID-19 restrictions put a swift and definitive pause on live of sports and entertainment, digital technologies led the way in connecting fans worldwide to the brands, teams, and personalities they love. In this context, Non-Fungible Tokens (NFTs) have emerged as a promising medium for fan engagement. Like cryptocurrencies, NFTs are issued on a blockchain and are used to designate the ownership of a certain asset. Each NFT is tied to some unique data, typically a digital content file of some kind (or reference thereto) and governed by a “smart contract.”

"Smart contracts" are actual contracts in which the clauses are encoded in computer language. This type of contract, thanks to blockchain technology, can have numerous advantages for users as a transparent and objective system can be reassuring for the parties. Thus, smart contract can be applied on a large scale and be an assurance tool for any contract or transaction made in the Metaverse. In fact, the registration of contract clauses on the blockchain ensures legal certainty about the performance of contractual obligations. Thanks to this, companies will be able to more efficiently manage negotiations in the Metaverse and reduce the risk of legal disputes.

Unlike cryptocurrency, NFTs are not fungible, meaning each NFT is unique and not interchangeable with another NFT. In other words, while one bitcoin is equivalent to another bitcoin, no two NFTs are the same. And, just as with bitcoins, the ownership record of NFTs is recorded on a blockchain database.

Because NFTs are new, there is limited information on how existing laws and regulations apply to NFTs. Despite these uncertainties, NFTs are an interesting medium for creators. For the first time, content on the internet in the form of an NFT can be definitively owned by a specific person independent of a centralized intermediary, and this is unlocking exciting opportunities for digital commerce and engagement.

NFT use cases

First and foremost, it should be clear how NFTs will be used. Depending on the use case, there are different mechanisms to design an NFT, like edition size and distribution. Some of the most prominent use cases seen to date include collectibles, art, gaming, and experiences.

NFTs can be used in various fields with different characteristics and objectives, in detail, several categories of NFT applications can be identified:

Sources: VISA Engaging Today's Fans in Crypto and Commerce available
<https://usa.visa.com/content/dam/VCOM/regional/na/us/Solutions/documents/visa-nft-whitepaper.pdf>

▶ **Metaverse**

In the Metaverse people can live their life using NFTs as objects.

▶ **Gaming**

Games that rely on the use of NFTs and allow you to win new NFTs or upgrade the ones you already have. NFTs allow players playing cryptocurrency-based games to own assets, earn assets in the game, take them out of the game, and sell the assets elsewhere, like an open market.

▶ **Collectibles**

NFTs can be used to make a digital collection with items of different value.

▶ **Utilities**

NFTs that provide a specific utility benefit (or set of utilities).

▶ **Fractioned ownership**

A stock market where you can buy royalties for products using tokens as if they were stock certificates.

▶ **Art**

Any work of art (painting, film, song) can have a digital equivalent to be purchased as NFTs.

Some market players as Mastercard and American Express are investing in NFTs and sponsoring events on the metaverse. On the occasion of the sporting event, the Australian Open offered an innovative experience for fans – they recreated the sports village in Decentraland allowing any tennis fan to access the AO wherever they were in the world. Additionally, the AO partnered with blockchain studio and metaverse specialists, Run it Wild and Rarer Things, to create AO art ball NFT.

The NFT art balls are linked to match data in real time, thus offering a unique opportunity to own a piece of the AO.

Mastercard sponsored the event and the metaverse of the AO by giving away an Art Ball NFT – in order to participate in the competition, it was necessary to create your own avatar, enter the AO metaverse, take a selfie in front of the Mastercard mural and post it in the social.

Furthermore, Mastercard is investing and researching new solutions based on consumer trends and the latest technologies that are emerging.

Through a design thinking laboratory, digital-first methodology and agile development, solutions are defined to offer high-impact experiences, revolutionary platforms and services.

Other players as PayPal, at the end of 2020, announced the opening to cryptocurrencies, offering the possibility to buy or sell Bitcoin and similar on its platform and at the beginning of 2022, PayPal has confirmed that it is working to develop its own cryptocurrency called PayPal Coin.

Jose Fernandez da Ponte, PayPal's general manager of blockchain, crypto and digital currencies, confirmed rumors that had spread regarding a possible development linked to a proprietary cryptocurrency. The US company's idea is to create a stable coin specifically intended for payments, supporting them on a large scale and ensuring network security.

All this confirms once again how much attention there is towards the crypto market.

Decentralized

Digital assets and financial smart contracts, decentralized protocols and applications (DApps) built on Ethereum

Finance

Composability – the idea that financial services should be interchangeable and easily compatible.



DeFi (Decentralized Finance) and central bank digital currency

Decentralized finance (DeFi) refers to financial services that use smart contracts.

DeFi, mostly built on the Ethereum blockchain, is the next step in the disruptive financial technology revolution that began 11 years ago with bitcoin. The expanding world of DeFi has led to several evolutions, especially in financial institutions and central banks. In this period of crypto turmoil, the most important central banks have accelerated in the direction of issuing their own digital currency, named central bank digital currency. A central bank digital currency is a digital form of an already existing fiat currency, issued and managed by a sovereign institution, such as a central bank.

For example, BCE wants to introduce a digital currency alongside cash and deposits, allowing synergies with the payments' industry. It would foster the digitization of the European economy and actively stimulate innovation in retail payments. The BCE and the national central banks of Eurozone countries are studying the benefits and risks to ensure that the currency continues to meet the needs of European citizens.

The Fed is conducting research and experiments for its own central bank digital currency that could offer greater speed and efficiency in payments, greater financial inclusiveness, and lower costs for end users, recalling the importance of the dollar globally.

The PBC has already launched the digital Yuan and it has been used on a large scale in China, especially during the Beijing 2022 winter olympics.

China's central bank has launched a pilot version of the digital yuan wallet app to expand its use to more people. The app, available in China's Android app stores and Apple's app store, allows users to open a digital yuan wallet and spend the currency. But other competitors have also launched the app, such as Ant Group's Alipay and Tencent's WeChat.

Some relevant players have begun to invest in payment cards that could allow people to buy other cryptocurrencies or NFTs to buy in the virtual world or exchange crypto for fiat currency (it is a type of money that is not backed by any commodity such as gold or silver, and typically declared by government decree to be legal tender) to buy in the real world.

4

Metaverse Market

“ The Metaverse can be thought of as an ocean of possibilities, into which anyone can dive and explore a new 3D world of endless opportunities. When thinking about the public sector, it has the potential to become an extremely innovative and effective means of reaching young citizens, who often shy away from traditional forms of public engagement. Over time, it could integrate existing tools rather than replace them, leading to a new way of bringing young people closer to understanding and participating in their country's public life. This would require governments to take several key decisions about the integration of Metaverse and the role it should play in this increasingly immersive online virtual world.

Sharon Di Nepi (EY Partner - Digital and Emergency Technology Leader)

Marketplace of the future: fashion and beauty

It seems that fashion is leading the transition from the physical world to the virtual world, the metaverse, an all-encompassing space where all digital experiences are possible. The most famous international brands, some of which are Italian, are leading the way.

At first glance it may seem counterintuitive, given that fashion is defined by a physical experience, both in terms of the materiality of the product and the shopping experience which, at least until the advent of e-commerce, was an offline experience.

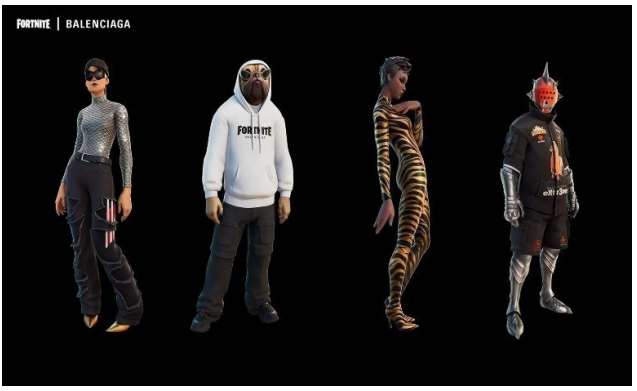


Figure 10: Balenciaga for Fortnite

The pandemic has accelerated, even in fashion and luxury, the tendency to exploit digital opportunities, but perhaps in fashion the acceleration is even more driven by the idea, which has been strongly emerging in recent months, that our lives can be digitized and virtualized. There's already an entire fashion-technology industrial complex springing up to cater to whatever dressing needs avatars will have now and in the future. There are digital-only fashion brands – more than 100, for example, on DressX alone, a virtual fashion boutique opened in 2019 by Daria Shapovalova and Natalia Modenova.

Digital styling games like Drest, owned by Farfetch, the digital marketplace-turned-conglomerate, offer the ability to play with hundreds of digital outfits, many also available IRL. There are also a growing number of ready-to-wear brands testing out virtual versions of their collections on various virtual platforms and creating metaverse business units staffed by fashion school graduates trained in virtual design. Gucci created a virtual Gucci garden for Roblox, and Ralph Lauren a virtual RL ski store. The British Fashion Council hosted “The Fashion Awards Experience” on the platform, complete with an award for metaverse design. Balmain teamed up with the gaming platform Altava to offer its own limited collection, meanwhile Balenciaga created special skins for Fortnite. Nike bought RTFKT, the virtual sneaker company. Practically every week seems to bring the announcement of another brand making NFTs, including Givenchy, JW Anderson and Adidas. In March 2022, for the first time, a metaverse fashion week will take place courtesy of Decentraland and UNXD (the digital marketplace that hosted Dolce and Gabbana's \$6 million NFT).



Figure 11: RTFKT Nike

Now, the only limits to wearing whatever you want are posed by what is available on what platform and for what price. On DressX, pieces range from \$30 to over \$1,000; still cheaper than high-end fashion or couture, though not exactly negligible. This may be why so many fashion brands are thinking of metaverse dressing as the technological equivalent of a lipstick – an entry-level product that can hook future consumers.

Sources: Republic Realm, 'The 2021 Metaverse Real Estate Report.' Available at: <https://www.republicrealm.com/post/the-2021-metaverse-real-estate-report>.

The world of beauty has also landed in the metaverse with Procter and Gamble Beauty sphere virtual world, allowing visitors to virtually interact with the group's product portfolio through live and simulated content.

The digital platform, which can be activated from any desktop, takes users through the values of responsible beauty using engaging video content and offers livestream discussions and in-game challenges. Beautyspere also features an area dedicated to the royal botanic garden at kew, where users can learn more about PandG's partnership with the scientific organization in the creation of herbal essences products.

Gaming

Gaming has always been a prime candidate for virtual reality (VR). Even early, immersive games in 2D like Minecraft and Second Life incorporated elements of the now-WIP metaverse – such as 3D avatars, world-building, and observation as gameplay. The metaverse can be defined as a unified and interoperable VR space where users can interact with each other and the digital world around them through advanced human-computer interaction (HCI) hardware and software. This takes VR gaming to incredible new heights. Currently, VR gameplay is available as standalone applications that you can install on your desktop, VR gear, or mobile phones to engage in an immersive rendition of traditional video games. The main difference is that the in-game universe now appears as a three-dimensional VR world that you can view in 360–degrees and almost “touch” through a realistic sense of perception. The metaverse expands this concept further. It allows you to connect multiple VR games – and, indeed, any VR application or space – to create a single interoperable environment for users.

Figure 12:
Epic
Games -
Fortnite



Sources: <http://www.pbc.gov.cn/en/3688110/3688172/4157443/4293696/2021071614584691871.pdf>

You would be able to navigate in and out of gaming applications, interact with the same players in multiple spaces, and even share their wins without having to take off the VR headset. In this context, gaming will have the following characteristics:

- ▶ **Games-as-platforms** – The gaming experience will become much more flexible. Users can add to the virtual world, create their own content, build sub-games within a game, and essentially treat the gaming environment as a platform-like space for other activities.
- ▶ **Social gaming** – The metaverse is inherently social, a trait that sets it apart from the traditional solitary VR experience. Multi-player gaming will take on an additional dimension as players are able to invite friends from the real world, interact with other players, build relationships, etc.
- ▶ **Play to earn** – This will be a crucial element of gaming in the metaverse. Apart from following linear storytelling and rules, players can engage in profitable activities. A simple example: they might be able to sell the assets they have won inside the game to other users for crypto.
- ▶ **The possibility of portable game assets** – The interoperable architecture of the metaverse could allow for asset portability. Weapons or avatar enhancements acquired in one game could be portable to a different environment, and NFT rules would govern persistent ownership.
- ▶ **Mixed reality experience** – The metaverse leverages AR and MR to provide a more organic experience. Gaming in the metaverse could incorporate mixed reality, where users move from group text in AR to an MR board game to a full-fledged VR world in a seamless workflow.

Healthcare

Medicine may be among the metaverse's most exciting ecosystems. Johns Hopkins neurosurgeons performed the institution's first-ever AR surgeries in June 2021. Microsoft's HoloLens is used with the OpenSight augmented reality system for planning surgeries, and this is approved by FDA since 2018. At the University of Miami's Miller school of medicine, instructors utilized AR, VR and MR to train first-responders to treat trauma patients who have had a stroke, heart attack or a gunshot wound. Students practice life-saving cardiac procedures on a life-like mannequin that realistically simulates nearly any cardiac disease wearing a VR headset. Therapeutic VR is already being used to treat different mental health conditions like ADHD and PTSD. During the COVID-19 pandemic, oculus developed a PPE kit safety training mobile app for who using VR.

Sources: <http://www.pbc.gov.cn/en/3688110/3688172/4157443/4293696/2021071614584691871.pdf>

The COVID-19 pandemic has accelerated the implementation of Decentralized Clinical Trials (DCT) or virtual trials, where the trial participants can take part from the comfort of their home or visit the hospital a few times (in case of hybrid trials).

The industry has now also started accepting and incorporating more digital options like eConsenting, ePRO, eSource, electronic health records and wearable devices in different clinical trials. So, it might not be wrong to assume that one day the virtual clinical trials will happen within a metaverse.

This will not only provide a real lifelike interaction between the doctors, nurses and patients, but also the blockchain technology will add another layer of security to the trial data, making it difficult to tamper and thus improving the data credibility. One obvious use of metaverse could be for telemedicine, which is one of the widely used technologies in DCTs. Multiple survey results show that many clinical trial participants still prefer face to face visits over a teleconsultation. In the world of the metaverse, the participant's digital avatar will meet the doctor in a 3D clinic or any other place of their choice, just like it happens during a traditional face-to-face appointment. We are not talking about 3D holo projections (an illusion of personal contact) which are available today, but of a digital twin of a participant – an identical copy made of health data from different sources like patients' electronic medical records and wearable devices measuring physical parameters in real-time. So, this will not only mimic a real physical presence, but the doctor can also evaluate the patient's health status quickly by accessing different digital health data. This is expected to give a much better patient experience by removing the key limitations of the current telehealth modalities. The applications for metaverse are endless, especially in regard to medicine and the delivery of health care. As the technologies are still evolving, we need to wait and watch how the health care industry will incorporate metaverse in a safe, secure, and patient-centric manner.



*Figure 13:
Health care in
metaverse*

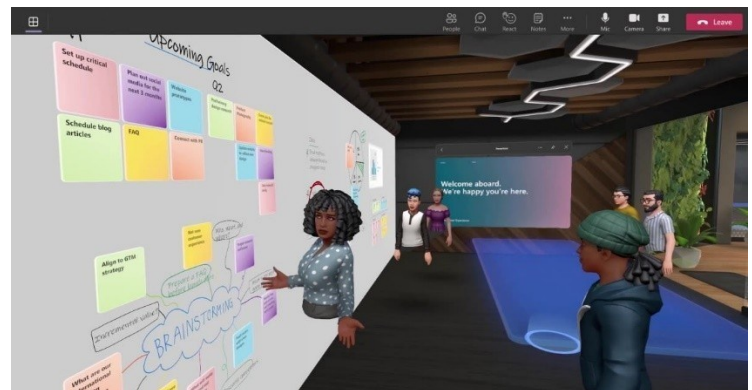
Sources: <http://www.pbc.gov.cn/en/3688110/3688172/4157443/4293696/2021071614584691871.pdf>

Collaboration and Training

More recently some of the big names in tech, Meta with Horizons Workrooms and Microsoft with Mesh, have been looking to bring the metaverse to work via virtual collaboration solutions using AR and VR. Instead of starting a video call or sending a message to a colleague, you can meet in the metaverse where you both have an avatar and a space to work together on a solution. Working remotely has been extremely popular over the last few years and will likely continue to be an option for a lot of people in the years to come. Companies are looking for solutions that bring back some of the benefits of meeting in person by leveraging the immersive benefits virtual reality has to offer. These environments enable you to talk, whiteboard ideas, and manipulate objects together as if you are in the same physical room. There are some good benefits of these virtual collaboration solutions:

- ▶ **Immersion and shared environment:** a fully immersive experience. No longer will you feel like sitting in your makeshift home office, but, instead, you will feel like you are in a well-designed meeting room. Participants can interact with the same environment by drawing on a whiteboard and moving around objects. It creates a memorable bond and experience compared to individuals looking at their separate monitors.
- ▶ **In the moment engagement:** a virtual version of your colleagues around you. People will look in the direction of the presenter, nod, or even raise their hand as if they were in a physical space. They are also not looking at different content while facing a camera.
- ▶ **Spatial audio:** sound appears to originate from its source. This makes it easier to identify who's speaking and maintain focus, differently than it is on a conference call or video call where all the sound comes from one direction. When someone on your left starts talking, you see everyone turn their head to listen just like in a real face-to-face meeting. It is possible to have side conversations as the further away you are the quieter the audio. Making it easier for smaller groups to break off and have a conversation without the need of spinning up breakout rooms or starting new video calls.

Figure 14:
Microsoft Mesh



Entertainment

It is easy to imagine the myriad implications for the entertainment industry. In a way, the metaverse could be seen as an entertainment experience itself, at least in its early iterations. The very fact that users can exit the physical world and engage with unfamiliar, yet acutely familiar surroundings is entertaining. Providers must build on these core capabilities of the metaverse to deliver content that captures and retains user attention. This will span traditional 2D content streamed to metaverse locations (e.g., a VR movie theater), 360-degree video content, immersive infotainment experiences, and live events.

As media and entertainment companies explore possibilities inside the metaverse, there are three key use cases to remember:

- ▶ Virtual reality theme park: theme parks and amusement parks are prime candidates for VR as they are costly to build in the real world but can be efficiently and safely executed in virtual reality. Theme parks have also struggled with location, as it is difficult for visitors to travel long distances for the experience if they are not residents. The metaverse could enable complex parks that can defy the laws of physics, invite visitors from around the world, and rapidly innovate without added costs.
- ▶ Competitive entertainment and sports betting: sports betting could be an incredibly profitable application of the metaverse for media and entertainment. VR would allow gamblers to observe the game from close quarters and make better decisions. Betting is also driven by peer networks, which is ideal for the quintessentially social nature of metaverse experiences. And the metaverse also comes with its own crypto wallet. All of this makes competitive entertainment an excellent fit for the metaverse.
- ▶ Concerts inside the metaverse: as we mentioned, the idea of virtual concerts isn't new and leading artists have turned to this technology to counter the losses during COVID-19. Imagine Dragons, Travis Scott, BTS, Muse, Post Malone, and several other contemporary artists have held VR concerts in the last one-and-a-half years. The metaverse will enable persistent venues where multiple artists can perform, just like in real life. It will drive greater visibility and flexibility for the user while ensuring predictable audiences for artists.

The future of VR entertainment is already here, and several companies are investing heavily into bringing similar (or better) experiences to the metaverse:

Sources: <http://www.pbc.gov.cn/en/3688110/3688172/4157443/4293696/2021071614584691871.pdf>

- ▶ **Walt Disney** – Disney announced its intentions to build a theme park metaverse in 2020, and at the 2021 Q4 earnings call, the company's CEO said that they are preparing to realize this vision.
- ▶ **Facebook (Meta)** – At Connect 2021, Meta debuted several simulated scenarios for the metaverse, including one for media and entertainment. Interestingly, Meta's vision uses both mixed reality and virtual reality to blur the lines between digital and physical.
- ▶ **Netmarble** in South Korea – Netmarble is a South Korean mobile gaming company that's launched its own Metaverse Entertainment to bring k-pop into VR.
- ▶ **Fortnite** – Fortnite is a VR entertainment veteran and the company behind it, epic games, recently announced \$1 billion in funding to build the metaverse.
- ▶ **NFT Art Balls** – NFT Art Balls were linked to real-time match data, providing a unique opportunity to own a piece of the AO.

Payment and Financial

In the metaverse you can also go to the bank.

- ▶ JP Morgan enters the metaverse and does so by opening its office in Metajuku Mall, one of the most luxurious districts in Decentraland. To welcome customers, in the virtual room there is a wandering tiger and a digital portrait of Jamie Dimon, CEO of JP Morgan. A staircase then takes customers to another room where they can meet one of the executives presenting the bank's cryptocurrency. The name chosen is not coincidental, as it refers to JP Morgan's Onyx suite, which is a set of services related to Web 3.0, the ethereum blockchain and the metaverse. According to a study by JP Morgan, a new trend in investing in properties in the metaverse is gaining momentum, and whereby loans or mortgages to purchase properties are expected to be possible in the future, in detail the average price of a land in the major metaverse platforms has doubled in just six months (june – december 2021), in fact it jumped from \$6,000 to \$12,000. In accordance with the JP Morgan study, the example of TerraZero technologies, a Vancouver-based company, has issued one of the first mortgages in the metaverse. The mortgages and availability of financing represent a major acceleration to embark on the metaverse adoption journey. The customer makes a monthly payment until the loan is paid off, during which time the lender owns the asset, but grants the customer certain rights, such as development and property leases on their land.

Sources: <http://www.pbc.gov.cn/en/3688110/3688172/4157443/4293696/2021071614584691871.pdf>

The client also has immediate access to develop on their land, plan events, administer digital marketplaces, and host their own in-house corporate office.

- ▶ **TerraZero** explained that interested customers can look at and choose deals and listings (including, but not limited to, land size, location and applicable prefab construction elements) on their platform. TerraZero customers looking to finance the purchase of virtual real estate (represented as non-fungible tokens) will use the customer's NFTs as collateral for digital assets.
- ▶ **Australian Open with Mastercard:** For the sporting event, the Australian Open offered an innovative experience for fans: the sports village was recreated in Decentraland (platform for creating metaverse) allowing any tennis fan to access the AO wherever they were in the world. Mastercard sponsored the event and the AO metaverse by raffling off an NFT Art Ball: in order to enter the contest, you needed to create your own avatar, enter the AO metaverse, take a selfie in front of Mastercard's mural and post it to social media. In addition, the AO partnered with blockchain studio and metaverse specialists, run it wild and rarer things, to create AO art ball NFTs.

Automotive

Electrification, vehicle autonomy and connected technology continue to be hot topics, along with an increased focus on customization and the metaverse, particularly in automotive design.

McLaren Automotive, a British automotive manufacturer, has entered the metaverse by giving customers a new level of experience where they can mint and sell non-fungible tokens (NFTs). McLaren announced that it has selected Infinite World, a leading metaverse infrastructure platform, as its first metaverse partner. Infinite World's platform enables brands to create, monetize and drive consumer engagement with digital content, and McLaren says this new partnership will allow it to offer its customers a deeper, more immersive digital experience. Included as part of this experience is the opportunity to create and coin original NFTs and digital artwork that will represent McLaren's luxury supercars and hyper cars. These digital products will then be made available on a McLaren marketplace. McLaren also says that some NFTs could be offered with additional unique benefits, including access to exclusive experiences, just for buyers.

Through Infinite World, McLaren will showcase its luxury hypercars and supercars in the metaverse in the form of NFTs or another digital artwork. By entering the metaverse arena, users will have the ability to own McLaren-branded products whether they can afford a car from the company. The metaverse continues to gain momentum in the modern era because it involves shared virtual worlds where avatars, buildings, land and even names can be bought and sold, often using NFTs. For example, Italian luxury car manufacturer Lamborghini launched its collection of NFTs earlier this year to solidify its position in the emerging world of digital art.

Neuroscience

“ The neuroscientific approach enables the design of metaverse spaces that ensure an immersive experience by following a Human-Centered approach, building environments capable of fostering the experience of positive emotions and well-being or accelerating the learning and development process by collecting physiological data related to people's experience.

Andrea D'Acunto (EY Partner - People Advisory Services Leader)

A digital revolution requires an organizational transformation to be more competitive and successful. Neuroscience can predict future product success more accurately than traditional approaches. Used in conjunction with emerging technology, it can enhance core processes through early virtualization of products to optimize supply chain costs. This union thus allows for accelerating the product development cycle by leveraging neuroscience and metaverse, through:

- ▶ **Process agilization**

Time and cost reduction.

- ▶ **Fact-based**

Customer insights.

- ▶ **Customer early feedback**

Neuroscience supports the end-to-end product life cycle through a process that is structured in three steps:

- 1. Ideate**

- ▶ Market requirements;
- ▶ Concept design (ideation and product definition).

- 2. Develop**

- ▶ Prototyping;
- ▶ Pre-production testing.

- 3. Commercialize**

- ▶ Marketing and distribution.

Ideate

Market requirement – *Test the creative brief*

- ▶ Enable client's design and engineering team with a creative brief scientifically validated;
- ▶ Identify new product requirements through digital or in-person focus groups and IRT (implicit reaction tests) to investigate which implicit values drive consumers' choice to get powerful insights to hypothesize new prototypes.

Concept design (ideation and product definition) – *Validate objectives*

- ▶ Enable client's product concept design to gain high value information thanks to meta scenarios and human data.
- ▶ Immerse clients in metaverse environments to evaluate core functionalities and capture their gut feelings and emotions with neuro-devices to ensure scientific validation of the phase.

Develop

Prototyping (product development) – *Identify high potential prototypes*

- ▶ Accelerate Client's product development with a low-effort MVP leveraging Metaverse;
- ▶ Immerse clients in a metaverse scenery to navigate different prototype cars, testing with neuro-devices how people react to various external environments, car bodies, interior design, and key features proposed.

Pre-production testing – *Understand how to improve your new product*

- ▶ Empower client's production with valuable insights to fine-tune the product;
- ▶ Validate your pre-series through the support of neuro-technologies during the test drive and IRT after the testing phase.

Commercialize

Marketing and distribution – *Maximize sales by empowering your CX*

- ▶ Prepare for launch, communication, in-store and digital experience.;
- ▶ Neuromarketing support to:
 - ▶ Advertising team;
 - ▶ Store layout;
 - ▶ Digital experience.

EY and Metaverse

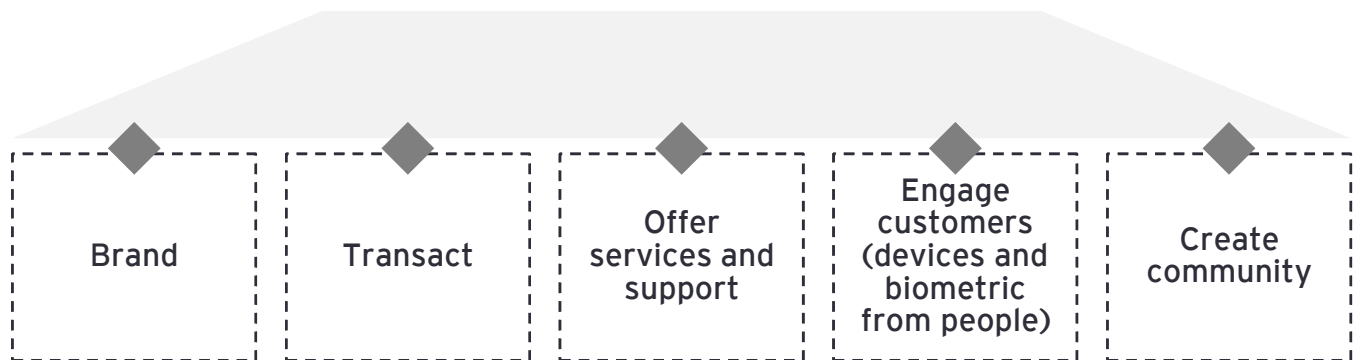
EY services and capabilities

What

The global EY organization has matured new technical and functional capabilities in the metaverse through concrete projects that have enabled the company to gain key skills and knowledge to accompany our clients in the virtual world.

The global EY organization has supported Adidas and McLaren in the launch of NFTs; it has followed projects with AB InBev, the world's largest brewer, that aim to strengthen its brand, engage consumers in a different way and unlock new revenues through a presence in the metaverse and branded non-fungible tokens (NFTs). In parallel, we are organizing and will continue to organize events that involve hybrid modes of execution, i.e., virtual and physical: first of all, the *World Retail Summit 2022* that involves many client companies in the retail sector, such as Benetton, Zegna, Peroni.

It is on the basis of these experiences and projects that the global EY organization offers its clients an end-to-end path to the metaverse and that offers added value to clients in terms of:



How

The global EY organization wants to guide its clients along the end-to-end journey by supporting them:

- ▶ in the design of the solution and in the construction of a virtual space customized to business needs;
- ▶ in the digital development of NFT to certify digital contents and products;
- ▶ in the use of NFT in the real world through the transactional systems that are being developed.

The end-to-end process consists of six phases, described in the figure below, which represent the the global EY organization framework on the metaverse:

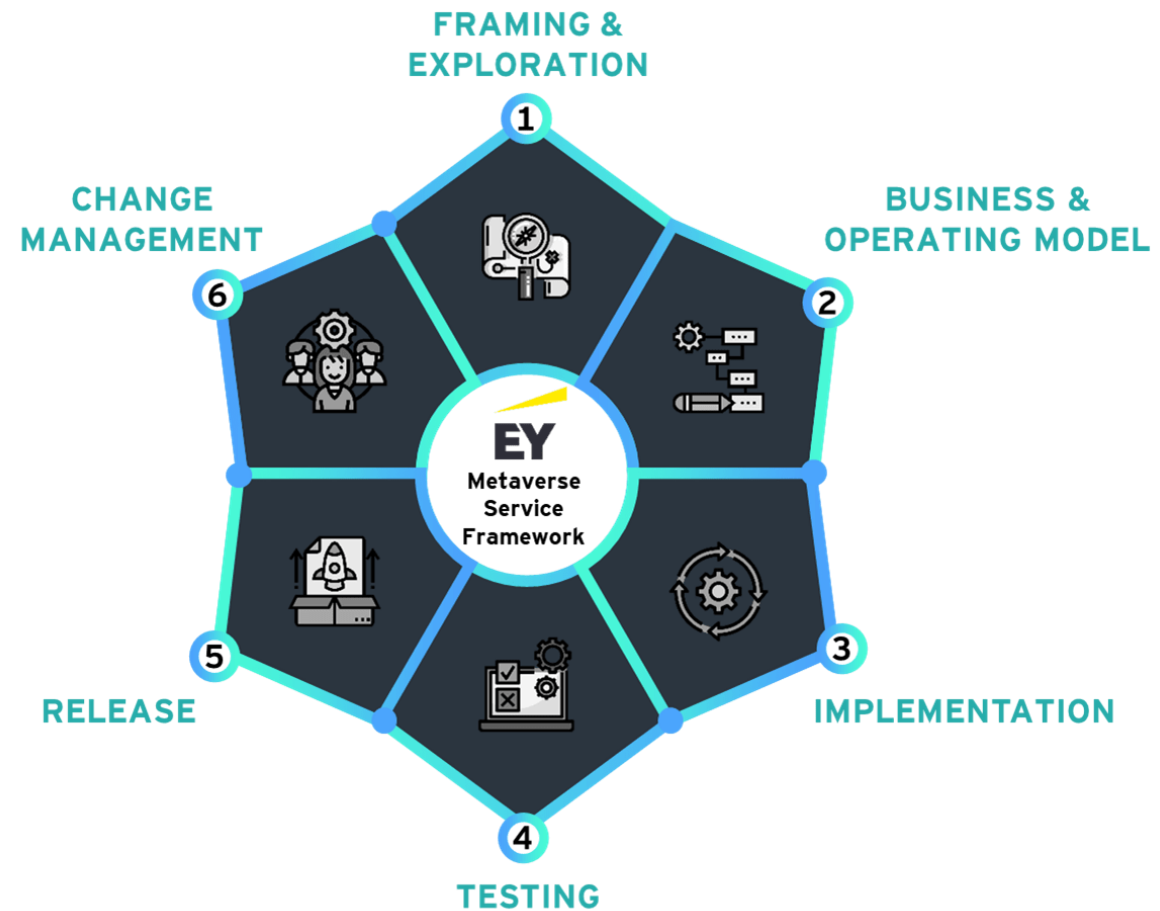
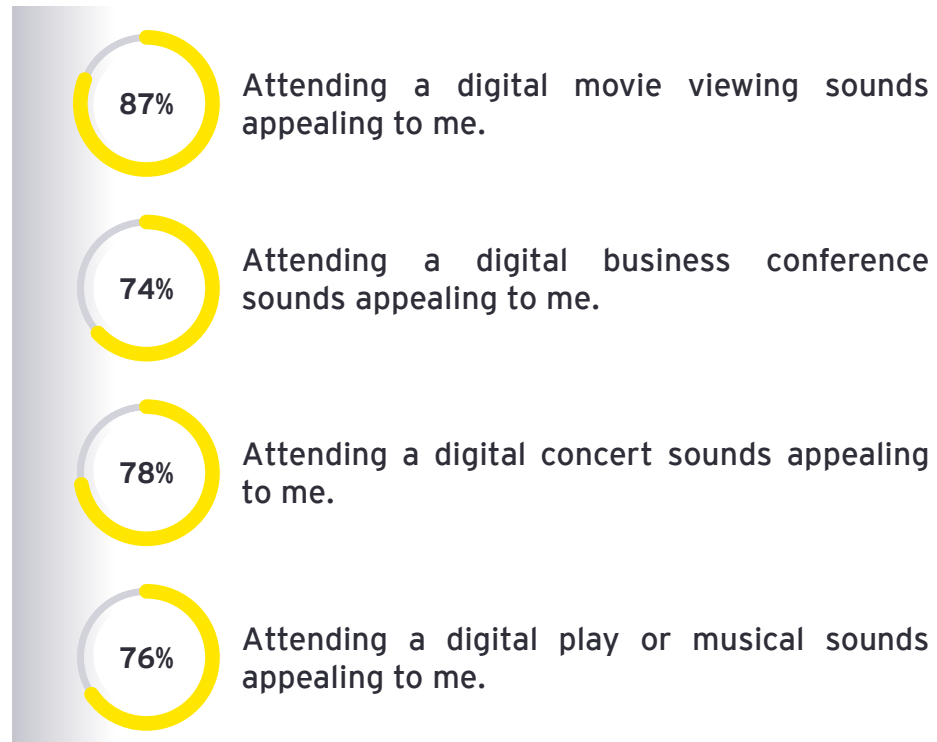


Figure 15: EY Metaverse Service Framework

EY solutions

Immersive world

Traditional gathering spaces are evolving, redefining what a home, event, office and vacation can be in the meta-era. The global EY organization's goal in the metaverse is to define use cases through replicas of custom environments and products based on business needs. In the metaverse our clients will be able to test innovative business solutions more easily, reducing costs and timing of development/test of the structure or of the designed prototype and at the same time they will be able to organize events, concerts, business conferences to recreate moments of sharing forgotten in recent years.



Sources: Wunderman Thompson Intelligence

Tokenization

OpsChain's tokenization service allows you to easily create fungible and non-fungible tokens and work with their features and functionality, allowing the complete digitization of the asset, representing its value without altering its possession.

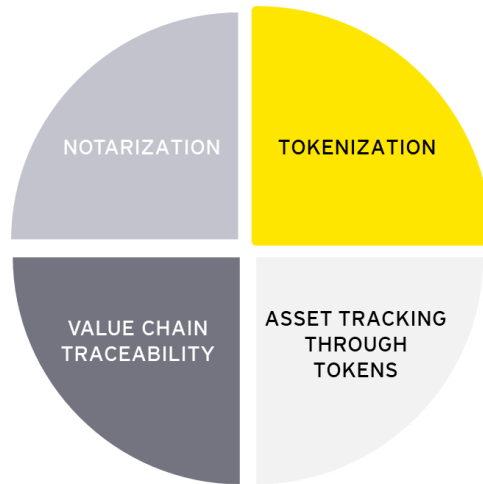


Figure 16: EY OpsChain Core

Standard tokens supported

- ▶ ERC20
ERC20 tokens are fungible tokens by nature, i.e., there is no difference between one token and another.
- ▶ ERC721
ERC721 is a standard for creating non-fungible tokens, i.e., tokens that are unique to each other.
- ▶ ERC1155
ERC115 is a standard for contracts that can handle different types of tokens.

Infinity office

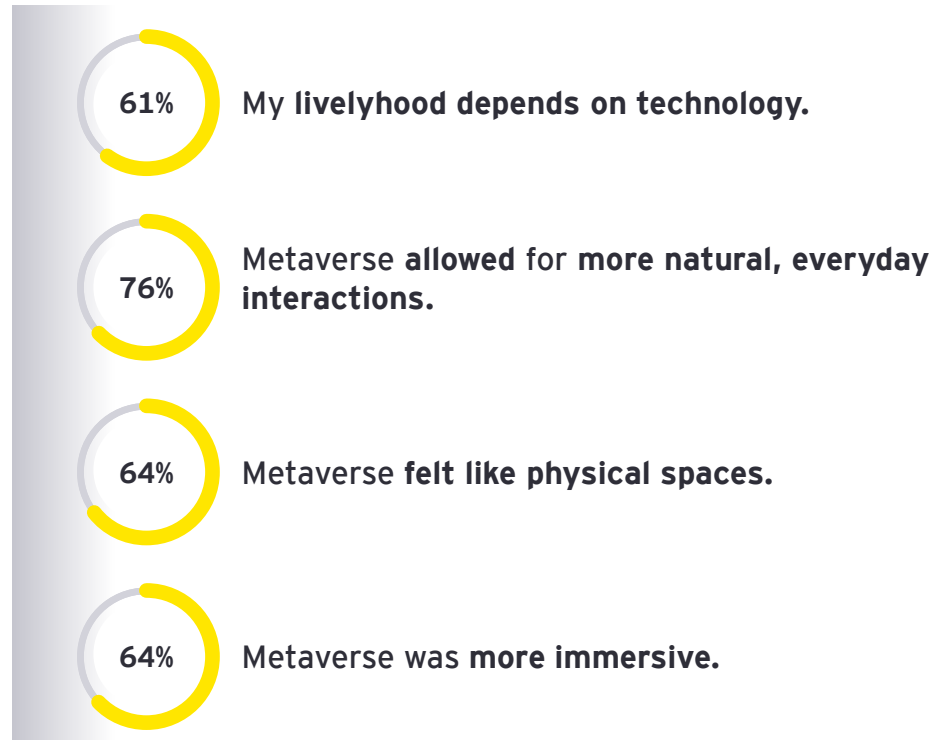
The metaverse involves enormous changes, even for the world of work, through the creation of more immersive and useful virtual spaces. New augmented reality technologies and the creation of personalized avatars will enable environments in which the digital world blends seamlessly with the physical world around us. The infinite office is designed to create a virtual space for employees to be more productive and flexible. The features allow users to work on multiple, customizable screens built on top of the oculus browser. Users will be able to view live feeds from on-board cameras, so they can integrate the VR world with their home. As more and more organizations adopt these technologies, millions of workers across all industries and from all over the world will benefit, in terms of:

- ▶ Innovation;
- ▶ Immersivity;
- ▶ Portability;
- ▶ Comfort;
- ▶ Productivity.

Collaboration

Collaboration in the metaverse is one of the main focuses on the development of this new technology. The way we connect, live, and work is transforming as a result of the digital revolution, and a metaverse workforce is in the making. Companies are looking for solutions that bring back some of the benefits of meeting in person by leveraging the immersive advantages that virtual reality has to offer. These environments allow you to talk, create ideas on a whiteboard and manipulate objects together as if you were in the same physical room.

Here is some data regarding the theme of collaboration in the metaverse:



Sources: Wunderman Thompson Intelligence

Neuroaesthetics

Neuroaesthetics is an area of research involving cognitive sciences and aesthetics that places a neuroscientific approach alongside the usual aesthetic analysis of the production and enjoyment of works of art and the visual world.

This recent discipline, also called neuroart, juxtaposes the knowledge and techniques of neuroscience with art. It is currently possible to record brain activity while viewing artworks, museums, and art galleries through totally wearable neuroscientific devices.

Thanks to wearable technologies, it is now possible to measure the unconscious reactions of people as they admire a work of art, painting, sculpture, or painting directly in a museum or art gallery. The main wearable technologies used are:

- ▶ **Eeg headset**

Measures pleasantness and mental effort in the face of a stimulus such as a work of art or sculpture.

- ▶ **Empathic**

It measures the valence (positive or negative) of our emotions, the level of arousal or emotional engagement while viewing a work of art or sculpture.

- ▶ **Eye - tracker**

Measures visual attention, and visual effectiveness given by stimuli such as sculptures, paintings, artwork.

For the XXXII edition of BIAF, the global EY organization has proposed two experiences, one digital and one immersive, making use of the metaverse and augmented reality, which will allow visitors to contemplate the winning pictorial works from previous editions (2011, 2013, 2015, 2017, 2019). In detail, the global EY organization has planned:

- ▶ **BIAF Space**

A three-dimensional virtual space in the metaverse in which visitors, both on-site and remotely (via the web), will be able to: connect to the digital platform in the metaverse wherever they are, create their own avatar, navigate, interact, and immerse themselves in the new museum space in order to house the winning works of previous editions. The BIAF space was created through the Spatial platform, which allows the user to immerse and interact with the artworks in a completely innovative way.

► BIAF Portal

A hybrid mixed reality experience, between physical and virtual reality, in which, through augmented and virtual reality, on-site viewers will be projected into virtual gates/portals to access three-dimensional and surreal spaces in which they can view the winning works of previous editions. The BIAF portal was created through the 8thWall platform, which allows users to immerse themselves in three-dimensional and surreal spaces by interacting dynamically and innovatively with the artworks in them.

The global EY organization, as a partner of BIAF, also conducted research in the field of neuroaesthetics in the wavespace of Rome to measure the emotions generated by the enjoyment of an exhibition, in a virtual environment reproduced in the metaverse. Participants, using visors, had an immersive experience, visiting a virtual exhibition in which there were various winning works in previous editions of the BIAF. A comparison was also made with the visualization of the same artworks present in the metaverse through a computer. The results that emerged from the study take into consideration the emotional index acquired through neuro device and participant-reported responses:

- The immersive experience in the metaverse generated a very high emotional involvement compared to that experienced via computer images;
- Comparing different types of works of art, it was found that the emotion in the metaverse was the same for the "painting" and "sculpture" types; in contrast, when these works were viewed on the computer those related to "painting" generated greater emotional involvement;
- Regarding the comparison of the self-reported scores (computer and metaverse), it emerges that there are no major differences between the two ways of viewing the works.

Ultimately, the metaverse in the field of art improves the enjoyment of artworks as it allows us to shorten spatial-temporal distances, projecting the subject into a reality at the click of a button, greatly reducing cost and time.

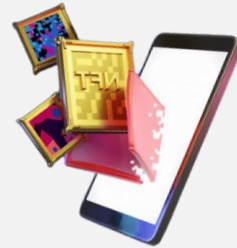
Conclusion

Big techs, big ambitions and big company: the metaverse is launching a new challenge for the internet to create a new place where digital and physical lives converge. The global EY organization's goal in the short term is to continue to invest in metaverse through skills, tech devices and solutions by taking actions that aim to strengthen our positioning, such as:

- ▶ Support and working together with customers to develop new metaverse experience and new business models to design new journeys and new forms of customer experience;
- ▶ Developing new tech competencies (e.g., UX or UI and 3D design, motions) and intensifying those already present;
- ▶ Make new investments in facilities, virtual terrains and devices;
- ▶ Create proof of concept and build new metaverse solutions and services, with VR/AR and blockchain expertise, to offer to the global EY organization clients.

The global EY organization main challenge to face will be to realize a metaverse **open to everyone** and **owned by everyone** and not by a single company, in which each of us will have an avatar and thanks to immersive visitors will relate with other people in different areas from where we are physically.

How to get your NFT GIFT?



Thanks for your time:

- ▶ You will receive an email from us with the redeem link of NFT;
- ▶ Click on the link in the email;
- ▶ Enter your wallet - if you don't have one, we'll help you create one on the fly which you can then import into metamask wallet;
- ▶ Redeem the NFT;
- ▶ A second email will confirm the creation and how to Import the NFT to your metamask wallet.

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