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INSIDE THE METAVERSE

Present and Future: A Critical Analysis

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Introduction

In October 2021, Mark Zuckerberg took the stage in Silicon Valley and announced that Facebook — the company — was renaming itself Meta. At a stroke, the word 'metaverse' was catapulted into everyday vocabulary. It appeared in every newspaper, magazine and television programme on the planet, and every brand, consultant and institution immediately began to express a view on what this phenomenon actually was, and above all on what it would become.

It was at that precise moment that this book began to take shape. The decision to write it was driven by a simple conviction: that behind the hype there is a real phenomenon which, already today, involves hundreds of millions of people; that it is far broader and more complex than the media narrative suggests; and that a clear, rigorous analytical framework is both possible and necessary.

The book you are holding is therefore not a work of science fiction, nor a visionary manifesto. It is an attempt to photograph the metaverse as it stands today — its players, its users, its stakeholders, its investments — while also projecting the possible trajectories of its near and more distant future. It deliberately sets aside all the most speculative aspects of the topic in order to focus on what can be observed, measured and analysed with confidence.

Ready Player One, the celebrated novel by Ernest Cline adapted for the cinema by Steven Spielberg in 2018, is one of the finest imaginative descriptions of the metaverse — a fully immersive virtual universe called the OASIS in which billions of people live, work, love, and fight. Its vision is extreme: a world in which the physical and digital have merged to the point of being indistinguishable. We are not there yet, and it is far from certain that we will ever reach that precise destination. But the direction of travel is clear, and the pace of change is accelerating.

This analysis focuses primarily on the business-to-consumer (B2C) dimension of the metaverse: the platforms, the games, the virtual worlds and the communities that are already populated by real users today. It does not ignore the B2B dimension — business applications, industrial processes, professional training — but the lens is firmly trained on the experience of the end user.

The book addresses five fundamental questions:

- What is the metaverse? How should we define it, and which definitions are the most useful?
- What is the ecosystem of the metaverse? What are the layers of infrastructure that support it, and what are the barriers to its growth?
- Who are the users of the metaverse today? Who are the main players, and how can they be mapped?
- Who are the stakeholders of the metaverse, and what role does each of them play?
- Where is the money going? What are the revenue flows and investment streams that are building the metaverse?

The analysis draws on a wide range of research and reports published by major consultancies, banks and industry associations. The data cited refers in the main to 2021 and early 2022 — the period in which the metaverse first became a topic of mass conversation. In a market that changes so rapidly, the reader should bear in mind that some figures will have evolved since

the time of writing. The conceptual frameworks, however, remain fully valid as instruments for reading a market that is still in its early stages.

One final word about method. This book does not attempt to predict the future. It offers scenarios and hypotheses, based on observable trends, without claiming to know which of them will prevail. The metaverse is a work in progress: its final form will be determined — as it always is in technology markets — by the interplay of innovation, investment, user behaviour, and regulatory choices. The most honest thing we can do is map the terrain as it is today, identify the forces at work, and suggest which questions are worth watching closely in the years ahead.

chapter 1

The Metaverse: Definitions and Market

Defining the Metaverse

The metaverse is a term with many definitions, and the first challenge is to choose the most useful one. Wunderman Thompson Intelligence, in its report 'Into the Metaverse' (2022), identifies five different possible definitions, each of which captures a different facet of the phenomenon:

1. The metaverse as a virtual world — a persistent, shared, three-dimensional digital environment accessible via the internet, with rules and an economy of its own.
2. The metaverse as an experience economy — a set of immersive digital experiences, including games, concerts, events and social interactions, capable of generating real economic value.
3. The metaverse as a digital mirror of the physical world — a digital twin of reality, in which physical environments, objects and people are reproduced in three dimensions.
4. The metaverse as a platform — a technological infrastructure that supports the creation and distribution of all these experiences.
5. The metaverse as an evolution of the internet — Web 3.0, a decentralised version of the internet based on blockchain technology, in which users own their digital assets and identities.

For the purposes of this book, we adopt a working definition that combines several of these elements: the metaverse is a set of persistent, shared, three-dimensional virtual worlds accessible via the internet, in which users interact through avatars, conduct social and economic activities, and own digital assets. This definition is broad enough to include both the centralised platforms that currently dominate the market and the decentralised worlds built on blockchain technology that represent its frontier.

It is worth noting immediately that in this definition the metaverse is not a single platform or a single world, but rather an ecosystem of many interconnected or at least coexisting worlds. Today this ecosystem is still fragmented: the different virtual worlds are not interoperable, meaning that users cannot freely move their assets or identities from one world to another. Interoperability is one of the great open challenges for the development of the metaverse, and we will return to it later.

Another key element of our definition is persistence: the metaverse exists independently of the individual user's connection. Events happen, economies evolve, communities develop, even when a given user is offline. This is what distinguishes the metaverse from a video game: a game exists primarily for the time the user is playing it, while the metaverse continues to live and evolve around the clock, like the physical world.

Finally, our definition places at the centre the avatar — the digital representation of the user — and the digital economy, which includes the purchase and sale of virtual goods, services, real estate and non-fungible tokens (NFTs). This economy is not metaphorical: billions of dollars are already circulating within these virtual worlds, and the revenues generated are very real.

The Potential Market

The most ambitious market estimates project a metaverse economy worth between eight and thirteen trillion dollars by 2030. These figures come from two of the most respected names in global finance: Citigroup, in its 'Metaverse and Money' report (March 2022), estimates a market of between eight and thirteen trillion dollars; Goldman Sachs, in its equity research of December 2021, puts the figure at around eight trillion dollars.

The Citi report identifies three main areas of economic activity within the metaverse:

- Consumer economy: purchases of virtual goods and services, including gaming, entertainment, fashion, education, social events and e-commerce.
- Business economy: enterprise applications, including product development, training, industrial simulations, professional collaboration and business-to-business services.
- Creator economy: the production and monetisation of digital content by independent creators, with estimated revenues that could reach over one hundred billion dollars a year.

In terms of users, the estimates are equally ambitious. Various reports converge on a figure of around five billion users by 2030, compared to roughly half a billion today who already interact in some form with virtual worlds — primarily through gaming. This projection is based on observable demographic trends: the youngest generations, in particular Generation Z and Generation Alpha, already spend a significant part of their time in virtual environments and demonstrate social and commercial behaviours that are entirely coherent with the development of a mature metaverse.

It is important to read these figures in context. The metaverse is not a market that will emerge from nothing: it is substantially the natural evolution of markets that already exist today and are already very large — above all the gaming market, which was worth approximately one hundred and sixty billion dollars in 2020 and is growing at high single-digit rates every year. The metaverse will not replace these markets: it will expand them, enriching them with new layers of experience and new economic models.

The gap between today's figures and the 2030 projections tells us how much needs to be built. This is both a challenge and an opportunity — and it explains why the largest technology companies in the world are investing so heavily in this space.

Considerations

The metaverse is a complex and multifaceted phenomenon that cannot be reduced to a single definition. For analytical purposes, we adopt a definition that focuses on persistent, shared, three-dimensional virtual worlds, accessible via the internet, in which users interact through avatars and conduct real economic activities.

The potential market is enormous — between eight and thirteen trillion dollars by 2030 according to the most authoritative estimates — and is built upon solid foundations: the gaming market, which is already large and growing, and the broader trend towards the digitalisation of human experience that the pandemic has greatly accelerated.

The main open questions concern: (1) the speed of adoption, which depends on the resolution of important infrastructure barriers; (2) the form the metaverse will take, particularly the balance between centralised and decentralised models; and (3) the ability of the different

players to build business models that are sustainable over the long term. These are the questions this book attempts to address in the chapters that follow.

chapter 2

The Metaverse Ecosystem

The Infrastructure

Like any complex digital market, the metaverse rests on a set of technological layers that form its infrastructure. Understanding these layers is essential to grasping both the opportunities and the barriers to the metaverse's development. We identify six fundamental layers:

1. Connectivity and 5G

The metaverse requires high-speed, low-latency connectivity for all of its users. The fifth generation of mobile networks (5G) is the enabling technology that will allow the metaverse to function at scale: with speeds of up to ten gigabits per second and latency below one millisecond, 5G makes immersive, real-time experiences accessible from any location. The global rollout of 5G is well underway, but its penetration varies enormously between countries and regions. The full deployment of 5G infrastructure is a prerequisite for the mass adoption of the metaverse, particularly through mobile devices.

2. Computing Power

Three-dimensional virtual environments require enormous computing power to render in real time. This computing power is provided by two main types of infrastructure: high-performance GPUs (graphics processing units), which process three-dimensional graphics; and edge computing, which brings processing capacity closer to the end user, reducing latency. Both are undergoing rapid development. NVIDIA and AMD are the leading players in the GPU market; cloud providers such as AWS, Google Cloud and Microsoft Azure are investing heavily in edge computing infrastructure. The ability to deliver high-quality three-dimensional experiences even on low-end devices is one of the key challenges in making the metaverse truly accessible.

3. VR/AR Hardware

Virtual reality (VR) headsets and augmented reality (AR) glasses are the devices through which users access the most immersive metaverse experiences. Today the market is still in an early phase: the most popular device, Meta's Oculus Quest 2 (now Meta Quest 2), is sold at a price of around three hundred dollars and accounted for approximately seven million units sold in 2021. The total market was just over eleven million units. These are small numbers compared to the penetration of smartphones, which confirms that the VR/AR hardware market is still far from mass adoption. However, the growth rates are impressive: the VR/AR market grew by ninety-two percent between 2020 and 2021, and all projections indicate sustained double-digit growth for the next five years.

4. Platforms

The platforms are the virtual worlds themselves — the environments within which users interact, play, create and trade. They are the most visible layer of the metaverse ecosystem and include both the centralised platforms (Roblox, Fortnite, Minecraft, Meta's Horizon Worlds) and the decentralised platforms built on blockchain technology (The Sandbox, Decentraland). The platforms are discussed in detail in Chapter 3.

5. Game Engines

Game engines are the software that allows developers to create three-dimensional environments. The two dominant players are Epic Games' Unreal Engine and Unity Technologies' Unity. Both companies have recently extended their software beyond the gaming market to serve the broader metaverse ecosystem: Unreal Engine is used not only for video games but also for film and television production, architectural visualisation, industrial simulation and automotive design. Game engines are one of the most important enabling technologies for the metaverse and both Epic and Unity are investing heavily in making their tools more accessible to non-specialist creators.

6. Payment Systems and Blockchain

The economic activity of the metaverse requires secure, efficient payment systems. In the centralised metaverse, payments are managed by the platforms themselves through proprietary currencies (Robux for Roblox, V-Bucks for Fortnite). In the decentralised metaverse, payments are made through cryptocurrencies (MANA for Decentraland, SAND for The Sandbox) on blockchain networks, primarily Ethereum. Blockchain technology underpins not only payments but also the ownership and traceability of digital assets — in particular NFTs. The development of more efficient, less energy-intensive blockchain solutions (such as the transition of Ethereum from 'proof of work' to 'proof of stake') is a critical element in the development of the decentralised metaverse.

Growth Barriers

Against this backdrop of rapid technological development, there are five main barriers that currently limit the growth of the metaverse and that will need to be overcome for the market to reach the scale envisaged by the most ambitious projections.

1. Standards and Interoperability

Today the metaverse is a collection of walled gardens: each platform has its own formats, its own currency, its own rules. A user of Roblox cannot take their avatar, their virtual items or their currency to Fortnite or The Sandbox. This lack of interoperability is one of the most significant structural barriers to the development of a true, unified metaverse. Resolving it requires the definition of open standards — for avatars, digital assets, payment systems and digital identity — that all platforms agree to adopt. This is a technically complex but above all politically difficult challenge: it requires the major incumbents to accept a degree of openness that potentially reduces their competitive advantage. Efforts in this direction do exist (the Open Metaverse Interoperability Group is one example), but progress is slow.

2. Content and Creators

The metaverse lives on content. A virtual world without things to do, people to meet, experiences to live is a ghost town. The creation of sufficient and compelling content requires a large, skilled and motivated community of creators and developers. Today, this community exists but is still relatively small in relation to the ambitions of the major platforms. The metaverse requires not only game developers but also architects, fashion designers, musicians, filmmakers, event organisers, educators — in short, a new generation of digital artisans capable of populating virtual worlds with meaningful experiences. Developing this community is one

of the major strategic investments of the large platforms, which compete with one another not only to attract users but also to attract creators.

3. Hardware

Despite the growth rates cited above, VR/AR hardware remains expensive, uncomfortable for prolonged use and limited in its field of view and resolution. The development of lighter, cheaper, more powerful devices is a necessary condition for the mass adoption of the most immersive metaverse experiences. The most influential roadmaps — including those of Meta, Apple and Microsoft — project that within five to seven years it will be possible to produce devices with a form factor close to that of normal glasses, at a price accessible to the mass market. But these are projections, and history teaches us that hardware development timelines are often optimistic.

4. Regulation

The metaverse raises a series of important regulatory questions that have not yet been addressed by any jurisdiction in a systematic way: the taxation of virtual economies, consumer protection in virtual environments, the legal status of NFTs, privacy in immersive environments, intellectual property in user-generated content, and the protection of minors. The regulatory vacuum is a source of uncertainty for investors and companies operating in the metaverse, and the resolution of these questions will have a significant impact on the development of the market — particularly for the decentralised Web 3.0 platforms, whose business models are built on regulatory assumptions that may not prove durable.

5. Privacy and Security

The metaverse collects an unprecedented amount of data about its users — not only behavioural data (what they do, what they buy, who they talk to) but also biometric data (eye movements, expressions, body posture) captured by the sensors in VR/AR devices. The management of this data raises fundamental questions about privacy and security that have not yet been fully resolved. The case of Cambridge Analytica reminds us of the potential for misuse of personal data in digital environments; the metaverse, which is even more intimate and immersive, could amplify these risks. Building trustworthy, transparent and secure data management systems is a prerequisite for mass adoption.

chapter 3

The Users' Metaverse

The Extended Perimeter

Before we can map the users of the metaverse, we need to define its perimeter. The metaverse is not a monolith: it is an ecosystem of very different products and platforms, which share some fundamental characteristics (persistence, three-dimensionality, avatar-based interaction, digital economy) but differ substantially in their technological model, governance and business model.

For the purposes of this analysis, we include within the 'metaverse perimeter' all virtual worlds and gaming platforms that already today demonstrate at least some of the following characteristics:

- A persistent virtual environment accessible via the internet
- Three-dimensional interaction through avatars
- An internal economy that allows users to buy and sell virtual goods and services
- A significant social component, i.e., the possibility of interacting with other users in real time
- Content creation by users or third-party developers

This definition is broad enough to include platforms like Roblox, Fortnite, Minecraft and The Sandbox, which are at very different stages of development and use very different technological models. It is also broad enough to include some products — such as Meta's Horizon Worlds and Decentraland — that are still in an early phase and have relatively small user communities, but whose strategic importance and innovation potential justify their inclusion in the analysis.

Conversely, we explicitly exclude from the perimeter: traditional video games without persistent social components, social networks (even those with some three-dimensional features), streaming platforms, and generic web applications. The distinction is not always sharp, and we acknowledge that the boundaries of the metaverse are in constant evolution. But the analytical framework we adopt is stable enough to produce useful insights.

The Map: A Quadrant Analysis

The most useful analytical tool for mapping the users' metaverse is a two-by-two matrix built on two axes: on the horizontal axis, the degree of centralisation (from fully centralised to fully decentralised); on the vertical axis, the size of the user base (from small pioneering communities to platforms with tens or hundreds of millions of active users). This produces four quadrants, each characterised by a specific group of players and a specific competitive dynamic.

	CENTRALISED	**DECENTRALISED**
LARGE AUDIENCE	QUADRANT A Traditional Players (Roblox, Fortnite, Minecraft)	QUADRANT C Big Tech (Meta/Horizon, Microsoft)
SMALL/MEDIUM AUDIENCE	QUADRANT D The Frontier	QUADRANT B Web 3.0 Players

	(Somnium Space, Blocktopia)	(The Sandbox, Decentraland)

Quadrant A — Traditional players with large audiences — is where the vast majority of metaverse users are today. These are centralised platforms, owned and operated by companies with proprietary business models, which have been successful in attracting tens or hundreds of millions of active users. The most important examples are Roblox (with over fifty million daily active users in 2022), Fortnite (with over three hundred million registered users), and Minecraft (with over one hundred and forty million monthly active users). These platforms share a freemium business model — free to access, with in-game purchases of virtual goods — and a strong community of user-generated content creators.

Quadrant B — Decentralised players with small-to-medium audiences — is the frontier of the Web 3.0 metaverse. These are platforms built on blockchain technology, in which digital assets (virtual land, game items, avatars) are represented as NFTs owned by users. The two most important examples are The Sandbox and Decentraland, each of which has a user base of a few hundred thousand active users but capitalisation values that at the peak of the hype in late 2021 reached several billion dollars. These platforms offer users new possibilities for ownership and monetisation, but they still struggle with usability, instability and the speculative dynamics of their cryptocurrency economies.

Quadrant C — Big tech players with large potential audiences — represents the frontier of the centralised metaverse. These are the large technology companies — Meta, Microsoft, Apple, Google — that are investing heavily in the metaverse but whose platforms are still in an early phase of development and do not yet have established audiences. Meta's Horizon Worlds and Horizon Workrooms are the most emblematic examples: ambitious, well-funded and technically impressive, but still far from the numbers needed to justify the investments being made.

Quadrant D — Pioneering players with small audiences — includes a series of innovative platforms that are experimenting with new models of experience and interaction. Examples include Somnium Space and Blocktopia, which represent very different approaches to the concept of virtual world. These players are characterised by deep innovation but very limited scale.

Quadrant A: The Traditional Players

The platforms in Quadrant A are the contemporary metaverse's main attraction. They have already achieved scale — tens or hundreds of millions of users — and have developed sophisticated economic models that generate billions of dollars in annual revenues. Above all, they have demonstrated that users are willing to spend significant time and money in virtual environments, and that the social and economic behaviours typical of the metaverse — buying virtual goods, attending virtual events, socialising through avatars, watching others play — are not marginal phenomena but mainstream ones.

The key characteristics of these platforms can be summarised as follows:

- Free-to-play or freemium model: access is free, revenues come from the sale of virtual goods (skins, items, accessories for avatars)
- Large and diversified user base: these platforms attract players of all ages, both male and female, from all over the world

- Strong community of creators: a significant fraction of the content on these platforms is produced by independent creators, not by the companies themselves
- Growing non-gaming activities: concerts, cultural events, branded experiences, virtual fashion shows — the platforms are becoming social spaces that go beyond gaming
- Progressive integration with physical brands: luxury fashion houses, sports organisations, film studios and consumer brands are increasingly investing in these virtual spaces

Among the traditional players, three deserve particular attention: Roblox, Fortnite and Minecraft. Each represents a different archetype of metaverse, with different target audiences, different business models and different development trajectories.

CASE STUDY: ROBLOX

Roblox is perhaps today's closest approximation to the metaverse as it is commonly imagined: a persistent, three-dimensional virtual universe in which users can play, create, socialise and trade. Founded in 2004 and listed on the New York Stock Exchange in March 2021, Roblox had over fifty million daily active users in 2022, with a particularly young demographic: sixty-seven percent of users are under sixteen years old.

What makes Roblox unique is its creator model. The platform offers easy-to-use development tools that allow any user — including children with no programming experience — to create games and experiences within the Roblox universe. Today there are over fifty million games on Roblox, virtually all created by independent creators. The company retains thirty percent of revenues generated by creators; the remaining seventy percent goes directly to the creators themselves. This model has created an ecosystem of over one million independent creators, some of whom earn millions of dollars a year.

Roblox's business model is based entirely on the sale of Robux, the platform's proprietary currency, used to buy virtual items, avatar accessories and in-game upgrades. In 2021 Roblox generated revenues of approximately 1.9 billion dollars, an increase of eighty-three percent over the previous year. Crucially, the company was already investing heavily in the infrastructure and content that will take the platform towards an increasingly mature metaverse: spatial audio, avatar animations, more realistic graphics, and events that blur the boundary between virtual and physical.

Roblox has also become an important marketing platform for global brands. Gucci created the 'Gucci Garden', a virtual replica of its Florence boutique that attracted over nineteen million visitors. Nike built 'Nikeland', a branded virtual space. Vans opened 'Vans World'. These initiatives confirm that Roblox has become a relevant cultural space, not only for the youngest generation.

CASE STUDY: FORTNITE

Fortnite, developed by Epic Games, is the most played video game in the world and one of the most important proving grounds for the metaverse. Launched in 2017, Fortnite had over three hundred and fifty million registered users in 2022 and generates revenues of approximately nine hundred million dollars a year — entirely from the sale of virtual items (skins, accessories, emotes) through a freemium model.

Fortnite is particularly interesting for its capacity to host large-scale virtual events. In April 2020, Travis Scott's virtual concert on Fortnite attracted twelve million simultaneous participants — a figure that no physical venue in the world could accommodate. Similar events

have been hosted for other artists including Ariana Grande and Marshmello, and for film franchises including Marvel, Star Wars and Tron. These events are not peripheral to Fortnite's business: they are a central element of its strategy to transform a battle royale game into a genuine social and cultural platform.

Epic Games has also invested heavily in the technological infrastructure of the metaverse, in particular through its Unreal Engine platform, which is the engine used to create Fortnite but is also licensed to thousands of developers, film studios and industrial companies worldwide. Epic Games has announced two billion dollars of direct investment in the metaverse and is one of the companies most explicitly committed to building an open, interoperable metaverse.

Fortnite is also noteworthy for the progressive integration of real brands. Numerous luxury, sports and consumer brands have created branded experiences within the platform, confirming Fortnite's role as a major new marketing channel. In 2022, Balenciaga, Ferrari, Airbnb and many others announced Fortnite activations. Nike's acquisition of RTFKT, a studio specialising in digital sneaker design, is partly motivated by the desire to integrate its digital products into platforms like Fortnite.

Minecraft, the third major player in Quadrant A, deserves a separate mention. Developed by Mojang and acquired by Microsoft in 2014 for 2.5 billion dollars, Minecraft is the best-selling video game in history, with over two hundred and thirty-eight million copies sold across all platforms. With over one hundred and forty million monthly active users, it is one of the few games to span multiple generations: it is played by children aged eight and adolescents aged twenty-five with similar enthusiasm. Minecraft's open-world, creative sandbox model has inspired a generation of game designers, many of whom have gone on to develop other metaverse platforms.

Quadrant B: The Web 3.0 Players

The platforms in Quadrant B are built on an entirely different philosophy from those in Quadrant A. Instead of centralised ownership and proprietary economies, they offer users true ownership of their digital assets through NFTs and governance rights through DAO (Decentralised Autonomous Organisation) mechanisms. The theoretical aspiration is a metaverse that no one company can own or shut down — a digital public space as open and resilient as the internet itself.

In practice, these platforms are still far from this ideal. The user experience is often technically demanding, the user bases are small compared to the traditional players, and the economies have shown high speculative volatility — with asset values rising by thousands of percent in the hype period of 2021 and then collapsing equally dramatically. Nevertheless, the innovations introduced by these platforms in the areas of digital ownership, creator monetisation and decentralised governance are genuine and will almost certainly influence the development of the entire metaverse ecosystem.

The two most important players in Quadrant B are The Sandbox and Decentraland.

CASE STUDY: THE SANDBOX

The Sandbox is a user-generated virtual world in which players can buy, build and monetise their digital experiences on the Ethereum blockchain. Originally created as a mobile game in 2011, it was acquired by Animoca Brands in 2018 and relaunched as a Web 3.0 platform. The Sandbox universe is divided into 166,464 plots of digital land (LAND), each represented as an

NFT. Users can buy LAND, build experiences on it, and monetise their creations through the SAND cryptocurrency.

The Sandbox's business model is fundamentally different from those of Quadrant A. Revenues come not from the sale of in-game virtual items but from the initial sale of LAND and from a percentage of transactions conducted within the platform. But the key difference is that users — not the company — own the assets they create or purchase. This ownership is guaranteed by the blockchain and cannot be revoked by The Sandbox or by Animoca Brands.

The Sandbox has attracted a remarkable roster of partners, including Snoop Dogg (who built a virtual mansion on the platform), the South China Morning Post, The Walking Dead, Atari, Binance, SoftBank (which invested ninety-three million dollars in the company in November 2021) and hundreds of other brands. At the peak of the hype, in November 2021, a plot of LAND adjacent to Snoop Dogg's virtual mansion sold for 450,000 dollars. The total market capitalisation of the SAND cryptocurrency reached 7.4 billion dollars in November 2021.

The Sandbox's fundamental challenge is to attract a user base large enough to sustain a genuine digital economy, rather than one driven primarily by speculation. As of early 2022, its monthly active user base was still in the tens of thousands — several orders of magnitude smaller than Roblox or Fortnite. The quality of the user experience and the cost and complexity of blockchain transactions remain significant barriers to mass adoption.

CASE STUDY: DECENTRALAND

Decentraland is the other major player in the Web 3.0 metaverse. Like The Sandbox, it is built on the Ethereum blockchain and offers users ownership of virtual land (parcels) and objects through NFTs. Its governance model is also managed through a DAO, in which MANA token holders vote on the platform's development decisions.

Decentraland launched to the public in February 2020 and quickly attracted attention as a platform for virtual events and brand activations. In March 2022, Decentraland hosted the first 'Metaverse Fashion Week', with the participation of brands including Dolce & Gabbana, Etro, Tommy Hilfiger and Selfridges — an event that attracted significant media coverage and demonstrated the potential of the platform as a space for brand innovation.

The MANA cryptocurrency's market capitalisation reached a peak of approximately six billion dollars in November 2021, driven largely by enthusiasm for Mark Zuckerberg's announcement of the rebrand of Facebook to Meta. Samsung opened a virtual store on Decentraland; NBA champion Stephen Curry announced a partnership with the platform; musicians Deadmau5 and Paris Hilton performed at a virtual Metaverse Music Festival.

Like The Sandbox, Decentraland's fundamental challenge is scale: despite the media attention and high-profile brand partnerships, its monthly active user base remains in the tens of thousands. The transition from a speculative asset platform to a genuinely populated virtual world requires attracting users who come for the experience, not for the investment opportunity — a challenge that has not yet been met.

NFTs: Digital Ownership in the Metaverse

Non-fungible tokens (NFTs) deserve a separate discussion, because they represent one of the most important and most misunderstood innovations introduced by the Web 3.0 metaverse. An NFT is a unique digital certificate, recorded on a blockchain, that certifies the ownership of

a specific digital object: an artwork, a virtual item, a game character, a plot of virtual land, or indeed any digital file.

The key innovation of NFTs is not the object itself — a digital image or a game item — but the proof of ownership. Before NFTs, it was impossible to establish in a definitive and unforgeable way who owned a digital file: digital objects are by nature perfectly reproducible, and 'owning' a digital image meant little more than having a copy of it. NFTs change this: by recording ownership on a blockchain, they make digital objects scarce, traceable and transferable in the same way as physical objects.

The practical implications for the metaverse are significant. NFTs allow users to truly own their avatars, virtual items and virtual land — not merely to use them subject to the terms of service of the platform. They allow creators to monetise their work directly, including receiving royalties on secondary market sales. And they theoretically allow digital assets to be portable between different virtual worlds, even if true interoperability of this kind has not yet been achieved.

The NFT market exploded in 2021 and the first part of 2022, with total trading volumes reaching nearly forty-one billion dollars in 2021 according to data from Chainalysis. The most famous sale — Beeple's digital artwork 'Everydays: The First 5000 Days', auctioned by Christie's for sixty-nine million dollars in March 2021 — announced the arrival of NFTs to mainstream cultural consciousness. Famous NFT collections include CryptoPunks (ten thousand pixelated character portraits), the Bored Ape Yacht Club (ten thousand cartoon apes, each unique, with some selling for hundreds of thousands of dollars), and Axie Infinity digital pets.

Among the practical use cases of NFTs in the metaverse:

- Digital real estate: plots of virtual land in The Sandbox and Decentraland, sold as NFTs, with values at the peak of the hype reaching hundreds of thousands of dollars
- Avatars and avatar accessories: unique digital characters or clothing items that can be owned, traded and displayed in virtual worlds
- Event tickets: NFTs as unique, unforgeable tickets for virtual (or physical) events, with secondary market functionality built in
- Brand collectibles: NFT collections launched by fashion houses, sports organisations, film studios, as a new form of fan engagement and loyalty
- Play-to-earn items: game objects (characters, weapons, land) in Web 3.0 games, earned through play and tradeable on secondary markets

The NFT market experienced a dramatic correction in 2022, with trading volumes and asset values falling sharply from their 2021 peaks. This correction has been interpreted by some as the collapse of a speculative bubble and by others as a healthy normalisation after a period of irrational exuberance. Our view is that the underlying innovation — the concept of provable digital ownership — is real and durable, even if many of the specific NFT projects launched in 2021 and early 2022 will not survive. The technology will outlast the hype.

Quadrant C: The Big Tech Players

The players in Quadrant C are the large technology companies — Meta, Microsoft, Apple, Google — that are building their own metaverse platforms with investments of billions of dollars. What distinguishes them from the traditional players of Quadrant A is not their size

(which is comparable or larger) but rather the maturity of their metaverse platforms, which are still in an early phase of development, and the strategic ambition of their vision, which goes beyond gaming to encompass professional collaboration, social networking, e-commerce, and the reinvention of the internet itself.

CASE STUDY: META – HORIZON WORLDS AND HORIZON WORKROOMS

Meta — the company formerly known as Facebook — is the most explicit and aggressive investor in the metaverse. In October 2021, Mark Zuckerberg announced the rebrand of the company and a commitment of ten billion dollars in annual investment in the metaverse through its Reality Labs division. This investment covers VR/AR hardware (the Meta Quest range of headsets), software platforms (Horizon Worlds for social and leisure, Horizon Workrooms for professional collaboration), and the underlying infrastructure.

Horizon Worlds is Meta's social metaverse: a collection of virtual spaces in which users interact through customisable avatars, participate in events, play games and socialise. As of early 2022 it was available only in North America and had approximately three hundred thousand monthly active users — a tiny fraction of Facebook's nearly three billion users, and far below the scale of Roblox or Fortnite. The platform was criticised for its relatively basic graphics, limited interaction possibilities and the difficulty of the onboarding experience.

Horizon Workrooms is the professional version: a virtual meeting room in which colleagues can collaborate using their Meta Quest headsets. The concept has attracted considerable interest from companies experimenting with remote working models, and has been cited as a potential corporate alternative to Zoom and Microsoft Teams.

Meta's ambition is to build the dominant platform of the next generation of the internet. Zuckerberg has repeatedly stated that the metaverse is a long-term bet — that Meta's investment will not generate significant returns for several years, possibly decades. The company is betting that the transition from the two-dimensional internet to the three-dimensional internet is as significant as the transition from desktop to mobile, and that whoever builds the dominant platform will enjoy the same advantages that Facebook enjoyed in social networking and Apple and Google in mobile operating systems.

The risks of this strategy are considerable: the platform is not yet mature, the competition is intense, and the regulatory scrutiny of Meta's market power is intensifying. But the scale of the investment and the strategic clarity of the vision make Meta the most important single actor in the development of the metaverse.

Microsoft is pursuing a different but complementary strategy. Rather than building a consumer social metaverse, Microsoft is focused on the professional and enterprise metaverse — using VR/AR technology to transform how people work, collaborate and learn. The acquisition of Activision Blizzard for fifty-nine billion dollars in January 2022 — Microsoft's largest acquisition ever — signals a parallel ambition to become a dominant force in the gaming and consumer metaverse as well. Microsoft's HoloLens mixed reality headset is targeted primarily at enterprise customers (military, industrial, healthcare), while Teams — the collaboration platform — is integrating virtual reality capabilities that will allow colleagues to meet as avatars in three-dimensional spaces.

Apple, characteristically, has said very little publicly about its metaverse ambitions. But the evidence of its activity — hundreds of AR-related patents, the ARKit developer tools, the steady enhancement of spatial audio capabilities in its devices, and persistent rumours of a mixed reality headset — suggests that Apple is preparing a significant entry into this space. Apple's

typical approach — entering a market late but with a polished, vertically integrated product — suggests that when it does launch a VR/AR device, it will be a product that prioritises user experience over technical specifications and could accelerate mainstream adoption of the hardware.

Google has had a more ambiguous relationship with the metaverse. Its early AR project, Google Glass, failed commercially in 2013 due to privacy concerns and usability limitations. More recently, Google has invested in Magic Leap, acquired the social gaming platform Niantic (which created Pokémon GO, the most successful AR game to date), and announced significant investments in AR research. Google's core competitive advantage — its control of the Android operating system, the dominant mobile platform globally — could be a powerful entry point into the metaverse if the market evolves towards mobile AR rather than dedicated VR headsets.

Quadrant D: The Frontier

The players in Quadrant D are at the frontier of the metaverse: innovative, ambitious and technically interesting platforms that have not yet achieved scale, but whose experiments are shaping the future development of the space. Two examples are particularly instructive: Somnium Space and Blocktopia.

CASE STUDY: SOMNIUM SPACE

Somnium Space is a VR-first virtual world built on the Ethereum blockchain, designed from the outset for full immersion through VR headsets. Unlike most metaverse platforms that treat VR as an optional enhancement, Somnium Space is built around the VR experience as its primary interaction paradigm. Users can buy virtual land, build environments, host events, and interact through highly realistic avatars.

Somnium Space has attracted a small but loyal community of VR enthusiasts and has hosted numerous events, art exhibitions and social gatherings within its virtual spaces. Its blockchain-based ownership model means that all assets — land, objects, avatars — are genuine digital property of their owners. The CUBES token is used for in-platform transactions.

What makes Somnium Space particularly interesting is its commitment to full photorealistic VR — its environments are designed to look as close to the physical world as current technology allows. This positions it as a preview of what the high-end metaverse may look like in five to ten years, when VR hardware has improved sufficiently to make this level of immersion accessible to a mass market.

CASE STUDY: BLOCKTOPIA

Blocktopia is a virtual reality skyscraper built on the Polygon blockchain — a more efficient and less energy-intensive blockchain than Ethereum. The building has twenty-one floors, each of which can be owned and customised by token holders. Each floor offers a different experience, from gaming to socialising to entertainment to education.

Blocktopia's innovative dimension lies in its attempt to create a self-contained vertical community — a complete virtual environment with multiple distinct zones, each with its own purpose and atmosphere. This 'stacked world' model is different from the flat, open-world model of most metaverse platforms and could be a more sustainable approach for environments with limited user bases.

The BLOK token is used for governance and economic activity within the platform. Blocktopia has formed partnerships with a number of gaming and crypto organisations and has attracted investment from venture capital funds specialising in the metaverse space.

Considerations

The mapping of the users' metaverse that we have just completed reveals a landscape of extraordinary richness and complexity, in which very different models coexist: centralised and decentralised, gaming and social, consumer and enterprise, playful and professional.

A few key observations stand out:

First, scale is concentrated in Quadrant A. The vast majority of metaverse users today are in the traditional gaming platforms — Roblox, Fortnite, Minecraft — which have already achieved the scale needed to sustain rich digital economies. These platforms are not the metaverse of science fiction, but they are real, functioning, and growing.

Second, the Web 3.0 platforms of Quadrant B represent a genuine innovation but face a significant scale problem. Their decentralised ownership models and NFT-based economies are intellectually compelling and commercially innovative, but they have not yet demonstrated the ability to attract and retain large user bases. Their survival and growth depend on improving the user experience, resolving the volatility of their cryptocurrency economies, and developing content compelling enough to attract users who are not primarily motivated by financial speculation.

Third, the Big Tech players of Quadrant C are the wildcards that could reshape the entire landscape. If Meta, Microsoft, Apple or Google launch products that significantly improve the user experience of the metaverse — simpler, cheaper, more beautiful, better integrated with everyday life — they could accelerate adoption dramatically. But the development timelines for hardware in particular are long, and it is far from certain that any of these companies will achieve the dominant position they are seeking.

Fourth, the development of non-gaming activities within gaming platforms is one of the most important and underappreciated trends in the metaverse. The fact that sixty percent of Roblox users regularly participate in social events, concerts and cultural experiences that have nothing to do with gaming is a strong signal that the metaverse is evolving towards something much broader than a game platform — towards a genuine social and commercial space.

Finally, the integration of physical brands — luxury fashion, sport, cinema, consumer goods — into the virtual worlds of the metaverse is accelerating rapidly and is one of the most powerful forces driving the mainstreaming of the phenomenon. We will return to this theme in the chapter on stakeholders.

chapter 4

The Stakeholder Ecosystem

Having mapped the platforms and the users of the metaverse, we now need to analyse the broader ecosystem of actors whose behaviour, investments and motivations will shape the development of the metaverse over the coming years. We identify eight distinct stakeholder clusters, each with its own profile, motivations and impact on the market.

The eight clusters we analyse are: game-spectators, personalities/influencers and brands, professionals, investors and traders, social and followers, gamers (players), professional players, and creators and developers. Each of these clusters has a specific and important role, and their interaction creates the virtuous circles that sustain the growth of the metaverse ecosystem.

Game-Spectators

The game-spectator cluster is one of the most revealing phenomena for understanding the cultural significance of the metaverse. These are users who participate in gaming — and in the metaverse more broadly — primarily as spectators: they watch others play, follow the careers of professional players, attend virtual events and tournaments, and participate in the communities that form around these activities. They do not primarily identify as players themselves.

The numbers of this cluster are extraordinary. Gaming today is, by most metrics, the largest entertainment sector in the world. The Twitch platform, dedicated to the live streaming of gaming content, had over nine million monthly active streamers and over one hundred and forty million monthly active viewers in 2021. YouTube Gaming, the gaming-dedicated version of the largest video platform in the world, hosts trillions of hours of gaming content per year. The gaming creator economy is enormous: gaming influencers accumulate tens of millions of followers, and the most watched gaming channels on YouTube have subscriber counts comparable to those of traditional television channels.

The most impressive demonstration of the scale of the game-spectator phenomenon was the Travis Scott concert on Fortnite in April 2020: twelve million simultaneous participants, who experienced the concert through their own Fortnite avatars in a fully immersive virtual environment. No physical stadium in the world could have hosted this event. The numbers demonstrate that the virtual audience for metaverse events can be of entirely different magnitude from anything physically possible.

The game-spectator cluster is important for the metaverse ecosystem for several reasons. First, they bring visibility and cultural legitimacy to the metaverse, normalising it for audiences that would not otherwise engage with it. Second, they are an important potential market for virtual goods and services — particularly for those related to the personalities and brands they follow. Third, and perhaps most importantly, they represent a population of potential future users who are already culturally immersed in the metaverse, even if their engagement is currently more passive than active.

Personalities, Influencers and Brands

The second cluster is perhaps the most powerful driver of metaverse adoption in the near term. Personalities — musicians, actors, athletes, content creators — and the brands that partner with them bring their existing audiences into the metaverse, creating a bridge between the physical and virtual worlds that is far more compelling than any technological specification.

The logic is simple: if a user follows a musician or an athlete or a fashion brand in the physical world, the opportunity to interact with them in a virtual world — to attend a private concert, to wear the brand's exclusive virtual collection, to access behind-the-scenes content — is a powerful motivator for entering the metaverse. The most impressive examples already cited include the Travis Scott and Ariana Grande concerts on Fortnite, Lionel Messi's NFT collection within his own 'Messiverso', and Socios.com's application of these concepts to European football clubs, allowing fans to purchase tokens that give access to exclusive privileges related to their team.

For brands, the motivations are both marketing-related and commercial. On the marketing side, virtual environments allow brands to reach young audiences that are increasingly difficult to reach through traditional media. On the commercial side, the metaverse opens new revenue streams — including the direct sale of virtual goods (digital versions of physical products) and NFTs as a new form of collectible and loyalty instrument.

The Gucci and Nike cases are illustrative. Gucci built the 'Gucci Garden' within Roblox, replicating in three dimensions its Florence boutique, and sold a digital handbag for over four thousand dollars — more than the price of the same bag in the physical world. Nike, through its acquisition of RTFKT, sold six hundred pairs of digital sneakers for a total of over three million dollars in just seven minutes, with buyers able to show their digital sneakers in photos on Instagram.

These are striking examples, but it would be a mistake to draw overly general conclusions from them. Many of these high-profile transactions took place at the peak of the NFT hype and reflected speculative dynamics as much as genuine demand for digital goods. What is more durable is the trend of brands entering the metaverse not just for marketing visibility but to build genuine digital presences — virtual stores, community spaces, loyalty programmes — that create ongoing relationships with consumers in virtual environments.

Brands face significant challenges in this journey. Building a consistent and meaningful presence in the metaverse requires not just a marketing activation but a genuine digital transformation: having all products and assets represented in three dimensions, developing new business models compatible with virtual economies, and managing the operational complexity of being present in multiple virtual worlds with different formats and standards. This is a medium-to-long-term journey, and most brands are still at a very early stage.

Professionals

The professional cluster has a distinctive profile: these are users whose primary motivation for engaging with the metaverse is professional rather than entertainment-related. They interact with virtual environments, VR/AR tools and three-dimensional collaboration platforms as part of their working lives, not their leisure time.

The impact of this cluster on the broader metaverse market is in some ways indirect — professional users do not typically interact with the consumer gaming platforms of Quadrant

A. But their adoption of immersive technologies at work is a significant driver of the overall growth of the metaverse, because it builds cultural familiarity and technical competence with virtual environments across a population that would not otherwise engage with them. The pandemic dramatically accelerated this process: the forced adoption of digital collaboration tools normalised remote and virtual working for hundreds of millions of people.

Professional applications of the metaverse are already widespread. Virtual meetings and events, training and simulation, industrial design, product development, architectural visualisation — all of these activities are already being conducted in virtual environments by leading companies in the automotive, aerospace, healthcare, retail and financial services sectors. NVIDIA's Omniverse platform, designed specifically for enterprise applications, offers companies the ability to create digital twins of their industrial facilities and simulate and optimise their processes in a virtual environment. Microsoft's HoloLens is used by surgeons, engineers, architects and soldiers. Meta's Horizon Workrooms is being adopted by forward-thinking companies as a more immersive alternative to video conferencing.

Research by Lenovo found that forty percent of employees expressed a positive attitude towards working in the metaverse, citing benefits including improved concentration, more natural collaboration and the ability to work more effectively in remote settings. The barriers to adoption — primarily cost, technical complexity and physical discomfort of VR headsets — are real but declining. The trend is clear: the professional metaverse will grow strongly over the coming years, driven both by the improvements in hardware and software and by the cultural normalisation of virtual working that the pandemic has accelerated.

Investors and Traders

When we speak of investors and traders in the context of the metaverse, we refer not to institutional investors but to individuals who invest in cryptocurrencies and crypto assets — and in particular in the tokens and NFTs associated with the Web 3.0 metaverse platforms. This cluster has a highly specific and concentrated impact: it primarily affects the Quadrant B players and their cryptocurrency-based economies.

The profile of the crypto investor is distinctive. According to a Gemini report analysing over three thousand adults in the United States, the population of crypto investors can be divided into three groups: current holders of cryptocurrencies (fourteen percent of the sample), crypto-curious individuals who do not yet own crypto but indicate interest in learning more or plan to purchase (sixty-three percent), and those not interested in crypto (twenty-three percent). The large proportion of crypto-curious individuals suggests that the investor base will continue to expand significantly.

The metaverse's Web 3.0 platforms are heavily dependent on this investor cluster, because their valuations — and hence their ability to attract creators, users and brands — depend largely on the performance of their associated cryptocurrencies. The extraordinary valuations reached by MANA and SAND in November 2021 — both in the top forty cryptocurrencies by market capitalisation — were driven primarily by the enthusiasm of the investor community following Meta's rebrand announcement, rather than by the underlying fundamentals of the platforms.

Coinbase, the leading crypto exchange, had 11.4 million monthly active users and eighty-nine million total registered users in 2021, with transaction volumes of five hundred and seventy-four billion dollars in Q4 2021 alone. MetaMask, the most popular Ethereum wallet, grew from five hundred thousand monthly active users in July 2020 to over ten million in August 2021.

According to an Activate Consulting study, twenty-three percent of cryptocurrency holders have also invested in NFTs, with seventy-six percent of NFT purchases motivated by financial or speculative objectives.

The implication is that the crypto-investor community is simultaneously one of the most powerful accelerators of the Web 3.0 metaverse and one of its most significant sources of fragility: the same enthusiasm that drives up valuations and attracts new users can reverse rapidly in response to market corrections, regulatory changes or negative news, creating a boom-bust cycle that undermines the long-term development of these platforms.

Social and Followers

The social-and-followers cluster represents one of the most significant growth vectors for the metaverse in the medium term. These are the audiences of the personalities, influencers and brands that we discussed earlier: people who follow specific individuals or organisations and who enter the metaverse motivated by the opportunity to engage more closely with those they admire.

The logic is compelling. A concert in the physical world can accommodate tens of thousands of people; a concert in the metaverse can accommodate millions, from anywhere in the world, at zero marginal cost. A meet-and-greet with a celebrity in the physical world is accessible only to the very few; in the metaverse it can be made available, in different forms, to millions of fans simultaneously. This democratisation of access to exclusive experiences is one of the most powerful arguments for the metaverse as a social platform.

The combination of social belonging, exclusive experiences and novel forms of fan engagement creates a powerful motivational cocktail for this cluster. Cinema franchises (Marvel, Star Wars, DC), sports organisations (football clubs, F1 teams), and fashion brands are all actively building their presences in the metaverse, and their fan communities represent natural audiences for these virtual spaces. Ralph Lauren partnered with Zepeto to create virtual outfits for avatars; Decentraland hosted the Metaverse Fashion Week; Pandora opened an island on Animal Crossing.

This cluster is also likely to be among the most commercially active in the metaverse: they will attend virtual events, purchase branded virtual goods, and participate in loyalty programmes. They represent, in many ways, the natural first market for brand e-commerce within the metaverse.

The direction of causality is not one-way. We have observed how stars created within the metaverse — gaming champions, virtual influencers, famous content creators — are building audiences that extend beyond the platform into the physical world. Virtual influencers — AI-generated personas with no physical existence — already accumulate millions of followers on Instagram and TikTok. As these flows intensify, the metaverse will increasingly function as a factory of cultural influence, not merely a medium for distributing it.

Players (Gamers)

The gamer cluster is quantitatively the largest and most important in the metaverse today. With approximately three billion gamers worldwide in 2022, this is the existing population that most naturally and immediately maps onto the metaverse. Not all three billion gamers are metaverse users in the strict sense, but a substantial fraction — particularly those who play on

the Quadrant A platforms — already exhibit exactly the behaviours characteristic of the metaverse: they live in persistent virtual worlds, interact through avatars, purchase virtual goods, and participate in social and cultural events.

The geographic distribution of the gamer population is dominated by Asia, with over 1.42 billion paying players, followed by Europe (668 million), Latin America (383 million) and North America (261 million). In the United States alone there are over 214 million video game players, and approximately three-quarters of American households have at least one person who plays video games. Sixty-four percent of the adult population and seventy percent of under-eighteens play regularly.

Three dimensions of segmentation are particularly useful for understanding the metaverse implications of the gamer population:

The first dimension is hardware. Mobile players (the largest and fastest-growing segment) tend to seek a more varied range of activities — socialising, creativity, competition — while console and PC players are more focused on single-game immersion. This behavioural difference has significant implications for the metaverse: mobile gamers are more likely to engage with the social and commercial dimensions of virtual worlds, while console and PC gamers are more likely to seek deep, single-game experiences.

The second dimension is age. The stereotype of the male adolescent gamer is outdated: over fifty percent of gamers are now female, and the age distribution is surprisingly broad — in the United States the average age of a gamer is between thirty-five and forty-four years, though the youngest generations are the most intensively engaged. The under-sixteens are particularly concentrated in the Quadrant A platforms: sixty-seven percent of Roblox users are under sixteen, as are comparable proportions of Fortnite and Minecraft players.

The third dimension is non-gaming activities. This is perhaps the most revealing: approximately sixty percent of American gamers participated in at least one 'non-gaming activity' within a game platform in the past year — events, films, virtual meetings, concerts. This figure is growing and suggests that gaming platforms are increasingly functioning as general-purpose social and cultural spaces, not just as vehicles for playing games. This evolution is the most important structural driver of the long-term growth of the metaverse.

What about the potential migration of traditional gamers towards the Web 3.0 platforms of Quadrant B? The barriers are significant: the technical complexity of blockchain wallets and transactions, the speculative and sometimes chaotic atmosphere of these platforms, and the lower quality of the gaming experience compared to traditional titles. But the potential drivers of migration are also real: the play-to-earn model (the ability to generate real income through gameplay) is particularly compelling for players in emerging markets, where platform earnings can represent a meaningful income. In the Philippines, during the peak of the Axie Infinity play-to-earn game, many players were earning more from the game than from their day jobs.

Professional Players

Professional players — the elite tier of the gamer population — deserve separate analysis. This cluster is numerically small but strategically important for two reasons: their visibility makes them powerful ambassadors for the metaverse to audiences who do not yet engage with it, and the expansion of the play-to-earn model could dramatically increase their numbers.

Today, professional players are primarily associated with esports — organised competitive gaming tournaments with prize pools that can reach tens of millions of dollars. The most

watched esports events attract audiences comparable to major traditional sporting events, and the top players have followings in the tens of millions on streaming platforms like Twitch and YouTube Gaming. Fortnite is consistently the most-watched game on Twitch; League of Legends World Championship attracts over seventy million viewers.

The play-to-earn model has the potential to dramatically expand the concept of 'professional player' beyond the elite esports tier. In a play-to-earn game, income is generated not through tournament prizes or streaming revenues but through the gameplay itself — by breeding and selling game characters, acquiring and developing virtual land, or completing quests that yield tradeable tokens. In theory, any skilled and dedicated player can generate income, not just those talented enough to compete at the highest level.

The scale of this opportunity is most vivid when considered globally. A player earning one hundred and fifty to two hundred dollars a month from a play-to-earn game may be earning less than minimum wage in the United States, but in a lower-income country that figure can represent a significant and potentially life-changing income. This dynamic was documented vividly in the Philippines during the Axie Infinity boom of 2021, and illustrates the potential of the Web 3.0 metaverse to create genuinely new economic opportunities for populations that would not otherwise have access to them.

Creators and Developers

The creator and developer cluster is the engine that produces the content and experiences that give the metaverse its value. Without creators, the metaverse is an empty infrastructure; with a large, skilled and motivated community of creators, it can become a space of endless discovery and engagement.

Today there are over fifty million independent content creators globally and over two million professional content creators, generating an estimated creator economy worth approximately twenty billion dollars in 2022 — with projections suggesting it will exceed one hundred billion dollars within a few years. This economy includes YouTubers, TikTokers, game developers, virtual world builders, digital artists and many others.

For the metaverse specifically, the most important creators are those who build experiences within virtual worlds. Roblox has over one million independent creators who have built over fifty million games and experiences within the platform. Many of these creators earn significant incomes: the top Roblox creators earn millions of dollars a year. The Sandbox, Decentraland and other Web 3.0 platforms also have active creator communities, though at smaller scale.

The relationship between creators and platforms is evolving. The traditional model — in which creators are essentially content suppliers to centralised platforms, which retain a large fraction of revenues — is being challenged by the Web 3.0 model, in which creators control their intellectual property through NFTs and receive royalties on secondary market transactions. This model is still in its infancy, but it represents a potentially significant shift in the economics of content creation.

Meta has announced a fund of one hundred and fifty million dollars dedicated to supporting the next generation of creators and developers. Epic Games has made massive investments in making Unreal Engine more accessible to non-specialist creators. All major platforms are competing intensely for creator talent, recognising that the quality and quantity of creator-generated content is the most important determinant of platform attractiveness.

The availability of skilled creator and developer talent is one of the potential bottlenecks for the growth of the metaverse. Building three-dimensional virtual environments requires skills — three-dimensional design, game development, virtual architecture — that are in short supply globally. The democratisation of creation tools (no-code and low-code platforms, AI-assisted design, accessible development environments) is therefore one of the most important infrastructure investments in the metaverse ecosystem.

Considerations

The analysis of all these stakeholder clusters leads to several important conclusions. First, the growth trends are positive across all eight clusters, confirming that the metaverse's audience growth projections — five billion users by 2030 — are realistic. Second, the growing importance of non-gaming activities as a draw for new audiences is a critical structural trend. Third, all these clusters are contributing to virtuous circles that feed each other: creators attract users, users attract brands, brands attract creators, creating a self-reinforcing ecosystem of growth. Fourth, the creator and developer community is simultaneously one of the most important assets and one of the most significant potential constraints on the metaverse's development.

chapter 5

Following the Money

Having mapped the players, the users and the stakeholders of the metaverse, we now turn to the financial flows that are sustaining and accelerating its development. Understanding where the money is coming from — and where it is going — gives us a clearer picture of the market's direction and of the priorities of those who are building it. We identify four main categories of financial resources: consumer revenues, direct investments, corporate investments, and venture capital and capital markets.

Consumer Revenues

Consumer revenues are the most solid financial foundation of the metaverse, because they reflect genuine demand — people voluntarily spending real money for virtual experiences. They come from three main sources: in-game purchases (freemium model), pay-to-play models, and hardware.

The global gaming market was worth approximately one hundred and sixty billion dollars in 2020, and is growing at high single-digit rates every year. The shift from pay-to-play to freemium has transformed the economics of this market: instead of a single upfront payment for a game, players now make continuous small purchases — skins, accessories, event tickets, virtual real estate — that generate far larger aggregate revenues over time. Roblox generated revenues of approximately 1.8 billion dollars in 2021 from Robux sales; Fortnite approximately nine hundred million dollars. In 2021, players spent more than fifty-four billion dollars on virtual goods within gaming platforms globally.

These numbers demonstrate that a large and growing population is not only willing but eager to spend money on digital goods — and that this willingness does not require the most technically sophisticated metaverse experiences. The freemium model has proven enormously effective at monetising engagement, and the trend is towards more and more sophisticated in-game economies with larger and more diverse ranges of virtual goods.

The hardware market — primarily VR headsets — is growing rapidly from a small base. Approximately eleven million VR headsets were sold in 2021 (according to IDC), led by the Meta Quest 2 (Oculus), which accounted for approximately seven million units. The market grew by ninety-two percent between 2020 and 2021, though the absolute numbers remain small compared to the smartphone market. The price range for VR headsets is from approximately three hundred dollars (Meta Quest 2) to several thousand dollars for professional-grade devices; the mass market is concentrated at the lower end.

Direct Investments

The large technology companies are investing tens of billions of dollars a year in the metaverse. These direct investments are concentrated in a few major players, but their scale and ambition are transformative for the entire ecosystem.

Meta announced investments of ten billion dollars in its Reality Labs division in 2021 alone, with expectations of continued or increased investment in subsequent years. These investments cover VR/AR hardware development, the Horizon platform ecosystem, creator

tools and funds, and the underlying infrastructure of the metaverse. Zuckerberg has stated explicitly that Meta's Reality Labs division is expected to continue losing money for many years — this is a long-term strategic investment, not a short-term profit-seeking activity.

Microsoft's acquisition of Activision Blizzard for fifty-nine billion dollars is the largest single metaverse investment to date. It significantly expands Microsoft's gaming portfolio (adding Call of Duty, World of Warcraft, Candy Crush and many others) and gives it the content depth needed to build a major consumer gaming platform alongside its existing enterprise metaverse strategy with HoloLens and Teams. Microsoft has also invested heavily in its cloud gaming infrastructure and in the integration of mixed reality into its productivity applications.

NVIDIA's investment in its Omniverse platform targets the enterprise metaverse: digital twins of physical facilities, industrial simulations, collaborative design environments. NVIDIA's strategy is distinctive in that it is primarily B2B rather than B2C — it builds the infrastructure that other companies use to build their metaverse applications, rather than competing directly for consumer audiences.

Epic Games has announced two billion dollars of direct investment to support its metaverse development efforts, with a particular focus on Unreal Engine as a general-purpose metaverse creation platform and on Fortnite as a model for the large-scale social metaverse.

In a fragmented market characterised by many small players, a significant fraction of the direct investments of the large tech companies will be directed towards M&A and consolidation. Microsoft's acquisition strategy is the most explicit example, but Meta and other players are also actively seeking acquisitions in the gaming and infrastructure sectors.

Companies and Brands

Beyond the technology companies that are building the infrastructure and platforms of the metaverse, a broad range of companies and brands from other industrial sectors are investing in the metaverse — primarily for marketing but increasingly for commerce and business transformation.

Fashion and Luxury

Fashion and luxury brands are the most advanced in the metaverse, having invested most heavily and most innovatively. The use cases span virtual fashion shows, NFT collections, virtual retail, branded virtual experiences, loyalty programmes, and digital twins of physical products. Gucci Garden on Roblox (attracting over nineteen million visitors), Nike's RTFKT acquisition, Adidas' purchase of a plot in The Sandbox, Ralph Lauren on Zepeto, Dolce & Gabbana at the Metaverse Fashion Week on Decentraland — these are just the highest-profile examples of a trend that is rapidly becoming industry-standard.

For fashion brands, the metaverse is not just a marketing channel but a new commercial space, because the aspirational and collectible nature of fashion products translates naturally to digital goods. A limited-edition digital handbag or sneaker appeals to the same desire for exclusivity and self-expression as its physical equivalent — and in some respects offers advantages: it never wears out, can be displayed to any audience in the virtual world, and is provably scarce thanks to blockchain technology.

Retail

Retailers are investing in the metaverse as an extension of their omnichannel strategies. Dyson launched a virtual store accessible via VR headset that allows consumers to walk through the space and experience products virtually. Samsung opened a virtual store in Decentraland. Walmart has filed trademarks related to virtual goods and cryptocurrency. The underlying logic is the same as for all digital retail evolution: meet consumers where they are, offer better experiences, build community.

Automotive

The automotive sector is investing in the metaverse both for marketing (virtual product launches, branded driving experiences) and for business operations (digital twins of factories, virtual training). BMW partnered with NVIDIA to build a digital twin of its factories on Omniverse; Hyundai partnered with Unity for the same purpose. McLaren, Maserati, Aston Martin and Tesla have all created virtual vehicle experiences within gaming platforms. Hyundai has announced an ambitious programme of in-vehicle technology integration that will connect physical cars to the metaverse.

Financial Services

Financial institutions are investing in the metaverse at multiple levels: as marketers (virtual branches, branded events), as employers (VR training for employees, as Bank of America has done), and as innovators confronting the fundamental implications of Web 3.0 for their business models. Crypto wallets, digital identity, cryptocurrency transactions, NFT custody, decentralised finance — all of these are areas where traditional financial institutions are actively experimenting with new products and services. New financial products native to the metaverse are emerging: virtual real estate mortgages, investment funds for metaverse projects, banking services for crypto wallet holders.

Consumer Goods

Consumer goods brands are investing in the metaverse primarily for marketing, but increasingly for product innovation and loyalty. Hasbro created a new character in Roblox selling virtual items; Coca-Cola launched a virtual jacket for avatars in Decentraland; Procter & Gamble entered the metaverse with a virtual storytelling experience called Beauty Star; L'Oréal registered seventeen patents related to NFTs. The pattern is consistent across the sector: an initial wave of marketing activations, followed by more strategic experimentation with virtual product extensions and loyalty programmes.

Venture Capital and Capital Markets

More than one hundred and twenty billion dollars flowed into the metaverse space as investment in 2022 alone — more than double the fifty-seven billion invested in 2021. According to Crunchbase data, the breakdown of 2022 investments by segment was approximately:

– Gaming: approximately 7.5 billion dollars across 382 investment rounds

– Online games: approximately 2.5 billion dollars across 110 rounds

– Augmented reality (AR): approximately 2.1 billion dollars across 176 rounds

– Virtual worlds: approximately 63 million dollars across 9 rounds

Notable examples include: OpenSea (the largest NFT marketplace), which raised three hundred million dollars at a valuation of 13.3 billion dollars; Yuga Labs (creator of the Bored Ape Yacht Club), which raised four hundred and fifty million dollars at a valuation of four billion dollars to build its own virtual world; Improbable (a metaverse technology company), which raised one hundred and fifty million dollars in a round led by Andreessen Horowitz and SoftBank; and The Sandbox, which raised ninety-three million dollars from SoftBank.

The VC community's enthusiasm for the metaverse is based on three sets of fundamentals: the rapid technological progress in infrastructure (5G penetration, GPU development, VR/AR hardware improvement, game engine democratisation); the demonstrated willingness of users to adopt metaverse behaviours and spend money in virtual environments; and the potentially transformative implications of Web 3.0 technologies (blockchain, NFTs, digital identity, decentralised governance) for the structure of the internet and the digital economy.

For the Web 3.0 metaverse players specifically, there is an additional source of financing: Initial Coin Offerings (ICOs), through which companies raise funds by issuing proprietary cryptocurrencies or tokens to the public. The total market capitalisation of crypto assets generated through ICOs already exceeds two hundred and fifty billion dollars globally. The MANA token of Decentraland ranks thirty-sixth by market capitalisation among all cryptocurrencies; SAND ranks thirty-seventh. These rankings are volatile and sensitive to market sentiment, but they demonstrate that even relatively niche metaverse platforms can access substantial capital markets financing.

The risks of this VC and capital markets dynamic are real. The enthusiasm of financial investors can be reversed quickly by adverse news, regulatory changes or disappointing results. The boom-bust cycle in ICOs and NFT valuations of 2021-22 demonstrated both the potential and the fragility of hype-driven financing. Our assessment is that the core gaming and hardware investments are on a stable and sustainable growth trajectory; the Web 3.0 metaverse is in a higher-risk zone where the sustainability of business models has not yet been proven.

Conclusions

The journey we have made through the metaverse — its definitions, its ecosystem, its users, its stakeholders and its financial flows — allows us to draw a map of a market that is at once already real and still in its infancy. What we have found may surprise those who came to this analysis shaped purely by the media hype of 2021: the metaverse is not a fantasy of the future. It exists today, it is populated by hundreds of millions of users, it generates billions of dollars in revenues, and it is attracting some of the largest investments in the history of technology.

At the same time, the metaverse as commonly imagined — fully immersive, fully interoperable, a seamless blend of physical and digital — is still a distant vision. The infrastructure is not yet ready, the hardware is too expensive and too cumbersome, the standards for interoperability have not been agreed, the regulatory framework has not been defined, and the user experience still requires too much technical sophistication for genuine mass adoption. Between the metaverse that exists today and the metaverse that has been promised, there is a long road of investment, innovation and experimentation to travel.

What has surprised us most in this analysis is the scale and cultural significance of the gaming sector at the base of the metaverse. Three billion gamers; fifty-four billion dollars spent on virtual goods in 2021; sixty percent of Roblox users regularly participating in non-gaming social activities; twelve million people attending a virtual concert simultaneously. These are not marginal phenomena. They are evidence of a deep and growing human appetite for virtual social and commercial experiences — an appetite that predates Zuckerberg's rebrand and will outlast any hype cycle.

Short-Term Outlook (1-2 Years)

In the near term, we expect continued strong growth in the traditional players of Quadrant A. The gaming and virtual goods markets are structurally sound and growing at consistent rates. New content, new events, new branded activations and the progressive expansion of non-gaming activities will continue to expand the user bases and revenues of Roblox, Fortnite, Minecraft and their peers.

For the Web 3.0 metaverse, the near term will be a period of turbulence and selection. The speculative dynamics that inflated valuations in 2021 will continue to correct. Many projects will fail. But those that survive the correction — those that build genuine user experiences and genuine communities, not merely speculative financial instruments — will emerge stronger and better positioned for the medium term.

For the Big Tech players, the near term is primarily a period of platform building: improving the user experience, expanding the hardware ecosystem, building creator communities and developer ecosystems. Meta's Reality Labs will continue to lose money. Microsoft's gaming integration will take time to bear fruit. The results will not be visible in two years.

Medium-Term Outlook (3-5 Years)

In the medium term, the most important question is whether durable and large-scale players will emerge from the Web 3.0 ecosystem. If, by 2025-2027, players like The Sandbox or Decentraland have significantly increased their user bases and proven the sustainability of their economic models, it will be possible to affirm that the Web 3.0 metaverse is a genuine

structural force. If not, the metaverse will remain primarily a centralised phenomenon, driven by the large technology companies.

The medium term will also see significant consolidation in the gaming and hardware markets. The large technology companies — Microsoft, Meta, potentially Apple and Google — will continue their acquisition strategies, and the market will gradually concentrate around a smaller number of dominant players. The balance between centralised and decentralised models will begin to become clearer.

In terms of technology, the medium term will bring significant improvements in VR/AR hardware — better resolution, lighter form factors, lower prices — but we do not expect a fundamental discontinuity. The mass market for VR headsets will grow, but will remain a fraction of the smartphone market. Augmented reality, which is less disruptive to everyday life, may grow more rapidly as form factors improve towards something approaching normal glasses.

Long-Term Outlook (10+ Years)

The long-term future of the metaverse will be shaped by three forces: the evolution of the hardware and the front-end experience, the resolution of the interoperability question, and the contest between centralised and decentralised models.

On the front end: as hardware improves — contact-lens-scale VR, brain-computer interfaces, seamless AR glasses — the line between physical and virtual experience will become increasingly blurred. The metaverse will become part of the fabric of everyday life in ways that are difficult to imagine today but that feel inevitable in retrospect. We already carry smartphones everywhere and could barely imagine life without them twenty years ago. The metaverse equivalent of the smartphone — whatever form it takes — will similarly become indispensable.

On interoperability: the achievement of genuine interoperability — the ability to move assets, avatars and identities freely between virtual worlds — will be the most important structural change in the metaverse. It is technically achievable and economically beneficial for the ecosystem as a whole, but politically difficult because it requires incumbents to accept a degree of openness that threatens their competitive advantages. We expect solutions to emerge in the areas of digital identity and digital asset ownership, even if full platform interoperability remains elusive.

On centralisation versus decentralisation: this is perhaps the most fundamental and philosophically significant question in the long-term development of the metaverse. If the Web 3.0 model succeeds — if decentralised, user-owned virtual worlds can grow to the scale of today's centralised platforms — it will represent one of the most significant redistributions of economic power in the history of the internet. Users and creators, rather than corporations, would own and control the virtual environments in which they live and work. This is an inspiring vision, but its realisation is far from certain.

What frightens us most — and perhaps should frighten us most — is not the economic or technical question but the anthropological one: what does it mean for human beings to spend increasing proportions of their lives in virtual environments? The metaverse offers extraordinary richness — new forms of creativity, sociality, commerce, education and entertainment. But it also raises profound questions about attention, identity, community, and the nature of experience. These questions will become more urgent as the metaverse becomes

more pervasive, and they deserve serious, sustained attention from scholars, policymakers, technologists and citizens alike.

Let us prepare ourselves. But perhaps this is not as revolutionary as it sounds: it is surely a great enrichment of the range of experiences available to us as human beings, potentially a very large and opportunity-rich market, and although it will become ever more pervasive, it will be we ourselves — as users, with our adoption rates — who determine whether it succeeds.

The Keywords of the Metaverse

The following glossary defines the most important technical terms used in this book.

avatar: The image or graphical representation chosen by a user to represent themselves within a virtual community.

blockchain: (Italian: catena di blocchi) A shared and 'immutable' data structure. It is defined as a digital ledger whose entries are grouped into 'blocks', concatenated in chronological order, and whose integrity is guaranteed by the use of cryptography. Although its size is destined to grow over time, it is immutable in the sense that its content, once written through a regulated process, can neither be modified nor deleted, unless the entire process is invalidated. The characteristics common to systems developed with blockchain technology are: data digitalisation, decentralisation, disintermediation, traceability of transfers, transparency/verifiability, immutability of the ledger, and programmability of transfers. Thanks to these characteristics, blockchain is considered an alternative in terms of security, reliability, transparency and cost to databases and ledgers managed in a centralised manner by recognised and regulated authorities (public administrations, banks, insurance companies, payment intermediaries, etc.).

cryptocurrency: (or crypto-currency) An Italian adaptation of the English term 'cryptocurrency', referring to a digital representation of value based on cryptography. The word derives from the fusion of 'cryptography' and 'currency'. A cryptocurrency is a digital currency that, unlike traditional currencies, does not exist in physical form and is neither controlled nor managed by any central authority. Information about cryptocurrency transactions is stored in a decentralised digital ledger, typically based on blockchain technology. Despite the name, cryptocurrencies are not considered currencies in the traditional sense. Today they are generally considered a type of asset in their own right: neither a commodity, nor a financial security, nor a currency. The first and most well-known cryptocurrency is Bitcoin, created in 2008. There are over seventeen thousand five hundred cryptocurrencies in the world.

crypto exchanges: Platforms where it is possible to buy and sell cryptocurrencies. In particular, they match the supply and demand for specific digital currencies, enabling their exchange. Their function is therefore to enable the purchase and sale of cryptocurrencies and to generate a profit. Among the most well-known: Coinbase and Bitpanda.

crypto wallet: The 'digital wallet' in which the user keeps and manages their cryptocurrency and NFT assets. Each crypto wallet is equipped with a private key that allows exclusive access to its contents. Although various types of cryptocurrency wallets are available — including physical ones (devices similar to a USB drive) or in the form of a mobile app — most cryptocurrency wallets work in essentially the same way: storing pairs of private keys that allow the wallet to be synchronised across multiple devices to send and receive cryptocurrencies.

DAO: Acronym for Decentralised Autonomous Organisation. In brief, a DAO is an organisation governed by computer codes and programmes. As such, it has the capacity to function autonomously, without the need for a central authority. Through the use of smart contracts, a DAO can work with external information and execute commands based on it, all

without any human intervention. A DAO is usually operated by a community of stakeholders, incentivised through some kind of token mechanism.

digital identity: The set of digital resources uniquely associated with a natural person that identifies them and represents their will during their digital activities. Digital identity is normally presented to access a computer system or an information system, or for the signing of digital documents. In a broader sense, it consists of the set of information present online relating to a subject. In the context of the metaverse, digital identity is associated primarily with two dimensions: the first is the avatar and one's representation in the virtual world; the second is the wallet that identifies one's payments and digital assets. These two dimensions do not necessarily coincide. A user can have several digital identities, some anonymous and others not, depending on their activities and the virtual worlds they frequent.

Ethereum: A decentralised Web 3.0 platform for the peer-to-peer creation and publication of intelligent contracts (smart contracts) created in a Turing-complete programming language. The cryptocurrency linked to it, Ether, is second in capitalisation behind Bitcoin.

gas fee: Gas fees are commissions paid by users to compensate for the energy expenditure required to process and validate transactions on the Ethereum blockchain (typically for NFTs). The 'gas limit' refers to the maximum amount of gas (or energy) that one is willing to spend on a given transaction.

marketplace: An NFT (non-fungible token) selling site; an e-commerce in marketplace form. That is, a platform managed by a third party, on which the demand from collectors and the supply of NFTs from creators meet. The exchange of 'goods' takes place using cryptocurrencies. Among the most well-known: OpenSea.

mining: Cryptocurrency mining is a decentralised computing process for processing, securing, verifying and synchronising all transactions relating to cryptocurrencies. Cryptocurrency miners can publish and process cryptocurrency transactions through solo mining or in mining pools, which provide the right computing power for more complex computing tasks. For transactions to be completed, they must first be legitimised by miners through the resolution of numerical puzzles with mining computers. As a reward for the 'mining process', miners receive cryptocurrency.

minting: To mint means, in practice, to uniquely publish a token on the blockchain to make it purchasable. Technically, the minting process is that of validating information, creating a new block and recording that information on the blockchain. The mint is decentralised, allowing anyone to create tokens without the need for a central regulatory authority. When you 'mint' an NFT you create an asset on the blockchain, permanently. The term is used particularly for NFTs, while in the case of the 'similar' process applied to cryptocurrencies the term Mining is used.

mixed reality: The fusion of the real world with the virtual world that allows new environments to be created in which people, physical and digital objects coexist and interact in real time. Mixed reality (MR) thus blends the physical with the virtual, using augmented reality to overlay them: one can observe the real world that surrounds us and draw useful information from it (in AR), but also see and move virtual objects as if they were real.

MMORPG: (Acronym for Massively Multiplayer Online Role-Playing Game) A video role-playing game (for computer or console) played simultaneously by multiple real people via the internet. In MMORPGs, thousands of players can play together and interact with each other,

interpreting customisable characters that evolve (acquiring skills, earning in-game currency, obtaining objects and equipment, etc.) together with the persistent world that surrounds them.

NFT: Acronym for Non-Fungible Token. NFTs are 'digital certificates' based on blockchain technology aimed at uniquely, irreplaceably and non-replicably identifying the ownership of a digital product. They are distinguished from 'generic' tokens by their uniqueness (they are individual and identified digital objects), while maintaining the other characteristics of generic tokens such as transferability, authenticity and transparency. Thanks to these characteristics, they lend themselves to multiple use cases.

play-to-earn: Play-to-earn games are particular video games through which users have the ability to invest and earn real money, through the exchange of 'digital native' financial instruments such as NFTs and cryptocurrencies. This is the typical user engagement mechanic for blockchain-based platforms.

smart contract: Digital contracts that 'self-execute' through a programme in a manner consistent with the agreements between the parties. In other words, the contract is a programme that is written and executed on the blockchain and that, when certain defined conditions occur, executes what has been established. Smart contracts are based on the decentralisation and distribution logic of the blockchain and are also the basis of DAO governance.

token: Literally a 'token', which can be associated with a value or generically with a privilege. In the context of the metaverse, it is applied primarily to Web 3.0 players based on blockchain. In this case, in response to a payment or a virtuous action by the user, the platform releases a token that allows the user to have certain privileges such as, for example, access to platform governance (via DAOs) or other kinds of benefits. A token may or may not be a real cryptocurrency depending on the case and the issuance logic. In general, reference is made to the Token Economy when a rewarding logic of virtuous user behaviour is created, to which tokens and economic and non-economic privileges correspond.

virtual good: Non-physical objects purchased for use within games and online communities. Virtual goods are different from digital goods and include a broader category of which music or e-books, for example, are part. Typically, virtual goods are digital clothing and accessories for one's avatar, today mainly linked to a single game and sold within platforms through micropayments by users.

virtual world: A three-dimensional (3D) immersive digital environment (with or without VR) within which the user interacts through an avatar and an identity. In the virtual world, the characteristics of persistence of experiences are maintained, in the sense that the contents and what happens are not static but dynamic and evolving thanks to interactions with users, the immersiveness given by the 3D dimension, and above all the social dimension and the possibility of interacting with other users/avatars in real time.

Web 3.0: Compared to Web 2.0, Web 3.0 is characterised by greater awareness and superior control by users over content and graphical evolution from 2D to 3D. The main evolutionary aspects of Web 3.0 can be identified as follows: (1) content is no longer constituted by HTML pages, but by an underlying database that allows more in-depth and accurate searches; (2) artificial intelligence, associated with more structured data storage; (3) greater computing capacity and new algorithms aimed at the construction of genuinely

usable 3D environments. In general, the term Web 3.0 is associated with an idea of a decentralised and interoperable future internet, based primarily on blockchain technology.

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