

In collaboration
with Accenture



Demystifying the Consumer Metaverse

JANUARY 2023

Contents



Foreword	3
Executive summary	4
Initiative overview	5



1 Decoding the metaverse, web3 and Web 3.0	6
2 Value creation in the consumer metaverse	15
3 Metaverse economic models	21
4 Future value horizons in the metaverse	24
Conclusion	29



Appendix: Economic models in the consumer metaverse	30
Glossary	48
Contributors	49
Endnotes	52

Disclaimer

This document is published by the World Economic Forum as a contribution to a project, insight area or interaction. The findings, interpretations and conclusions expressed herein are a result of a collaborative process facilitated and endorsed by the World Economic Forum but whose results do not necessarily represent the views of the World Economic Forum, nor the entirety of its Members, Partners or other stakeholders.

© 2023 World Economic Forum. All rights reserved. No part of this publication may be reproduced or transmitted in any form or by any means, including photocopying and recording, or by any information storage and retrieval system.

Images: Getty Images, Unsplash

Foreword



Cathy Li
Head, Media, Entertainment
and Sport and Member of
the Executive Committee,
World Economic Forum



Kevin Collins
Managing Director and
Global Software and
Platforms Lead, Accenture

Defining and building the metaverse

The next era of the internet is taking shape, with the convergence of technologies forging the metaverse, an immersive, interoperable, and synchronous virtual world. Though a single standard definition for the metaverse has yet to emerge, experts agree that this new age of the internet will disrupt and transform current social and economic structures. From more immersive, empathetic social experiences to more universal access to services and education, the metaverse presents momentous opportunity, but also brings about new challenges.

It is within this context that in May 2022, the World Economic Forum launched the initiative [Defining and Building the Metaverse](#). The initiative has brought together a global, multistakeholder group of more than 100 experts in academia, civil society, government, technology and business to help shape a future metaverse that is equitable, safe and economically viable. The initiative does so via two tracks: governance, and economic and social value creation, as the interdependent topics that the public and private sectors must work together on in order to responsibly activate the metaverse.

The governance track focuses on frameworks that prevent potential harms and mitigate emerging risks while ensuring equity, privacy, security, safety and interoperability. The first output of the track is focused on interoperability, which is founded on the ability for users to participate across environments and technologies, for data to circulate freely and securely, and for systems to exchange information seamlessly.

Meanwhile, the value creation track looks at the opportunities in consumer, industrial and enterprise metaverses and researches the considerations for access, inclusion, sustainability and well-being that will come with its development.

This insight report, written by the World Economic Forum in collaboration with Accenture, is focused on consumer applications, exploring the key components, foundation technologies, roles and paths to economic value and growth. Due to their experimentation, incubation and creation of new behaviours and business models, the work of consumer organizations can serve to inspire and illuminate more changes to come.

While some economic models will simply be replicated from the existing internet to metaverse environments, complemented by a certain level of immersion or interaction, others will disrupt entire industries and generate brand new revenue streams. It is our hope that this paper will educate and guide organizations to stable and informed decision-making so that value creation is equitable and sustainable for all.

Executive summary

The consumer metaverse offers a myriad of economic opportunities and challenges

The metaverse is expected to have a wide-ranging impact on consumers' attitudes and behaviours, impacting how, where and when they will want to play, learn, earn and socialize in their existing reality or newly established augmented and virtual realities. Consequently, organizations will need to redefine their brand image, shift their relationship model with consumers and change the way they monetize products and services in order to create true consumer value. They will likely move from offering products and services to being metaverse participants and providers, introducing engaging experiences and building communities in order to create meaning and fulfilment for their customers.

The World Economic Forum has launched the Defining and Building the Metaverse initiative to help explore and qualify the metaverse's social and economic opportunities and challenges while aiming to explore and create a holistic governance framework. The initiative does so within two tracks, the **value creation** and **governance** track.

While the broader initiative explores the metaverse from multiple angles and dives into areas from interoperability and identity to social value, this report aims to give a holistic introduction to the consumer-facing metaverse and its economic opportunities.

The key question of this report is: What makes up the metaverse and how can organizations and individuals create equitable economic value through it in a consumer context?

Drawing on expertise in retail, media and entertainment, consumer packaged goods, real estate, banking and communications, as well as technology innovation, web3, environmental, social and governance (ESG), and economics experts, this insight report presents an interdisciplinary view of the end-user experience layer of the metaverse, capturing the present technology landscape and related economic models that may pave the way for future growth.

A selection of this paper's key insights is outlined in the following:

- While it currently is difficult to define the metaverse, its main distinguishing components are highlighted to be social interaction, identity, multilateral value exchange and distribution, and a degree of immersion.
- Impacted by wider society – organizations and individuals can take on one or multiple roles in the metaverse, from being participants to creators or providers.

- The role of individual creators will be amplified in the metaverse. Technologies such as AI and blockchain, will support this amplification. An evolving creator economy will influence value distribution in the metaverse greatly and offer far-reaching opportunities for businesses and individuals, but it will also pose challenges when approached incorrectly.
- Eight economic models were identified to drive value in the metaverse, including digital products and assets, access and influence, immersive commerce, payments and currency, asset monetization, advertising and marketing, the creator economy, and metaverse-native services.
- A selection of six drivers of metaverse growth and adoption were identified, including metaverse-ready networks, realistic avatars, infrastructure, governance, standards and regulation, ownership and artificial intelligence.

Given the breadth of the metaverse topic, this report confines itself to the consumer metaverse and its economic challenges and opportunities. Further work within this value creation track will explore the enterprise and industrial metaverse, as well as the metaverse in the context of education, healthcare, life sciences, infrastructure and cities.

Defining and Building the Metaverse

Initiative overview

Value creation

The consumer metaverse

Exploration of the key components, foundational technologies, roles and paths to economic value creation and growth in the consumer metaverse.

The industrial metaverse

Exploration of early-stage use cases, foundational technologies and future potential related to the industrial metaverse.

Social value in the metaverse

Exploration of social opportunities and challenges in the context of the metaverse as it relates to diversity, equity and inclusion, as well as access and well-being.

The future of consumer, industrial and enterprise metaverses

Expanding on research and analysis from 2022, the initiative will look at how to activate the economic fly wheel of the metaverse, through the identification of new value chains and future growth scenarios

Coming up:

Explore the frontier technologies in healthcare, education and cities

2022

2023

2024

Governance

Interoperability

Exploration of target states, capability gaps, potential risks, solutions and opportunities related to metaverse technical, usage, and jurisdictional interoperability.

Privacy, security and safety

Exploration of target states, capability gaps, potential risks, solutions and opportunities related to privacy, security and safety. These will be explored in conjunction with notice and consent structures, anonymity, and the right to be forgotten, among other topics.

Identity

Exploration of target states, capability gaps, potential risks, solutions and opportunities of technical and functional identity. Additional topics to explore include physical, emotional and mental well-being.

Governance white paper

Analysis of the material shared across the exploratory series on interoperability, privacy, security, safety and identity bolstered by a supporting governance white paper, which can be used by metaverse stakeholders to create a human-first metaverse.

1

Decoding the metaverse, web3 and Web 3.0



Introduction

The introduction of innovative technologies regularly changes and shapes the world's social and economic structures, presenting momentous opportunities and pivotal challenges.

The prime example of groundbreaking technological change is the internet. While the first versions of the internet (internet of data) solely served the purpose of exchanging information, later iterations introduced the concepts of social interaction, entertainment, commerce (internet of people) and direct interconnection of physical objects, creating connected worlds (internet of things).

The current iteration of the internet, Web 3.0 (internet of place and ownership), evolves its predecessors towards a more intuitive interaction with technology. It reimagines the connection between the virtual and the physical world while emphasizing ownership of identity and assets, enhancing the way humans conduct their private, public and professional lives.

While exact definitions are widely discussed, Web 3.0, web3 and the metaverse are expected to create the next wave of significant technological, and hence economic and societal change.

FIGURE 1

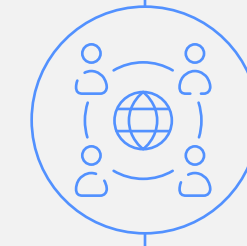
Evolution of the internet



1990s

Internet of data

Made vast amounts of information available for people to access anywhere, anytime and search with ease



2000s

Internet of people

Connected people to people across vast distances and brought virtual social life to the forefront



2010s

Internet of things

Connected phones, devices and machines together, extending the digital world for people

Web 3.0

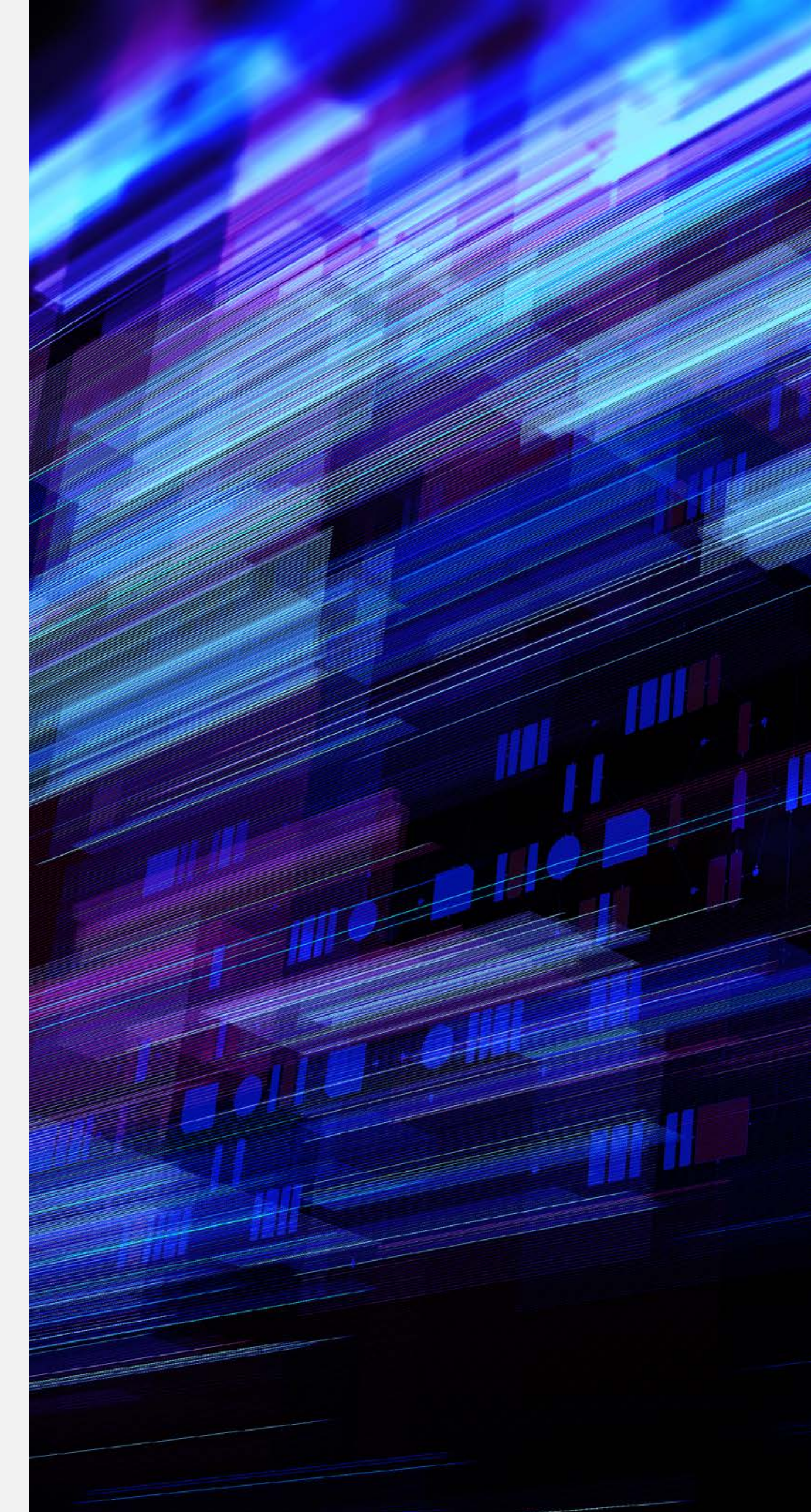
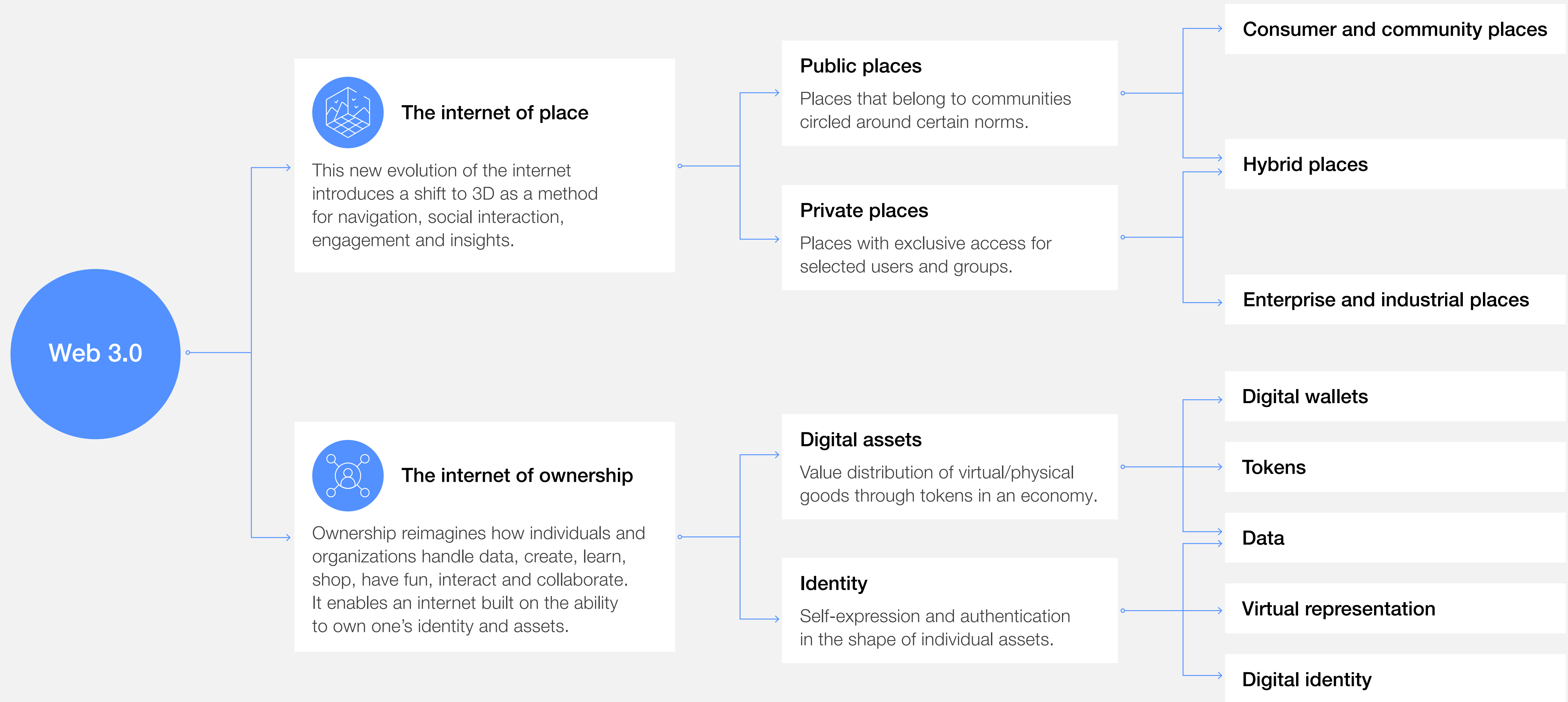
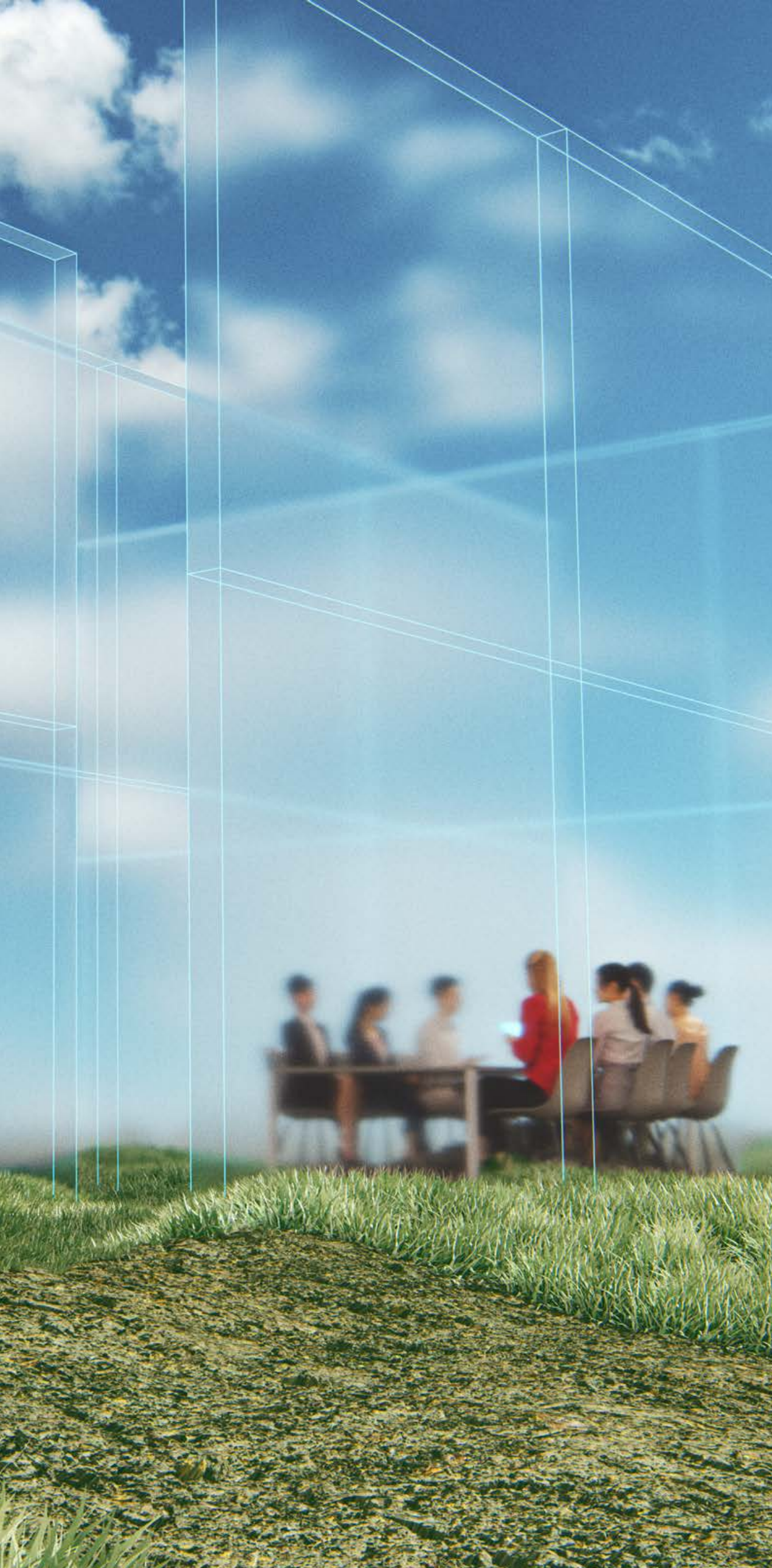


FIGURE 2

Web 3.0 as defined by Accenture





Decoding the metaverse

In a quest to quantify the metaverse's future impact, the metaverse is predicted to be worth \$6-13 trillion by 2030,¹ with global revenues expected to reach \$800 billion by 2024.²

Today's metaverse is an expanding and evolving proposition that will be re-defined perpetually. A "true" metaverse does not exist yet, and mass adoption will most likely be driven by advances in hardware, software and processing power, enabling density of population and high levels of interaction in virtual worlds. Hence, formulating an all-encompassing definition for the metaverse is rather difficult at this point in time. However, it is acknowledged that there is a need to define the metaverse's components to help identify its fabric and inform investment decisions.

Guided through conversations with metaverse thought leaders and analysis of existing publications, the World Economic Forum highlights social interaction, identity, multilateral value exchange and distribution, and a degree of immersion as the main components of metaverse worlds, which combined with a set of foundational technologies, immersive content and experiences make the metaverse a new iteration of digital change, that will disrupt value chains, businesses and entire industries. It is noted that the metaverse won't be comprised of one single entity but many different worlds in either centralized or decentralized

environments that offer a certain degree of interoperability and create meaning and user fulfilment through value exchange between realities across virtual and physical worlds.

web3 and the metaverse

The terms web3 and the metaverse are often used interchangeably, though they refer to two different, albeit related, concepts.

While this report does not aim to give an exhaustive definition of the two terms or define their overlap, it will give a brief summary of the public's understanding of these concepts and their delineation.

Web 3.0, referenced earlier, describes the third stage of the internet. It is an evolution focused on distributing systems to create a more secure, transparent and open internet experience that enables direct interactions between users and their peers without intermediaries. Decentralization in this frame is achieved through web3, an emerging portfolio of decentralized technologies (such as blockchain and its applications), protocols and standards, which establish provenance, veracity and value of data.

Even though the metaverse and web3 are not interchangeable, use cases often employ both concepts. Hence, in the frame of the Defining and Building the Metaverse initiative, both concepts will be taken into consideration when discussing economic and social implications.



A massively scaled and interoperable network of real-time rendered 3D virtual worlds that can be experienced synchronously [...] with an individual sense of presence, and with continuity of data, such as identity, history, entitlements, objects, communications, and payments.

Matthew Ball, *The Metaverse*



... virtual worlds are generally 'composed of a few distinct elements: a society or grouping of humans; another world or reality involving events, identity, rules and things that are deemed to be in some way real; and an ongoing transfer of value between the two, which grows individual and group fulfilment, wealth and meaning.

Herman Narula, *Virtual Society*

The metaverse stack

Identity, value distribution, social interaction and immersion are key components of the metaverse and are enabled by an interplay of technologies, capabilities and human behaviour. Figure 3 aims to outline this interplay as the “metaverse stack”, layers of the metaverse in which value can be realized. Policy, security and governance should ensure the equitable realization of the entirety of the stack.

FIGURE 3
Layers of value creation in the metaverse



Select the layers
to discover more

Foundational technologies and capabilities driving the expansion of the metaverse

The previously outlined metaverse stack is enabled through a set of foundational technologies and capabilities. The metaverse market is expected to denote a compound annual growth rate of 39.8% from 2022 to 2030,³ which may signal a promising market unfolding the possibilities of new innovations and business models. Understanding the metaverse's technologies and their implications on future developments, from experiences to operations and adoption, is vital to foresee value creation in a consumer context. Figure 4 outlines and describes a selection of these metaverse technologies.

FIGURE 4

Foundational technologies and capabilities



Roles in the metaverse

In the metaverse, individuals and organizations take on the roles of society, participants, creators and providers, bringing the metaverse stack to life. Within these roles they constantly exchange value. Even though this value exchange is use-case dependent, each role is integral to the fabric of the metaverse.



Select the tabs
to discover more

The gaming industry as the pioneer in virtualized world-building

After a pandemic bump, interest in gaming has continued to skyrocket. Video game revenue is projected to show an annual growth rate of 7.7%, resulting in a projected market volume of \$285 billion by 2027.¹⁰

The gaming industry and the metaverse share an inherent experiential, social, transactional and sometimes virtual nature, with gameplay at the heart of its consumer value. Players in the gaming industry, such as Epic Games and Roblox, are pioneering ideas of what the metaverse could be, both in terms of engaging content and attracting audiences. Seen in the widely publicized virtual concerts and brand collaborations, these platforms engage users to develop their digital identities and enable them to express these identities through collectables and skins while offering them a virtual home in their communities.

The gaming industry has essentially moulded users for the metaverse and will continue to lead and help support development in perpetuity.

Just as gaming shapes our idea of the metaverse, the metaverse also impacts the gaming industry.

Collaboration is key to growth

Fuelled through the introduction of XR and web3 technologies such as blockchain, traditional business models of gaming companies are being challenged. Cryptocurrencies, non-fungible tokens (NFTs), and GameFi models are only some of the metaverse concepts that will impact gaming.

Conversely, consumer brands operating in the metaverse can draw inspiration from gaming company experiences in how to create unique and engaging touchpoints.

Creators as the primary source of content

User-generated content (UGC) has been a vital building block of the gaming industry for years. It provides virtual environments with personality, authenticity and scale, acting as a steady stream of new, engaging characters and content to fill the gaps between official content releases or even replace them altogether.

An expanding creator economy, in which tools for creation are widely available and easy to use, is essential to ensuring a steady flow of creativity into virtual worlds with new, engaging and personalized content that will inspire and retain users and ensure diverse and inclusive experiences. The metaverse brings this model a step further by enabling creator economies in which creators can monetize their IP in perpetuity, such as through royalties.

Organizations inside and outside of the gaming industry are expected to empower and uplift creators in the form of content generation but also in building long-lasting communities that bring creators to the forefront.

Implications of gamified experiences

With an aim to create responsible gaming and metaverse worlds, certain considerations need to be taken into account when designing both virtual worlds and experiences.

A growing data economy will elevate the need for privacy and security, while an influx of virtual assets will lead to the growing need for asset management. Furthermore, studies reveal a correlation between microtransactions, gaming and gambling disorders.

What valuable lessons from gaming light the path ahead?

Engage through play

VR gaming is expected to grow at a compound annual growth rate (CAGR) of 32.7% over the forecast period 2021-2027¹¹ and gamified commerce is booming. “Play” has led the first wave of metaverse adoption, with companies shifting from selling products and services to offering experiences.

Next generation of users are innate gamers

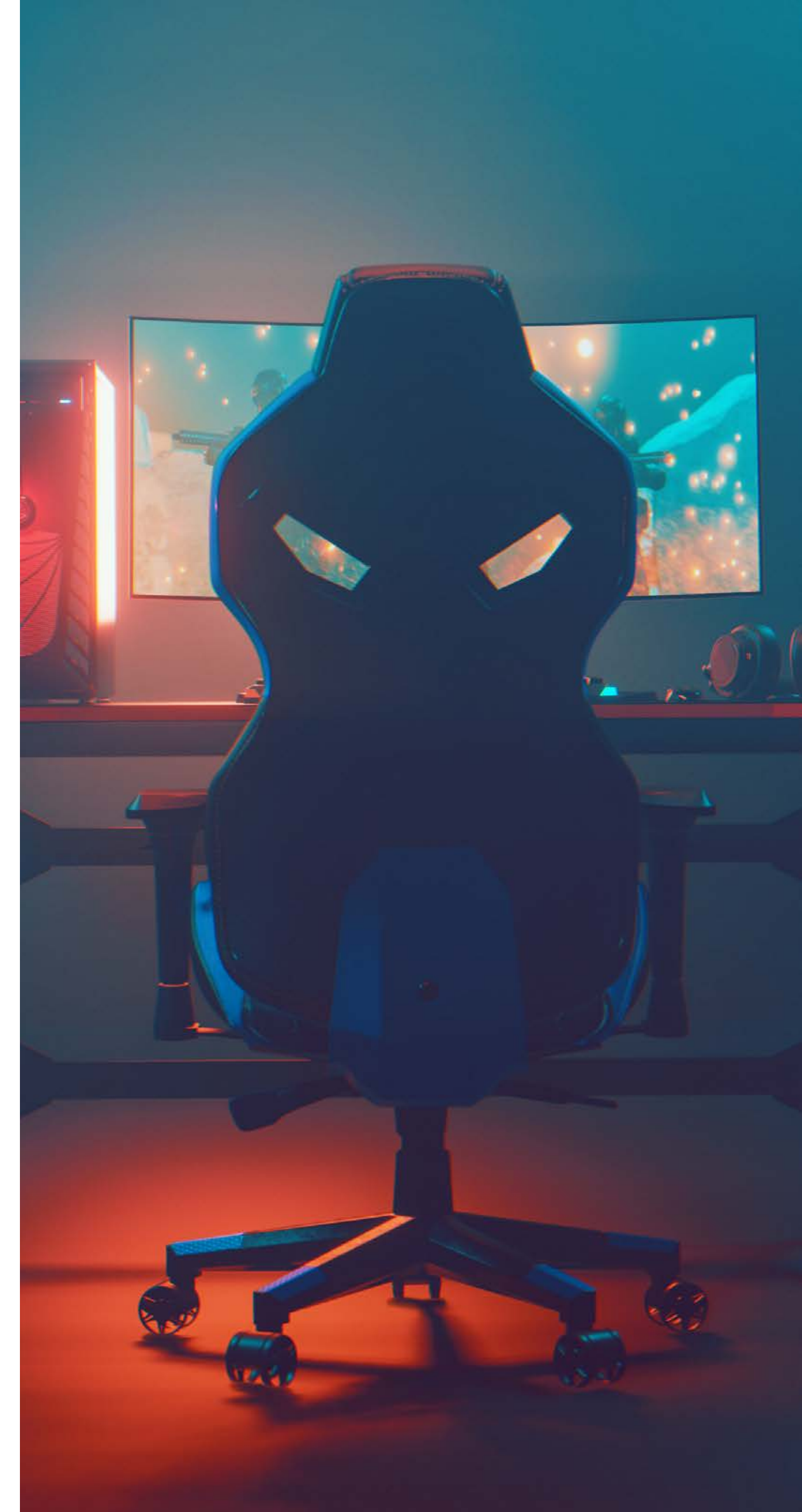
Gamers will inherit the metaverse: 54% of Roblox participants as of 2020 are younger than 13¹² and this demographic highlights gaming’s future potential, with the users of tomorrow being intrinsically gamers. As the metaverse of tomorrow is designed, users will expect frictionless, non-intrusive and socially engaging experiences to play, share, learn and socialize.

Creators and IP rights

Content in the metaverse will be increasingly built by individual creators, requiring the development of new ways of managing content, IP rights and ownership as important value drivers of leading metaverse experiences. Seen by many as a “prototype” of the metaverse, the platform Second Life has reportedly paid creators \$80 million in 2021 while reporting 64.7 million active users on their platform in the same year.

Social pays

Engagement is higher for metaverse players who play to socialize (over two extra hours played/month), and players who socialize spend more (over 4-5% spent every six months).¹³ While platforms like Roblox and Fortnite are becoming the most sought-after virtual destinations for socializing, branded virtual spaces and experiences on these platforms are gaining traction for advertisers. Roblox recently stated that it would soon allow brands to directly purchase in-game advertising and launch advertisement experiences, providing an opportunity for brands and businesses eager to target a tech-savvy young audience.



2

Value creation in the consumer metaverse

Introduction

The metaverse isn't conducive to a linear consumer journey. The days of step-by-step journey models are over. Humans don't follow linear paths to purchase, predictable patterns of behaviour, or set attitudes. They are driven by their in-the-moment intent. The next step from awareness is not always engagement. Brand loyalty doesn't require purchase. This could not be truer in the metaverse, where immersive experiences and fluid interactions allow brands to develop a deeper sense of relevance in their consumers' day-to-day. Brands will find new ways to authentically play a role in their consumers' specific missions, key occasions and magic moments.

A recent report, Gen Z and the Metaverse, by Nokia and Ipsos, implies that "consumer value" in the metaverse will look different for different personality profiles. As highlighted in the report, solidarity searchers, which are described as rather introverted, will find the most value in the metaverse, offering them heightened convenience, allowing them to complete mundane "social chores", such as clothes shopping, from home. In contrast, citizens, which the research describes as less tech-forward, will find the most value in the socialization and entertainment aspects of the metaverse.¹⁴

Further research in Roblox's recent 2022 Metaverse Fashion Trends report highlights that one attitude that most Gen Z shares is an ambition to embrace their digital identities and the liking of brands that support this identity creation.¹⁵ These findings highlight that just as in the current version of the internet, consumer value will not be generated universally but will have to be strongly aligned with the target group's wants and needs, using consumer data in a responsible manner that puts the human right for privacy at its centre.

→
Source: Accenture, Accenture Consumer Metaverse Study (Insights from ~9,000 global consumers), 2023.



61%

of consumers look forward to interacting with family and friends in the metaverse



52%

of consumers believe that the metaverse will strengthen the connection to their favourite brand



51%

of consumers look forward to creating and monetizing content in the metaverse

Drivers of consumer adoption

Virtual reality (VR)/augmented reality (AR) reaching mass market potential: This will open up the devices to millions of consumers and developers, ensuring a price point and feature set that meets consumer expectations.

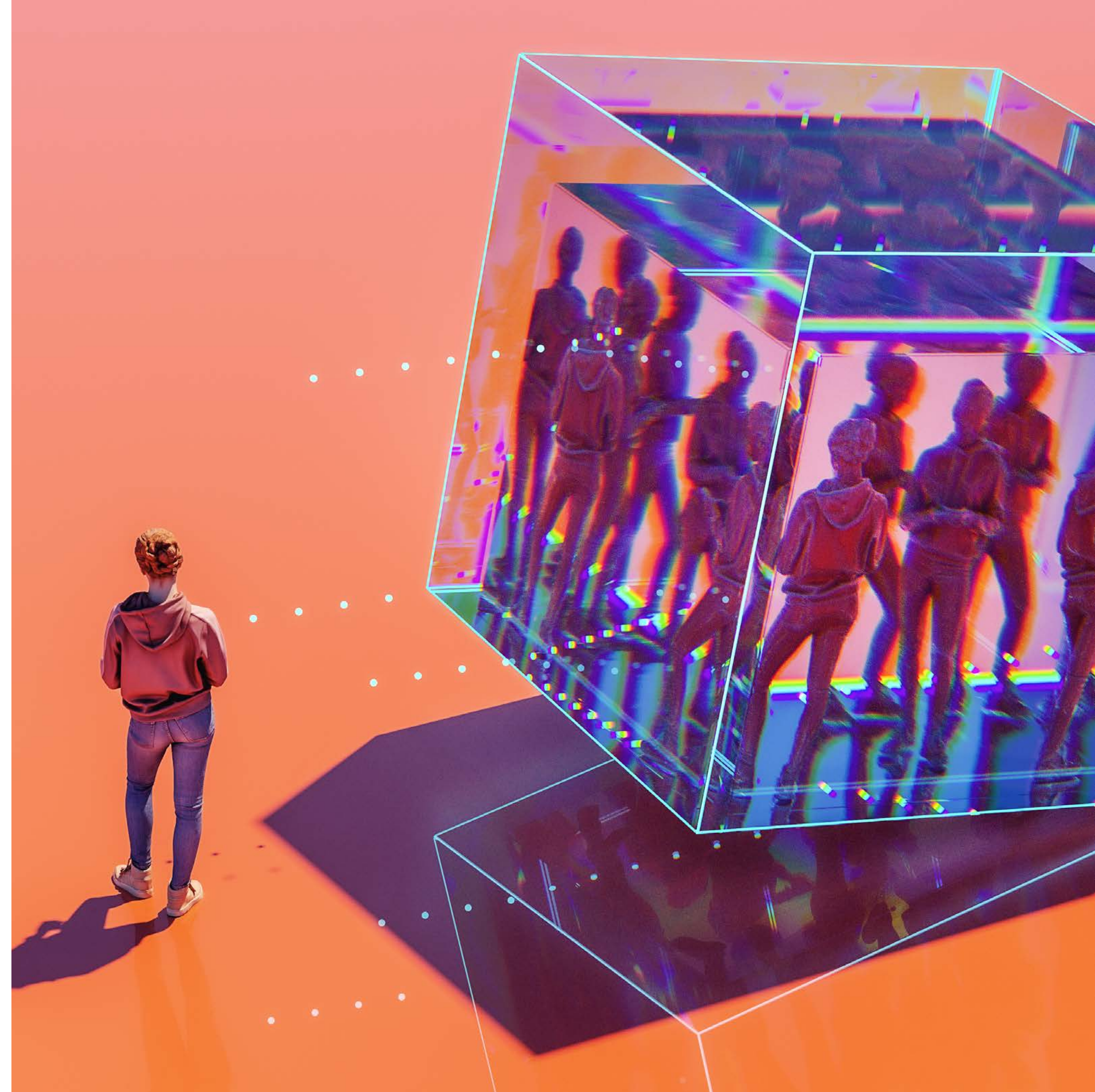
A workforce in the metaverse: When enterprises accelerate metaverse adoption and introduce immersive technologies into the workforce, adoption will transition from employee to consumer use.

Network effects: The development of net-new offerings, achieved as big tech brands and creators create new experiences, products and services that are more compelling, unique and convenient. Today there are only a few must-play games and experiences – for example, location-based AR games and AR commerce.

Everyone born today is an innate gamer: iPad natives and gamers native to platforms such as Roblox and Fortnite will enter the working population in 5-10 years. This audience has grown up expecting the world to be interactive.

Technological progress: As the underlying technologies required for the metaverse continue to evolve (such as game engines, small and power-efficient XR-processors and XR optics), integrated virtual world platforms will become easier to use, more capable and easier to build on.

Other factors include the maturation of digital wallets and tokens, the evolution of payment rails through regulatory action, advancements in network edge computing, low-latency cloud computing, the establishment of a culture of ownership and market-wide adoption of interoperability standards. These factors and more can be explored further in chapter 4.



Successful players will choose the future they build for tomorrow, today



Select the tabs
to discover more

The metaverse economy

Far beyond opening the door to virtual gameplay, the metaverse expands societies' reality and introduces environments in which every consumer can take an active role in creating, shaping and distributing value. The application of the metaverse and web3 is set to herald a new era in content and world creation and drive immense economic opportunity, thus making the creator economy a vital part of the overall metaverse economy. Moreover, this shift presents an opportunity to address flaws of a current Web 2.0 centralized system that sees the majority of value created fall into the hands of a few centralized entities. Web 3.0 provides an opportunity to reinvent the way value is generated and shared among a diverse set of creators, brands and businesses.

To achieve this goal, it is important that the metaverse is designed with a value-led economic mindset that learns from past mistakes and encourages a sustainable and fair economic climate for creators in this new era of authenticated ownership.

Changing the paradigm of artistic creation, creators now have a way to ensure visibility, voice and economic share. Blockchain applications allow creators to monetize talent independently of centralized hosting platforms. While they do not provide proof that a particular creation, was in fact generated by the original creator, they provide mechanisms for transferring ownership of particular assets. Advancements in AI are also likely to play a significant role in the creation of the metaverse, such as putting design tools into the hands of consumers – turning metaverse participants into creators.

Businesses (participants and providers) play a vocal role in uplifting a diverse set of creators while ensuring creator tools and features are available and accessible to everyone.

Creators, participants and providers introduce a symbiotic value exchange, which opens up new possibilities for equitable and fair digital economies.

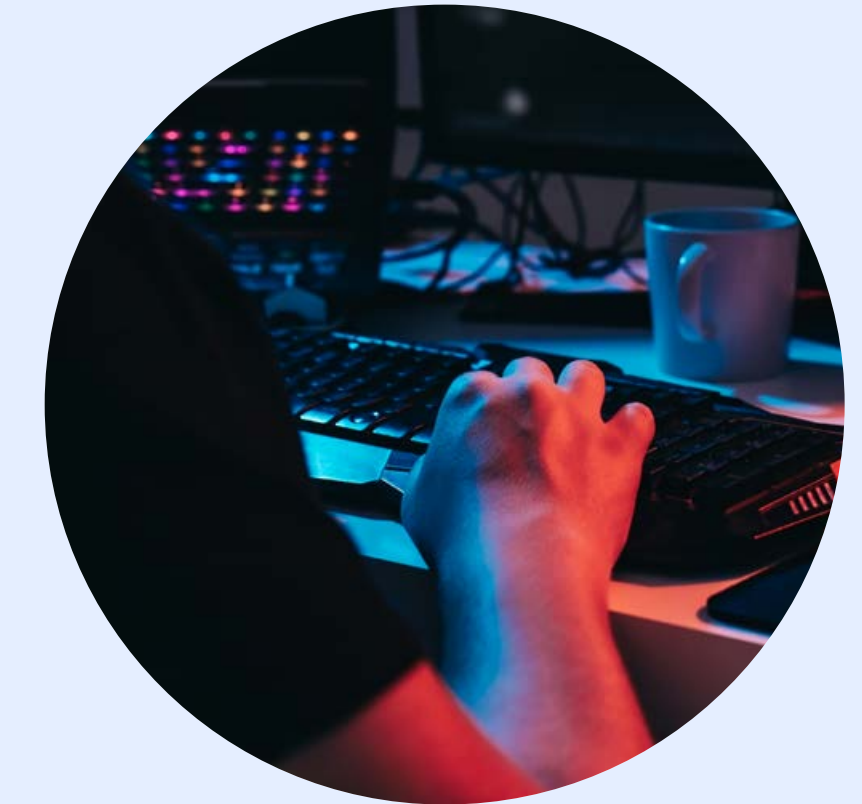
Brands and platform providers benefit from enabling and amplifying creators, as they are at the pulse of consumer sentiment. The creator economy goes far beyond amplifying content creation and will be transformative for the metaverse, as creators are in a position to reinvent and challenge the status quo and inherently accelerate metaverse adoption speed.

While benefiting from the threefold value distribution, it is both participant's and provider's obligation to ensure equitable treatment of creators while keeping transaction fees reasonable and at a minimum.

The creator economy plays a significant role in the broader metaverse economy, and it is acknowledged that a wide range of factors – from tokenomics to stable currencies and fair voting rights – contribute to a stable and equitable metaverse economy. The sheer number of voices to be considered makes for a strenuous balancing process and a need for a set of tools and rules to be established.

USE CASE

Roblox



Roblox's immersive marketplaces are scaling towards becoming fully user-generated, with 90% of avatar items currently from the community.

Roblox is introducing new mechanisms for the community to build sustainable businesses, including giving creators full control over the scarcity of their items and allowing all users to resell or trade items.¹⁶

Future papers in the frame of this initiative aim to investigate how to activate the economic flywheel of the metaverse and build on the idea of value distribution.

Ensuring fair value distribution in the metaverse

Mechanics for transparent and fair value distribution in the metaverse will be essential to ensure a sustainable economy. While in Web 2.0, IP attribution to creators was limited by individual platform mechanisms, web3 technologies offer the unique opportunity to ensure trust, credibility and fair value distribution by design. Establishing a new set of standards and processes is required to allow creators and participants (businesses) in the metaverse to create, build and share ideas in a way that cultivates a circular economy in which everyone wins.

Value distribution by design

Assumption: An equitable and fair system tracks each individual and new creation. This requires:

- Platforms or systems that allow users to easily find and re-use existing creations
- Transparency on the re-use of existing ideas and mechanisms to credit the initial creator
- Fair value distribution across the entire value chain (credit to all parties)
- AI-driven transparent and automated decision-making with sufficient control mechanisms, including an appeal process
- Attributing value to intermediaries, such as legal, marketing and influencers, who create value through rights, promotion, distribution and more
- All parties (creators and organizations) to share a percentage of credit and/or monetary value

What must we get right?

- Address the culture of ownership in relation to IP rights management and treatment
- Address how to properly measure “added-value”
- Address how to flow micro-credits fairly and efficiently
- Design for growth, not to inflate, such that the majority of creators can make a sustainable living

FIGURE 5

The value-add economy



3

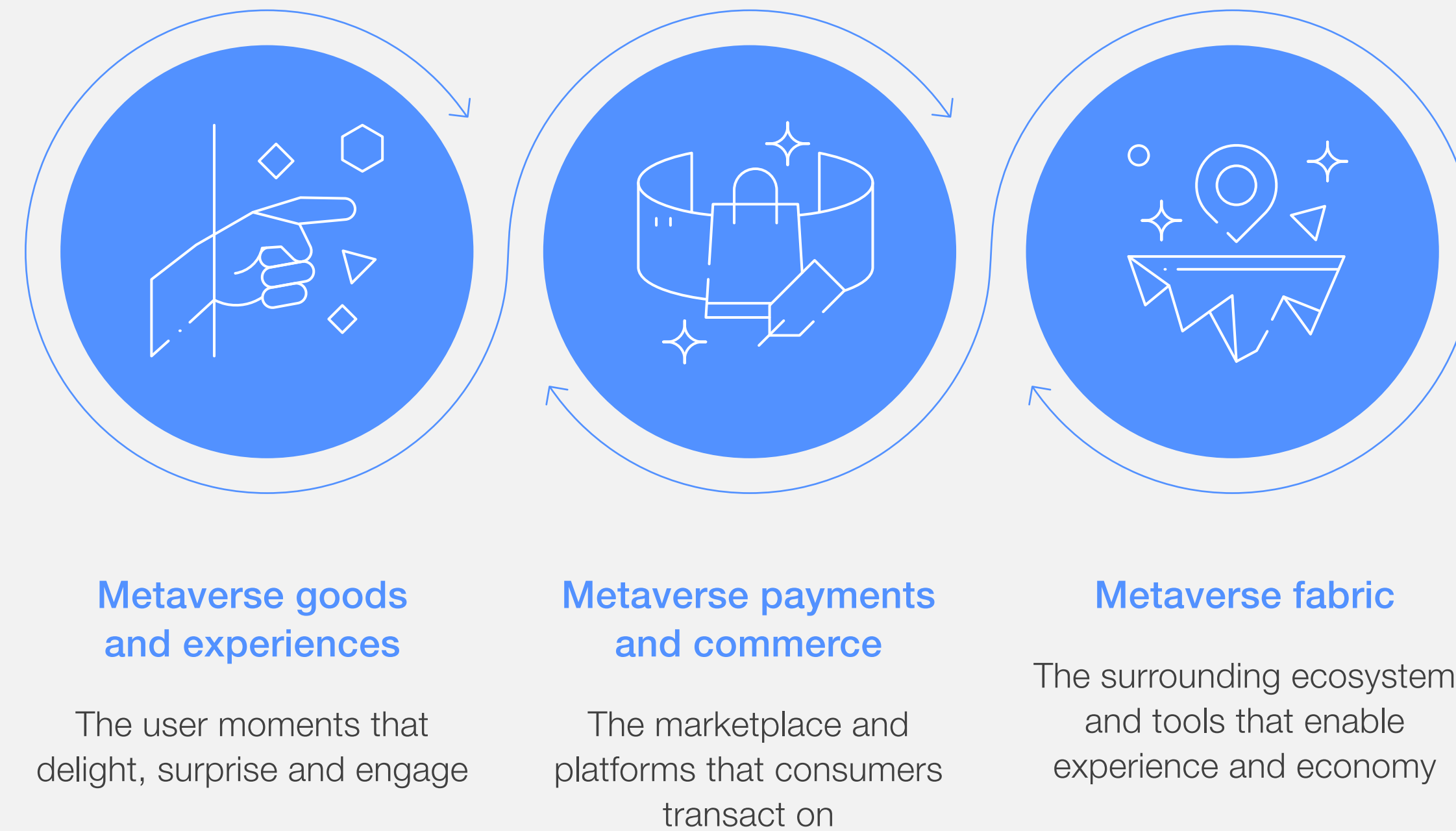
Metaverse economic models

Introduction

The metaverse is expanding traditional monetization channels and opening the door for net new consumer opportunities. Economic models will form an interdependent ecosystem across all roles that is driven by compelling experiences, seamless commerce options and the fabric that will underpin both.

FIGURE 6

Metaverse economic models



It is evident that the metaverse offers a myriad of opportunities for new circular business models. Users continue to develop their digital identities, and they do so by making use of economic mechanisms, such as avatar skins, NFTs or immersive games. Gen Z especially exhibits a liking for brands and platforms that help them embrace their unique identities.¹⁷ However, consumer value will not be generated universally.¹⁸ Leaders must understand consumer wants and needs and decide which role to play in the metaverse, informed by consumer data, designed in a human-centric manner.

Organizations need to align their metaverse strategies with industry-specific needs, target group metaverse adoption and maturity, and the technological and regulatory landscape. New economic plays will be based on successfully delivering compelling experiences, seamless commerce options, social interaction and transactions, the underlying fabric that will support the surrounding ecosystem and tools that enable circular experiences and economies.

Aware of the fast-evolving nature of this space, this chapter explores the potential value capture of nine economic models. These models are projected using market research and analysing value captured from existing Web2.0 business models.

Paths to economic value and growth in the metaverse

The metaverse opens a spectrum of new revenue opportunities – from traditional to entirely unprecedented. The following eight economic models represent notable shifts from today’s ways of doing business. Businesses may pursue one or more of these simultaneously.

Note on the metaverse and personal data: the metaverse will introduce new models that enable users to share, manage and operate their own data. Although personal data is not called out as an economic model in its own right, this report aims to emphasize the responsible use of personal data while outlining its potential.



Select the tabs
to discover more

4

Future value horizons in the metaverse



Introduction

Mass scale will depend on the ability to deliver engaging experiences – however, maturity across key enablers will be the defining driver.

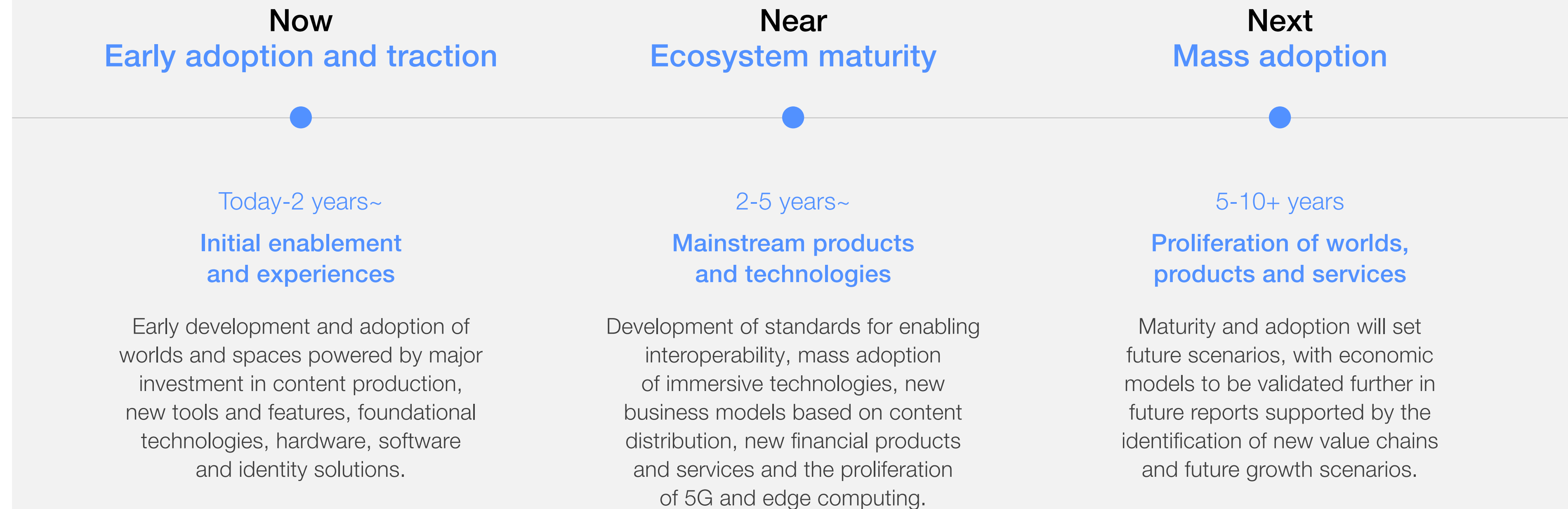
Forecasting beyond this first wave of use cases and their corresponding economic mechanisms will continue to be an open and evolving dialogue. However, as technologies continue to be adopted, purposeful experimentation acts as an opportunity for brands, businesses and creators to design, build and refine experiences and supporting models. The thinking today will act as core foundational learnings for stakeholders to position themselves and to evolve and expand offerings into longer-term, sustainable opportunities.

It's important to understand that this is a rapidly evolving space of technologies, and albeit an evolving ecosystem, development requirements can be attached to the time constraints of when fundamental technologies will be mass-produced and adopted and the impact this will have on select value plays.

FIGURE 7

Projected horizons of metaverse growth and adoption

Economic models selected today must consider the varying stages of maturity across technology, policy and wider enablers that these choices may use, as these choices will act as the foundations for how experiences of product and service offerings will evolve over time.



Drivers of growth and adoption of the metaverse

Six non-exhaustive areas were identified as leading prerequisites for impactful metaverse mass adoption.



Select the tabs
to discover more

Projected horizons of metaverse growth and adoption

This list does not aim to provide an exhaustive overview but brings to life the types of enablers required to accelerate the development and adoption of the metaverse, with a particular focus on the metaverse stack layers of software and platforms, infrastructure and network. Experience, economy and identity are addressed in greater detail in other sections of the report.



Select the now, near and next to discover more

Sources: “What’s New in the 2022 Gartner Hype Cycle for Emerging Technologies”, *Gartner*, 10 August 2022.

Gartner, *Gartner Identifies Key Emerging Technologies Expanding Immersive Experiences, Accelerating AI Automation and Optimizing Technologist Delivery* [Press release], 10 August 2022.

Rimol, Meghan, “Metaverse, Web3 and Crypto: Separating Blockchain Hype from Reality: Q&A with Avivah Litan”, *Gartner Newsroom*, 30 August 2022.

Baier-Lentz, Moritz, Faye Maidment, Benedikt Hübenthal, “Reality Check” Perspectives on Extended Reality (AR, MR, VR)”, *Bitkraft*, 2021.

Biondi, Matteo, Anna Heid, Ivan Ostojic, Nicolaus Henke, Lorenzo Pautasso, Niko Mohr, Linde Wester, Rodney Zimmel, *Quantum computing: An emerging ecosystem and industry use cases*, McKinsey & Company, 2021.

Mello-Klein, Cody, “The Future of 6G Wireless Could be Closer Than You Think”, *Northeastern University*, 26 May 2022.

“6G: preparing today the mobile networks of the future”, *Orange*, 11 July 2022.

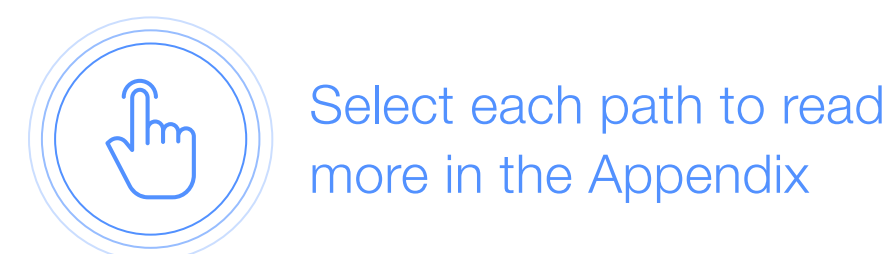
“Digital identity trends – 5 forces that are shaping 2022”, *Thales*, 29 December 2021.

Cordon, Stephanie, “2023 will be a pivotal year for VR: Which headset will you buy?”, *ZDNET*, 5 July 2022.

Makarov, Andrew, “12 Augmented Reality Trends of 2023: New Milestones in Immersive Technology”, *MobiDev*, 2 August 2022.

4 Future value horizons in the metaverse

Projections of when the value of these economic opportunities may be realized across the same horizon



Disclaimer: The displayed projections are based on market research and forecasts. Various variables, such as investment, regulation or economic climate, impact metaverse evolution. In consequence, the displayed mechanisms may mature and evolve earlier or later than projected.

Paths to economic value and growth in the metaverse	Now Early adoption and traction	Near Ecosystem maturity	Next Mass adoption
Digital products and assets	Digital assets	External platform utility	Potential future scenario: As ownership of digital assets becomes mainstream, new economic models making use of those assets will arise. Models will include the development of specific assets for target communities as a reward for their engagement. Other models, such as the tokenisation of the brand-to-consumer relationship, will enable greater participation, collaboration and innovation, where users' creative input is recognized and rewarded – creating a sense of togetherness, inspiration and loyalty.
Access and influence	Play-to-earn	Access as an asset	Potential future scenario: Premium experiences, which allow users to access and acquire products, services and experiences by paying a fee, will mature. Mechanisms such as governance and voting rights will go mainstream. Brands will grant users' rights by means of utility tokens or virtual assets. It is important to note that sufficient governance, regulation and standards will need to be in place to make this metaverse experience truly democratized and not a one-share-one-vote process.
Immersive commerce	Tokenized gated marketplace	Immersive shopping	Potential future scenario: Growth of token-based business models and aspects of the commerce value chain becoming decentralized may lead to the potential transition to a decentralized future of commerce (commerce 3.0) where decentralized commerce (DeCo) platforms go mainstream.
Payments and currency	Digital wallet custody	Central bank digital currencies (CBDCs) and stablecoins	Potential future scenario: The inclusion of digital wallets within the financial services sector and the adoption of CBDCs and Stablecoins will improve cross-border payments, making remittances cheaper and faster. This will create new kinds of financial instruments, such as fractional lending.
Asset monetization	Staking	Credit/loans	Potential future scenario: Mass adoption of worlds and spaces will result in the potential for net-new sources of revenue generation, as end-users, creators, brands and businesses will be able to lease items such as virtual spaces or renting digital products and spaces for passive income.
Advertising and marketing	Virtual brand worlds	“Buy off your back” affiliates	Potential future scenario: Moving from traditional content to more natural, immersive, and intuitive experiences, new concepts will come to the fore, from programmatic advertising at scale, to hyper-personalized brand experiences where users live the Nike commercial, to integrated advertising across omni with virtual/AR as the new channels, built on a trusted identity foundation where users control their data, potentially opening the door for consumers to reap some of the monetization benefits.
Creator economy	Creator tools and features	Product co-creation	Potential future scenario: By 2030, it is projected that immersive technologies, content and experiences will accelerate this sector, blurring the lines between creator and consumer on an unprecedented scale. Leading to a proliferation in creator-led content and resulting in next-gen creator tools and features and new brand/creator partnership models as the metaverse matures and evolves.
Metaverse-native services	Smart contracts	Premium connectivity	Potential future scenario: A proliferation of interoperable worlds and spaces will result in a need for net-new virtual services, from access to network and computing power to digital-twin-as-a-service and metaverse-as-a-service offering specialized services, simulations and entire world builds.

Conclusion

A comprehensive understanding of the metaverse builds the foundation for equitable adoption and economic success across industries.

While the metaverse's full potential will likely unfold in the coming decade, its current nascent stage offers great opportunity to individuals and organizations to position themselves clearly in a newly emerging world. As education and understanding drive equitable adoption and value distribution, it is essential that the public and private sectors create a deep understanding of the metaverse, its components, implications and economic models today.

Today's imagination drives tomorrow's innovation. Thus, growth drivers and emerging technologies require further development and innovation to enable meaningful metaverse engagement and interaction. Based on forecasts and statistics, this report can only speculate that, next to others, these drivers include metaverse-ready networks, software, hardware infrastructure and AI.

Individuals and businesses must find their role within the metaverse economy and clearly define their metaverse strategy, goals and target group to ensure meaningful value exchange and distribution in augmented or immersive worlds. They must evaluate their current offerings, appropriately translate them into metaverse environments, or allow disruption of their business models.

This report gives a comprehensive but non-exhaustive overview of possible economic opportunities and their potential for companies across various consumer-facing industries. In recognition of the evolving creator economy, the report aims to show the positive impact that comes with a metaverse that potentially strengthens the role of creators. Organizations in the public and private sectors should continue to amplify creators in order to fuel an equitable digital economy.

While this report marks an important step on the journey towards an equitable and meaningful metaverse, it will be followed by further research, analysing potential social implications of the metaverse, implications to metaverse governance, as well as quantitative data-based forecasting of potential economic scenarios and value chains in the metaverse.

This current nascent stage of the metaverse offers an unprecedented opportunity to build better, more equitable and just worlds that may greatly impact current physical reality. This report sets a steppingstone for companies and individuals to start their educational journey and to translate it into economically and socially viable action.



Appendix

Economic models in the consumer metaverse

The metaverse will expand traditional economic models by replicating them in metaverse environments and by complementing them with a certain level of interaction and immersion. At the same time, the metaverse will open the door for new, unexplored economic models, which will disrupt entire industries and generate brand-new revenue streams.

This appendix aims to highlight a selection of relevant economic models the metaverse offers today or will offer in the near to long-term future, outlining possible commercial opportunities for companies and creators to explore.

Digital products and assets

The metaverse unlocks a new frontier with digital products and assets. New product opportunities will range from independent revenue streams driven by entirely virtual goods, over NFTs, avatar skins, accessories and features, tokens enabling fractional ownership and perpetual royalties that generate passive income, to phygital products that provide utility within and across virtual experiences and extend to the physical simultaneously.

The metaverse introduces new user experiences and relationship models, such as micro-interactions or micro-experiences, that deepen the connection between the brand, creator and consumer, offering new ways to express, create, share content and drive community behaviours introducing new forms of growth.

Economic mechanisms: product sales and royalties

1 Digital assets

Digital products, such as in-game assets (skins, wearables) or art (NFTs), can drive meaningful revenue through direct end-user sales while also enabling royalties (passive income from secondary sales in perpetuity) to creators and platforms.

2 Phygital products

End-users can redeem digital products or NFTs/tokens for physical, and vice versa, increasing utility and brand exposure across channels. Products can be directly mirrored or conceptually related, expanding experience and storytelling opportunities for brands.

3 Consumables

Single or multiple use tokens, with the potential for expiry, open the door for applications like coupons, tickets, and more (loyalty programs). These items can be sold or rewarded by brands to end-users where they can choose to trade or consume the item.

4 External platform utility

Brands can develop goods for end-user utility within existing external platforms, such as creating a wearable for use in Decentraland, an in-game asset, or a 3D model to be imported into a virtual environment. They can be bought or earned and then resold by the user. The platform may take a cut of the sale.

Economic mechanisms: equity and entitlement sales

5 Pre-production sales

Fund/refine product development through digital, pre-production representation of a product. End-users can collect/sell/trade, and the brand can benefit from the market insight and cash flow.

6 (Hyper) fractional ownership

Enable fractional ownership of more expensive assets to end-users by broadening the pool of potential buyers and increasing engagement.

7 Community exclusivity

Brands can develop products specifically for target communities of end-users as a reward/incentive for their engagement. Products can be sold or gifted, physical or virtual, and can be personalized or tiered based on membership level or owned assets.

8 Physical asset tokenization

Physical assets can be tokenized as NFTs and exchanged, traded, transferred and held like any other NFT; or redeemed for the physical asset.

Selected insights

Mindset shifts

- Digital and physical experiences will need to transition seamlessly.
- Community-led approaches will support product development, funding and more.
- Digital scarcity elevates value, and embedded royalties foster connection in the creator economy.

Additional considerations

- Interoperability of assets will play an important role in value creation.
- Virtual to physical commerce models have not yet been scaled.
- Potential impact on supply chains to deliver virtual to physical offerings.

EXAMPLE USE CASE

Digital assets – strategic evolution



The almost century-old publisher TIME has been facing a changing media environment, shifting consumer behaviours and the challenge to stay competitive in a market strongly impacted by free online content. Widening its existing business model, the company introduced TIMEpieces, connecting culture and technology. Within the project, TIME partners with artists and creators to create NFTs, which can be purchased through platforms such as OpenSea. Through this, TIME has showcased a fluid ability to develop web3 offerings and business model alternatives. The company has gathered more than 50,000 artists and sold over 22,000 NFTs generating more than \$10 million in profit and over \$600,000 for charities to date.¹⁹

Access and influence

The potential to monetize the “live-able” virtual experiences of tomorrow presents a tremendous opportunity for the platform and experienced players. Many early metaverse gaming experiences are free to play today. Yet, pay-for-access offers an opportunity for metaverse players to monetize exclusive and premium offerings for participants or creators – such as exclusive worlds, games, in-game tiers, individual events, voting rights or items. The pricing structure for these experiences can be designed to take advantage of scarcity while enhancing – or at least not inhibiting – engagement.

Economic mechanisms: payment-based access

1 Paywalled access

End-users pay to become a paywall subscriber, acquiring access to exclusive content.

2 Premium tier access

End-users pay a subscription fee to access immersive games and experiences.

3 Usage-based toll

End-users pay for the amount of content they consume (i.e. how much time they spend playing a game or how many times they access the service).

4 Single-instance fee access

End-users pay brands for access to one-time events (exclusive fan experiences, virtual concerts, sporting events).

Economic mechanisms: ownership-based access

5 Access as an asset

NFTs as tools for verification. End-users pay for tokenized access to exclusive virtual communities, goods, offerings and services through ownership of specific assets.

6 Governance and voting rights

End-users are granted governance and voting rights by purchasing/ gaining utility tokens and/or virtual assets from brands.

7 Play-to-earn

Whether in NFTs, cryptocurrencies or fiat, the metaverse allows for new revenue models where users can be rewarded for playing games and exchange such rewards for (crypto) currencies beyond the platform.

Selected insights

Mindset shifts

- A trend towards non-paywalled but tiered or premium models based on exclusivity and engagement is evident.
- Virtual network effects will be key to scaling. Companies will need to create ways to build community and gather around content.
- NFTs can act as tools for verification.

Additional considerations

- Higher customer acquisition costs associated with subscription models need to be considered.
- Mechanisms, such as premium tier access, must not be a barrier to adoption.
- Technology and capabilities still need to evolve to provide engaging real-time, immersive experiences for large crowds.

EXAMPLE USE CASE

Virtual events



Ranging from concerts to fashion or sporting events, access to an engaging and interactive experience has been limited to those situated in specific geographic locations with specific financial means. In order to access a wider and more diverse audience, Justin Bieber, Ariana Grande and Travis Scott are just some artists who have entered the sphere of virtual concerts in Fortnite. Virtual concerts offer artists the opportunity to monetize through ticket sales, virtual merchandise and premium tier access, while platform providers attract new users into their virtual worlds. According to Forbes, Travis Scott's 2020 concert on Fortnite has attracted over 12 million viewers, grossing "roughly \$20 million (...) including merchandise sales",²⁰ which highlights the future potential of virtual events.

Immersive commerce

The metaverse powers the next evolution of commerce, which progressed from shopping in store to shopping online, and now to blended and immersive virtual and physical experiences. It is positioned to both evolve and revolutionize online and physical commerce. As end-users shift from browsers to participants, their shopping will become increasingly experiential along multiple layers of immersion. Not only will consumers encounter products within their experiences (like encountering a wearable during a digital fashion event), but they'll also be able to buy it on the spot without having to link to a site, decentralizing the shopping experience.

Economic mechanisms: point of sale (POS) transactions

1 Marketplace

Brands can design marketplaces to attract and feature curated products, offer a unique shopping experience, or be exclusive to a community (tokenized gated marketplace) of end-users. Curation, personalization and filtering capabilities will drive differentiation.

2 Interactive contextual PoS

Brands can link products on display or in-use to a site or seamlessly facilitate the transaction with the click of a button to end-users, taking a fee in the referral process.

Economic mechanisms: enhanced/embedded shopping

3 Social shopping/commerce

Brands can benefit from social interaction and end-user contribution within virtual communities in order to drive brand interaction and sales. Wallet and end-user data can be used for personalization, recommendation and insight.

4 Immersive shopping

End-users can use augmented reality (AR) and virtual reality (VR) to virtually try on or visualize products before purchase, driving confidence (conversion) in digital/virtual purchases for brands. Virtual capabilities enable manipulation of size, perspective, environment, etc. for the good.

5 Virtual context

Brands can offer digital products in the environment/experiences they're most useful in, such as allowing end-users to purchase an NFT profile picture while setting up an avatar.

6 Cross-channel shopping

Brands can make use of virtual interactions to trigger IRL behaviours. Products can be bought virtually to be redeemed physically, using digital wallets to deliver a seamless transition for end-users.

7 In-game commerce

Opportunities to buy digital or physical goods while playing or consuming an experience. Goods may be placed in the game and fit the context of the experience.

8 Decentralized commerce (DeCo)/marketplaces

Physical and digital (phygital) goods will be tokenized as NFTs and listed and traded on an open market eliminating high transaction fees through the support of blockchain technology and smart contracts.

Selected insights

Mindset shifts

- Brands' shopping experiences will connect various channels seamlessly while transitioning between 2D and 3D, AR and VR.
- Product placement is expected to gain traction, and minimal time between product discovery and purchase will be expected.
- The opportunity to experience and explore products in virtual or augmented contexts drives buyer confidence in online commerce.

Additional considerations

- The virtual commerce consumer base is small but growing. Consumers currently lack the hardware, software, payment means or understanding to shop in virtual environments.
- Physical commerce experiences cannot simply be replicated in virtual environments but need to be aligned with platform, interface and consumer needs.
- Virtual worlds and protocols are still immature, and products and interactions may not be compatible across platforms.

EXAMPLE USE CASE

Gamified commerce



Young, digitally native consumers are a key audience for Forever21 and many metaverse-like online games. With an aim to cultivate a following among young consumers, Forever 21 introduced their interactive experience, “Forever 21 Shop City”, on Roblox in December 2021. The experience encourages individuals to express themselves by means of digital fashion and cosmetics. The brand allows users to design, own and manage their own virtual store of digital assets, which have been inspired by physical products and created by known digital creators. Beyond opening up new revenue streams, the experience elevates Forever 21’s relationship with its customers, as it actively involves them in a rather unusual part of the retail value chain. To date (November 2022), the experience has registered over 256,900+ visitors highlighting the potential of gamified commerce.²¹

Payments and currency

Powering a digitally native economy, the metaverse will necessitate robust payment infrastructures, encompassing digital assets as a store of value or cryptocurrencies as means for payment.

While cryptocurrencies have occupied the metaverse spotlight for a while, metaverse transactions are expected to be conducted in fiat currency, in-platform tokens as well as cryptocurrencies. The interplay of various payment means and currencies is expected to establish a need for services such as on and offramps for currency conversion, wallets to store digital assets and provide access, and custody to protect assets from potential threats.

Economic mechanisms: digital wallet payment, exchange and custody fees

1 In-platform tokens (utility)

End-users can buy, earn and exchange tokens, which brands can provide, that can be used to get products/rewards or cashed out for money.

2 Digital wallet payments

End-users pay fees to brands – or generate B2B fees, depending on the solution – for payment transactions for digital products, services, access, etc.

3 Currency exchange

End-users pay fees to companies – or generate B2B fees, depending on the solution – for using a crypto-to-fiat offramp or executing token exchanges.

4 Digital wallet custody

End-users pay fees to brands– or generate B2B fees or interest, depending on the solution – for storing digital assets in third-party wallets.

5 CBDCs and stablecoins

New means of payment may result in new transaction models where fees may apply.

6 Cross-border payments

Improvements in the cross-border payments space may result in a competitive landscape to offer faster and cheaper payments/remittances (fees may apply).

7 Fractional lending

Tokenized ownership of NFTs is split into forms of repayment methods with an applied interest. The act of dividing the ownership of an NFT between the owner and the lender into fractions allows the owner of the NFT to take out a loan on the asset and the lender to apply a see in the form of an interest return.

Selected insights

Mindset shifts

- Virtual payments should be an extension of existing digital and crypto payments.
- Private key storage and custody services will enable new opportunities for trusted third parties and a broader spectrum of options for the end-user (including self-custody).
- Interoperability of digital wallets benefits from network effects and standards proposed by both the crypto communities and public initiatives, such as the European Blockchain Services Infrastructure (EBSI).

Additional considerations

- Access and payment experience in the metaverse requires simplification of the user experience.
- Unfavourable token cash-out rates could result in fewer users and creators on metaverse platforms.
- A current lack of clear risk and regulatory framework is evident.

EXAMPLE USE CASE

Payments, trading and custody



With a growing want of end-consumers for crypto-related services provided by trusted financial institutions, Mastercard recently introduced Crypto Source™. In partnership with regulated and licensed crypto custody providers, the company provides banks and fintech companies with technology and partnership support that enables buying, holding, and selling of selected crypto assets, security management, crypto spending and cash-out capabilities, as well as crypto program management. Mastercard has been working alongside customers and partners to bring additional security to the crypto ecosystem and offer seamless crypto experiences that meet consumer needs.²²

Asset monetization

While digital assets are mostly associated with the storing of value, they offer organizations and individuals monetization options that enable passive income. Similar to fiat products, asset owners can extract value from these assets beyond their original intended value-exchange, using different monetization mechanisms while keeping ownership.

Economic mechanisms: renting/leasing virtual assets

1 Renting digital products and spaces

Brands can rent out digital/virtual products like virtual clothing or accessories, and virtual spaces for hosting events to end-users for a defined period of time (NFT-based).

2 Leasing virtual space

Owners of digital/virtual space can lease it to brands for ad purposes for a defined period of time.

Economic mechanisms: savings and investments

3 Staking

Brands can offer end-users the option to stake their crypto, allowing them to earn a return from assets instead of idling them in their virtual wallets. Brands can generate value by keeping end-users assets in their native ecosystems and encouraging the growth of their platform through fees and network effects.

4 Earn

Yield farming or liquidity pooling are some of the earning strategies, similar to fixed income, that brands can offer to asset owners to attract liquidity to their ecosystems while allowing them to earn a return from assets instead of idling them in their virtual wallets.

5 Airdrops

Airdrops are produced when a company issues tokens that go directly to the community, earned through features such as staking. This enables users to become early adopters and build community, while acting as a foundation to start creating value from the token or asset for trading, in-game currency, exchange and more.

6 Credit/loans

Asset owners can use their digital assets as collateral to ask for a loan, so they get liquidity to purchase goods and services while keeping assets ownership.

Selected insights

Mindset shifts

- Virtual assets offer new opportunities to link with physical assets.
- Extension of enterprise assets into the virtual realm, such as virtual land and space, art and more.
- Blockchain-based contracts can help build trust and provide authenticity.
- Staking is currently the most trusted form of asset monetization, albeit a new and somewhat complex concept which comes with its own risks.

Additional considerations

- Renting/leasing would only gain traction when there is enough demand for assets like land and spaces.
- Decentralized finance (DeFi) is currently not extensively user-friendly and lacks regulation for protecting end-users against fraud and cyber risk.
- Staking is not risk-free, as users staking their crypto could incur losses as a result of the value of a currency decreasing.

EXAMPLE USE CASE

Renting virtual land



With virtual land prices ranging up to \$1 million and monthly rent sometimes exceeding \$60,000, more and more businesses venture into the space of buying and renting virtual land. Admix, a monetization platform for AR, VR and games, has leased virtual spaces to brands like Pepsi and Formula One. According to Admix CEO Sam Huber, “Admix has pulled profits upwards of 70%”. With an uncertain future of the metaverse, according to Huber, many brands are still wary about buying virtual real estate. This in return offers unique opportunities for individuals and companies to monetize on renting virtual land and spaces.²³

Advertising and marketing

Consumers' virtual lives will entirely or at least partly shift into the metaverse, creating new digital channels for companies to make use of for marketing purposes. This shift will trigger a transformation of traditional marketing and advertising models. Metaverse advertising models will use immersion, storytelling and user expression through authentic content and experiences. Brands will play the role of extending users' identities and will be most successful if they provide authentic and transparent value.

Beyond passively consuming ads, consumers will "live" targeted experiences that match their wants and needs (identities) throughout various channels, leading to richer, more intimate marketing that yields higher margins for key ad products. With an expanding data economy, the metaverse will offer new types of consumer data, delivering consumer insights with unprecedented depth. While using this data to provide personalized and targeted experiences that match consumer needs, organizations are expected to implement transparent and responsible data practices to ensure digital trust.

Economic mechanisms: ad sales on owned or third-party properties

1 Non-intrusive display ads

End-users generate B2B revenue through targeted, programmatic and AI-driven models (tracking facial expressions to adapt ad content) that serve ads on virtual banners, billboards and during gameplay, possibly complemented by the sponsorship of virtual venues.

2 Marketplace ads

End-users generate ad revenue through targeted, programmatic and possibly AI-driven retail media placements in metaverse marketplaces.

3 Phygital experiences

End-users generate B2B revenue through extended reality (XR) ads that bridge the virtual and physical worlds to drive foot traffic in both realms.

4 Immersive ads

End-users generate B2B revenue through engaging in 3D advertising experiences that are clearly labelled as ads and seamlessly transport between virtual worlds and ad experiences.

Economic mechanisms: experience-driven brand and product promotion

5 "Buy off your back" affiliates

End-users, creators or AI avatars can become brand affiliates with the potential for others to purchase products directly from their avatars, spaces, profiles, or streaming/community events, increasing product sales.

6 Brand gamification

Brands create free games and events that end users can engage with, creating a deeper connection with the brand by learning about the company, its products and driving sales.

7 Virtual brand worlds

Brands create virtual worlds to connect with end-users in a way that is more authentic to the brand and serves as an additional PoS.

8 Loyalty and token-based loyalty

Brands generate value through brand loyalty by providing meaningful experiences with end-users which can drive future sales of digital and physical products. It also unlocks the opportunity for blockchain-based tokenization in loyalty programmes.

Selected insights

Mindset shifts

- Advertisements will span from 2D to 3D, between AR and VR.
- Advertising will shift towards content creation, enabling businesses to engage with more authenticity.
- Ad spend growth will be coupled with metaverse user growth rates.
- The metaverse/web3 may trigger increased user control of personal data.

Additional considerations

- The adoption of new touchpoints will define new parameters for audience segmentation and a need for new marketing metrics.
- Data privacy needs to be front and centre in metaverse marketing and advertisement.
- Current marketing approaches will need to be adapted to new opportunities and consumer expectations of the metaverse.

EXAMPLE USE CASE

Immersive ads



A recent consumer survey showcases that 41% of respondents are often annoyed by online advertising, while 35% state that they don't mind advertisements if they get content in return.²⁴ Survey results like these highlight consumers' needs for more engaging advertising and might be some of the reasons Roblox will introduce immersive ads its platform in 2023. The immersive 3D advertising experience will be labelled as such and will seamlessly transport users back and forth between experiences while operating in a walled garden.²⁵ Roblox's introduction of immersive ads is expected to open up new revenue streams to the platform and offer new opportunities to advertisers to raise brand awareness and drive sales.

Creator economy

As an evolution of our traditional economy, the creator economy represents a paradigm shift of new business models and content creation. Web3 marks a decisive shift in data ownership from platforms to individuals, and the metaverse enables creators of all ages to have autonomy over how, where and when they monetize the content they make (e.g. through royalties). Reimagining the future of content design in the metaverse opens our eyes to additional avenues of virtual asset and world creation, as well as collaboration. Brands will be able to originate diverse creations by empowering diverse creators. While social media has introduced a fluidity between consumers and creators, the metaverse will exhibit a unique dynamic between brands, creators and consumers.

1. **Brand to creator:** Beyond offering creator tools, brands can license their IP to creators to empower their creativity to create branded assets, which end-users can purchase and use in the metaverse.
2. **Creator to creator:** Creators can sell their content to other creators to customize and build on top of. Original creators will continue to receive royalties every time the content is sold.
3. **Creator to consumer:** Creators can sell their content directly to the end-user or brand, providing new ways to enhance virtual experiences.

Economic mechanisms: creation enablement

1 Creator tools and features

Brands can provide creators with tools and features to create content or to facilitate collaboration with other creators and end-users. This can help financial inclusion by generating end-user assets, and originating new content and revenue from platform royalties and fees.

2 Creator consulting

Brands can serve as the connective tissue between brands and/or end-users to contract out and fulfil metaverse-related design requests. Revenue can be generated through contracting fees and commission from service.

3 Product co-creation

Brands directly collaborate with creators to design new products and services in virtual, physical and phygital environments. Generation and sale of products drive awareness and revenue for both the brand and creator.

4 Create-to-earn

As part of GameFi, end-users can be part of the in-game asset build. Introducing a new model and royalty stream, end-users can provide their input to create digital in-game assets, granting the creator unique merits and brands/businesses a new source of creative content.

Economic mechanisms: creation monetization

5 License brand IP

Brands can license their IP to creators to create branded worlds, digital products, and other experience consumables for end-users. Revenue generated from sale of assets and perpetual royalties from resale and licensing fees.

6 Transactional fees

Environment/platform owners can charge creators a transactional fee to create and maintain a space in the environment. Additionally, the platform can charge fees every time the creator sells a good to an end-user.

7 Usage fees

Metaverse environment owners can charge end-users fees based on their usage of assets in the environment. Royalties of usage could also be paid out to the original creator of the asset.

Selected insights

Mindset shifts

- User roles will shift further to being creators themselves, and their digital identities will be amalgamations of creators they like.
- Creator economies will evolve into multi-dimensional IP, triggering multi-surface delivery throughout the physical and XR at every level, as well as across platforms, ensuring continued revenue generation and value distribution.

Additional considerations

- Applying current IP approaches and not adapting them to the needs of the creator will trigger potential loss of content and IP generation for brands.
- Current creator payout models don't leave enough margin for creators; platforms need to ensure creators have the incentive to create.
- Creators can track the impact of their brand-related communication and value delivered, leading to greater transparency in how they charge for their influence and creativity. Brands will need to include the resulting insights in their negotiations with creators for enhanced visibility on engagement key performance indicators (KPIs) and return on investment (ROI).

EXAMPLE USE CASE

User co-creation and license brand IP



While ways to turn perfume into an engaging experience may not be obvious, the British company Rook has excelled in turning perfume sales into a metaverse experience that delivers ownership. In the frame of their “Scent of the Metaverse” project, Rook has sold 30 NFTs, which served as an invite to an exclusive decentralized autonomous organization (DAO). The NFT enabled holders to join exclusive learning sessions, interactive games and metaverse trips. It furthermore allowed NFT holders to work with perfumer Nadeem Crowe to create the “Scent of the Metaverse”. NFT holders then received a bottle of the perfume (with a collaboratively designed NFT of the label) and co-creation rights to the fragrance, which still earns them royalties on fragrance sales.²⁶ While the exact results of the campaign are not public, the use case highlights the metaverse’s potential for user co-creation, as well as the inclusion of consumers into rather unusual stages of businesses’ value chains while strengthening brand awareness and consumer relationships.

Metaverse-native services

Just like the need for virtual goods, the metaverse amplifies the growing need for virtual services in the metaverse. Some metaverse-native services have an enabling function. Services like smart contracts, premium connectivity or network and computing power will fuel metaverse experiences and drive an equitable creator economy. Other services directly serve an end consumer or business. Through offerings such as digital twin or rendering as a service, brands, users and creators will be able to outsource select metaverse-related tasks while focusing on key capabilities in the space.

Economic mechanisms: metaverse-native services enablement

1 Smart contracts

As brands create new metaverse experiences and digital products, a need for smart contract creation services will be required to stake and transfer ownership to end-users seamlessly.

2 Network and computing power

Brands, and even users, can rent their network access and computing power to other users for a fee.

3 Premium connectivity

End-users pay brands for premium network connectivity, improving the end-user metaverse experience by reducing buffer time.

Economic mechanisms: metaverse-native services

4 Net-new services/brokers

Brands can offer select services/foundational capabilities to enhance end-user metaverse experiences, from entire builds of virtual branded worlds to specialized service offerings (identity services, delegated custody, etc.), to experience consulting, user reviews and more (also known as metaverse-as-a-service).

5 Digital-twin-as-a-service

Service offering enabling a virtual duplicate of a physical object, process or system.

6 Rendering-as-a-service

An extension of net-new services, brands can offer to pay per amount of computing resources needed for certain rendering.

Selected insights

Mindset shifts

- The metaverse will require brand-new service offerings while advancing existing offerings by translating them into new technological realms.
- Interaction of large sums of individuals in virtual environments will require sufficient computing and network infrastructure.
- Brands will increasingly rely on metaverse native service providers to outsource work that does not lie in their core capability.

Additional considerations

- Additional technological developments, such as 5G (6G), will be required to provide certain services.
- Value add of moving services into metaverse environments needs to be assessed and communicated.

EXAMPLE USE CASE

Net new services



The recent COVID-19 pandemic has highlighted the human need for face-to-face interaction and communication. With an aim to elevate the way we communicate, Deutsche Telekom, Orange, Telefónica and Vodafone have partnered with MATSUKO to develop an easy-to-use platform, that combines the physical and virtual world through a mobile connection. Using a smartphone camera, the platform creates a 2D video, which “is then rendered into 3D holograms in the cloud to be streamed by viewers” in an AR, VR or MR environment.²⁷ While detailed results are yet to be published, this metaverse service promises great potential to enhance communication in both consumer and business settings.

Implications to personal data in the metaverse

The metaverse will allow organizations to capture increasingly large amounts of personal data. Through input channels such as haptics, camera vision, audio or Electroencephalography (EEG) sensors, this data will take entirely new forms, as it will capture biometric insights and precise information about people's surroundings. New data analytics will be possible, including insights into consumers' emotions, cognitive load or attention span. A 2020 study suggests that five minutes of VR tracking data can produce "information that can identify a user out of a pool of 511 people with an accuracy of 95.3%", indicating the increasing privacy risks of the metaverse's growing data ecosystem.²⁸

New data types, combined with technology enablers such as AI and digital twins, will unlock an unprecedented degree of consumer understanding, as well as new capabilities for brands to connect with audiences, for example, through hyper-personalized marketing and engaging experiences in XR. Enhanced privacy, security and safety protections will be critical to encourage people to participate in these experiences and unlock the value the metaverse can deliver.

Companies will need to prioritize safe virtual environments, enhanced data protection measures, and proactive security to achieve robust adoption of metaverse offerings.

The metaverse will give end users more mechanisms to exercise personal ownership and control over their data and will offer new ways to let people manage their own identities online. Both in centralized and decentralized environments, the metaverse will enable users to share, manage and operate their own data. Users will exert their rights to profit from their data, or to be forgotten; they will embrace privacy and anonymity. Platforms, device makers and other organizations have an opportunity to support consumers in their data ownership journey by incorporating decentralized identity protocols and data portability into their business models, where possible. Users may additionally outsource their data stewardship, e.g. by hiring external privacy services providers (such as the Solid project²⁹), opening the door for new personal data products and services.

Future papers in the governance initiative track will analyse privacy and security in the metaverse. This appendix aims to outline economic models in the metaverse and emphasizes the responsible use of personal data while outlining its potential.

Glossary

Metaverse: The metaverse describes persistent, interconnected virtual worlds and spaces that are characterized by the enablement of social interaction and value distribution and a certain degree of immersion.

Human-first: A metaverse that prioritizes the human needs of an individual and consequently integrates supportive design choices, tools and interactions to respect the persons behind the data; this transcends decisions – from architecture and security to privacy, identity and safety choices.

web3: web3 describes an emerging portfolio of decentralized technologies, protocols and standards that help to establish provenance, veracity and value of data.

Web3.0: Web3.0 describes the third stage of the World Wide Web's development. It is an evolution focused on distributing systems to create a more secure, transparent and open internet experience that enables direct interactions between users and their peers without intermediaries.

Interoperability: The ability to interact, exchange and make use of data and resulting information to enable movement, transactions and participation across systems, platforms, environments and technologies.

Phygital: Combines the words physical and digital to describe blending digital/virtual experiences with physical ones. Extending into the metaverse, phygital now portends to describe opportunities for experiences to exist dually in physical and digital spaces simultaneously – as well as real goods and services as they become interoperable.

XR: XR or extended reality is an umbrella term that includes immersive technologies such as augmented reality (AR), virtual reality (VR), and mixed reality (MR).

Decentralized finance (DeFi): Used to refer to a financial ecosystem built on blockchain technology where users exchange assets without intermediaries.

Digital token: A unit on a digital ledger that is used to represent value, such as an asset or a basket of assets, including real-world assets such as commodities, stock or real estate property. The token can be used to facilitate transactions and transfers of title to such underlying value or asset.

Non-fungible tokens (NFTs): A solution created to allow us to represent objects with unique, unrepeatable and indivisible qualities within a blockchain.

Tokenization: The digitization and representation of a physical or digital asset within a blockchain, including all its information. This process brings a more commercialized vision, where people can value and exchange any element based on its supply and demand.

Digital wallet: In the context of this paper, a digital wallet is considered a crypto wallet, a piece of software or hardware with which users perform the send/receive operations of digital assets through a blockchain network.

Digital identity: A collection of individual attributes (e.g. name, date of birth, occupation, health status) associated with a uniquely identifiable individual, stored and authenticated in the digital sphere. Digital identity may be used for transactions, interactions, representations and authentication online.

Decentralized identity: Decentralized identity, also referred to as self-sovereign identity, is an open-standards-based identity framework that uses digital identifiers and verifiable credentials that are self-owned, independent and enable trusted data exchange.

Decentralized autonomous organization (DAO): An organization that is managed by making use of smart contracts and blockchain technology to provide transparency, immutability, autonomy and security. All decisions are taken based on programmatic algorithms, where participants can execute their voting rights if applicable.

Permissionless: Refers to (blockchain) networks without restrictions neither to read nor validate transactions, which means all participants have the same rights. Permissionless networks are also known as public networks.

Centralized: Refers to environments, platforms and ecosystems in which governance resides in a small group of participants with great power of action and control over the rest of the participants.

Decentralized: Opposite to centralized. Refers to those environments, platforms and ecosystems in which governance resides with the whole community.

3D worlds: Digital environments and objects occupying 3D worlds in an immersive sensory setting displayed on flat screens.

Contributors

This paper is a combined effort based on numerous interviews, discussions, workshops and research. The opinions expressed herein do not necessarily reflect the views of the individuals or organizations involved in the project or listed below. Sincere thanks are extended to those who contributed their insights via interviews and workshops, as well as those not captured below.

World Economic Forum

Connie Kuang

Project Lead, Media, Entertainment and Sport

Cathy Li

Head, Shaping the Future of Media, Entertainment and Sport; Member of the Executive Committee

Metaverse Initiative Project Fellows

Thomas Beckley

Project Fellow, Accenture

Jennifer Bettinger

Project Fellow, Accenture

Kevin Collins

Managing Director and Global Software and Platforms Lead, Accenture

Daniel Diez

Project Fellow, Accenture

Acknowledgements

Sincere appreciation is extended to the following working group members, who spent numerous hours providing critical input and feedback to the drafts. Their diverse insights are fundamental to the success of this work.

Brian Afande

Co-Founder and Managing Director, BlackRhino VR

Joe Abi Akl

Chief Corporate Development Officer and Managing Director, Xsight Future Solutions, Majid al Futtaim

Ahmed Alghamdi

Chief Executive Officer, Artificial Intelligence Global, Aljihaz Holding

Abdulla Aljaziri

Senior Manager, Digital Disruption, Dubai Electricity and Water Authority

Peter Allwood

Vice-President, Cyber & Intelligence, Mastercard

Daniel Asmar

Associate Professor, Mechanical Engineering, American University of Beirut

Moritz Baier-Lentz

Partner, Lightspeed Gaming

Paul Bances

Vice-President, Market Development & New Legal Entity, PayPal

Justin Banon

Co-Founder, Boson Protocol

Avi Bar-Zeev

Chief Technology Officer and Founder, Reality Prime

Jonathan Batty

Director, Public Relations, DXC Technology

Itamar Benedy

Chief Executive Officer and Founder, Anzu

Mike Blank

Chief Operating Officer, Polygon Technologies

Doreen Bogdan-Martin

Director, International Telecommunications Union

Edward Bowles

Global Director, Public Policy for Meta Financial Technologies, Meta Platforms

Jehangir Byramji

Emerging Technology and Innovation, Lloyds Banking Group

Ciara Byrne

Vice-President, New Business Innovation, Conde Nast

Xochitl Cadena

Project Manager, Metaverse, NEOM

Adam Caplan

Senior Vice-President, Emerging Technologies, Salesforce

Isaac Castro García

Co-Founder and Co-Chief Executive Officer, Emerge

Pearly Chen

Vice-President, HTC-VIA

Eugene Chung

Chief Executive Officer, Penrose Studios

Nihat Dad

Executive Director, Digital Rights Foundation

Daniel Diez

Chief Marketing Officer, Magic Leap

Scott Eckert

Senior Vice-President, Next Generation Retail and Store No. 8, Walmart

Maureen Fan

Chief Executive Officer and Founder, Baobab Studios

Tom Ffiske

Editor, ImmersiveWire

Ryan Fitzpatrick

Senior Vice-President, Strategy, Vindex

Fabio La Franca

Chief Executive Officer, Blueverse Ventures

Clementina Giraldo

Project Specialist, Blockchain, Centre for the Fourth Industrial Revolution, Colombia

Arturo Gonzalez

Director and Global Head, Policy Advocacy & Research, Meta Platforms

Keith Grossman

President, TIME Magazine

Walter Grüner

Chief Information Officer, Covestro

Cathy Hackl

Chief Metaverse Officer, Journey

Ylva Hansdotter

Founder and Executive Director, XR Impact

Cortney Harding

Chief Executive Officer, Friends with Holograms

HE Huda Al Hashimi

Deputy Minister of Cabinet Affairs for Strategic Affairs, Prime Minister's Office in the Ministry of Cabinet Affaires and Future, United Arab Emirates

Mohamed Heikal

Head, Business Development, Majid al Futtaim

Roberto Hernandez

Global Metaverse Leader, PwC Americas

Heidi Holman

Assistant General Counsel, Microsoft

Abdulrazzak Hussain

Vice-President, Information and Communication Technology, Olayan Financing Company

Tatsuya Ichikawa

Chief Executive Officer, Avers

Stephanie Ifayemi

Head, Digital Standards Policy, London Hub

Rolf Illenberger

Chief Executive Officer, VR Direct

Dale Imerman

Director, Metaverse Partnerships, WPP

Kyle Jackson

Chief Executive Officer, Talespin Reality Labs

Masa Kawashima

Executive Producer, Director of Asia Pacific Operations, Niantic

Hoda Al Khzaimi

Assistant Research Professor, Engineering, New York University, Abu Dhabi

Marja Konttinen

Marketing Director, Decentraland

Ingrid Kopp

Co-Founder, Electric South

Basak Koralturk

Head, Corporate Strategy, JP Morgan

Kyle Kretschman

Chief Economist, Spotify

Abhinmanyu Kumar

Chief Executive Officer and Founder, Naavik

Natalie Lacey

Executive Vice-President, Ipsos Media and Entertainment

Joseph Lin

Head, HTC Content and Platforms, HTC-VIA

George Liu

Vice-President, AlixPartners

Kuniyoshi Mabuchi

Managing Director, PwC Japan

Calvo Mawela

Group Chief Executive Officer, Multichoice

Dinusha Mendis

Professor of Intellectual Property and Innovation Law, Bournemouth University

Nelly Mensah

Vice-President of Digital Innovation, LVMH

Tibor Merey

Managing Director and Partner, Boston Consulting Group, (BCG)

Alan Miles

Chief Executive Officer, NCSolutions

Jonathan Miranda

Vice-President and Head, Corporate Strategy, Sony Interactive Entertainment

Peter Miscovich

Managing Director, Strategy and Innovation, Consulting, JLL

Hiroaki Miyata

Professor and Chair, Department of Health Policy Management, Faculty of Medicine, Keio University

Hamdullah Mohib

Managing Director, Khas Fund, Chimera Investment

Karabo Morule

Founder, Capital Art

Angelica Munson

Executive Officer, Chief Digital Officer, Shiseido

Rucha Nanavati

Chief Information Officer, Mahindra Group

Rajan Navani

Vice-Chairman and Managing Director, Jetline Group

Genki Oda

Chairman and Chief Executive Officer, Remixpoint

Judith Okonkwo

Founder, Imisi 3D Creation Lab

Helen Papagiannis

Founder, XR Goes Pop

Nimesh Patel

Chief Executive Officer and Founder, Kabuni

Gerald Podobnik

Chief Financial Officer, Investment Bank and Corporate Bank, Deutsche Bank

Anna Rafferty

Vice-President, Digital Consumer Engagement, The LEGO Group

Gabriela Ramos

Assistant Director-General for Social and Human Sciences, UNESCO Digital

Yonatan Raz-Fridman

Founder and Chief Executive Officer, Supersocial

Michael Reffay

Advisor for Digital, Telecommunications and Postal Services, Permanent Representation of France to the European Union

Philip Rosedale

Co-Founder, High Fidelity

Ali Sajwani

Chief Operation Officer, DAMAC International Limited

Nadim Salha

Investment Director, Amanat Holdings

Nagwa El Shenawy

Undersecretary, Ministry of Communications and Information Technology of Egypt

Jeongho Shin

Chief Technology Officer, CJ Olivenetworks, CJ

Lewis Smithingham

Director, Creative Solutions, Media.Monks, S4 Capital

Tracy Stallard

Global Vice-President, Consumer Experiences & In House Agency, Anheuser-Busch InBev

Artur Sychov

Chief Executive Officer and Founder, Somnium Space

Timmu Toke

Chief Executive Officer and Founder, Wolfprint 3D

Sara Lisa Vogl

Co-Founder, R00ts Club

Amy Webb

Chief Executive Officer and Founder, Future Today Institute

Silvia Wiesner

General Manager, Belgium and Luxembourg, Unilever

Collette Winn

Vice-President, Creative Partnerships, NBC Universal Media

Alexander Winterling

Managing Director, Europe, Huma

Jonathan Wong

President, Group One Holdings

World Economic Forum**Kimmy Bettinger**

Project Specialist, Data Policy, C4IR Platforms

Jaci Eisenberg

Head, Content Curation, Global Collaboration Village

Jeremy Jurgens

Managing Director, Managing Board, World Economic Forum

Stephanie Llamas

Project Lead, XR Ecosystem Governance

Erin Parsons

Project Specialist, XR Ecosystem Governance

Sandra Waliczek

Platform Curator, Blockchain and Digital Currency

Accenture**Kathleen O'Reilly**

Senior Managing Director, Global Communications, Media and Technology Industry Practices Chair, Accenture

David Treat

Senior Managing Director, Metaverse Continuum Business Group Lead, Accenture

Kathryn White

Associate Director, Metaverse Continuum Business Group (MCBG), North America, Accenture

Denise Zheng

Managing Director, Metaverse Continuum Business Group, Responsible Metaverse, Accenture

Project team**Phoebe Barker**

Designer, Studio Miko

Laurence Denmark

Creative Director, Studio Miko

Martha Howlett

Editor, Studio Miko

Endnotes

1. Citi GPS: Global Perspectives & Solutions, *Metaverse and Money – Decrypting the Future*, 2022.
2. “Metaverse may be \$800 billion market, next tech platform”, *Bloomberg Intelligence*, 1 December 2021, <https://www.bloomberg.com/professional/blog/metaverse-may-be-800-billion-market-next-tech-platform/>.
3. Global Data, *Metaverse Market Size, Share, Trends, Analysis and Forecasts By Vertical (BFSI, Retail, Media and Entertainment, Education, Aerospace and Defense, Manufacturing, Others), Component Stack (Hardware, Software, Services), Region and Segment 2022-2030*, 2022.
4. “XR/AR/VR/MR market size 2021-2028”, Statista, 2022, <https://www.statista.com/statistics/591181/global-augmented-virtual-reality-market-size/>.
5. Grand View Research, *Blockchain Technology Market Size, Share & Trends Analysis Report By Type (Private Cloud, Public Cloud), By Application (Digital Identity, Payments), By Enterprise Size, By Component, By End Use, And Segment Forecasts, 2022 – 2030*, n.d.
6. “Worldwide Spending on AI-Centric Systems Will Pass \$300 Billion by 2026, According to IDC”, *IDC*, 12 September 2022, <https://www.idc.com/getdoc.jsp?containerId=prUS49670322#:~:text=NEEDHAM%2C%20Mass.%2C%20September%2012,%24118%20billion%20in%202022%20and.>
7. Zaveria, K., “Big data is the future of metaverse, in a sustainable way”, *Analytics Insight*, 02 October 2022, <https://www.analyticsinsight.net/big-data-is-the-future-of-metaverse-in-a-sustainable-way/>.
8. Kranz, Garry and Christensen, Gerry, “What is 6G? Overview of 6G networks & technology”, *Tech Target*, April 2022, <https://www.techtarget.com/searchnetworking/definition/6G>.
9. Pankaj, J., M. Neha, and V. Vitika, *Digital Twin Market Report*, Allied Market Research, 2022.
10. “Video Games – Worldwide”, *Statista*, 2022, <https://www.statista.com/outlook/dmo/digital-media/video-games/worldwide>.
11. Mordor Intelligence, *Global Virtual Reality In Gaming Market - Growth, Trends, COVID-19 Impact, and Forecasts (2022-2027)*, 2022.
12. “Distribution of Roblox games users worldwide as of September 2020, by age”, *Statista*, 2021, <https://www.statista.com/statistics/1190869/roblox-games-users-global-distribution-age/>.
13. Melcher, Niklas, “Deep Dive: Early Metaverse Players – Data on Demographics, Socializing, Playing, & Spending”, *NewZoo*, 19 January 2022
14. Roblox, *Metaverse Fashion Trends*, 2022.
15. Nokia, Ipsos, *Gen Z and the Metaverse*, 2022.
16. “RDC 2022: Our Vision for the Future of Roblox”, *Roblox*, 9 September 2022, <https://blog.roblox.com/2022/09/rdc-2022-vision-future-roblox/>.
17. Roblox, *Metaverse Fashion Trends*, 2022.
18. Nokia, Ipsos, *Gen Z and the Metaverse*, 2022.
19. De León, Riley, “How 99-year-old publisher Time is leading legacy media into the NFT future”, *CNBC*, 17 July 2022, <https://www.cnbc.com/2022/07/17/99-year-old-publisher-time-is-leading-legacy-media-into-the-nft-future.html>.
20. Brown, Abram, “How Hip-Hop superstar Travis Scott has become corporate America’s brand whisperer”, *Forbes*, 30 November 2020, <https://www.forbes.com/sites/abrambrown/2020/11/30/how-hip-hop-superstar-travis-scott-has-become-corporate-americas-brand-whisperer/?sh=7f826f9b74e7>.
21. “Forever 21 Shop City”, *Roblox*, n.d., <https://www.roblox.com/games/8254336243/Forever-21-Shop-City>.
22. Mastercard, *Mastercard makes it easier, safer to buy crypto* [Press release], 4 October 2022.
23. Berg, Nate, “Inside the lucrative business of a metaverse landlord, where monthly rent can hit \$60,000 per property”, *Fast Company*, 5 September 2022, <https://www.fastcompany.com/90749937/inside-the-lucrative-business-of-a-metaverse-landlord-where-monthly-rent-can-hit-60000-per-property>.
24. Kunst, Alexander, “Attitudes towards online advertising in the U.S. in 2022”, *Statista*, 28 November 2022, <https://www.statista.com/forecasts/997054/attitudes-towards-online-advertising-in-the-us>.
25. “RDC 2022: Our Vision for the Future of Roblox”, *Roblox*, 9 September 2022, <https://blog.roblox.com/2022/09/rdc-2022-vision-future-roblox/>.
26. “RSX | The Scent of the Metaverse: Verse 1 Extrait de Parfum”, *Rook Perfumes London*, n.d., <https://rookperfumes.co.uk/products/sotm>.
27. Orange, *Deutsche Telekom, Orange, Telefónica and Vodafone together with MATSUKO implement a proof of concept of holographic presence as a simple phone call* [Press release], 21 September 2022.
28. Miller, M. R., F. Herrera, H. Jun, J.A. Landay and J.N. Bailenson, “Personal identifiability of user tracking data during observation of 360-degree VR video”, *Scientific Reports*, vol. 10 no. 1, 2020.
29. “About Solid”, *solid project*, n.d., <https://solidproject.org/about>.