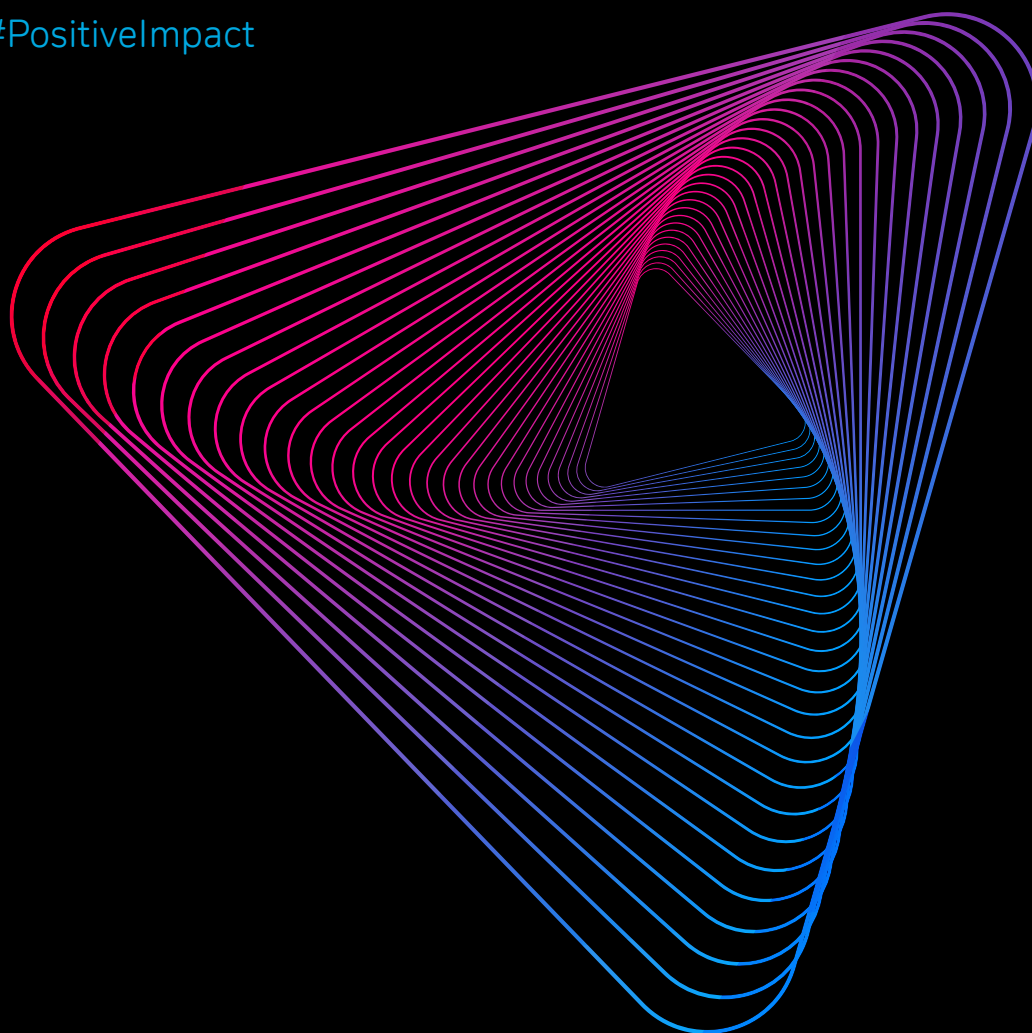


# Metaverse – The next e-commerce revolution

A guide to the metaverse: the opportunities for e-commerce; the risks; the technology; and legal/regulatory environment

#PositiveImpact



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Contents

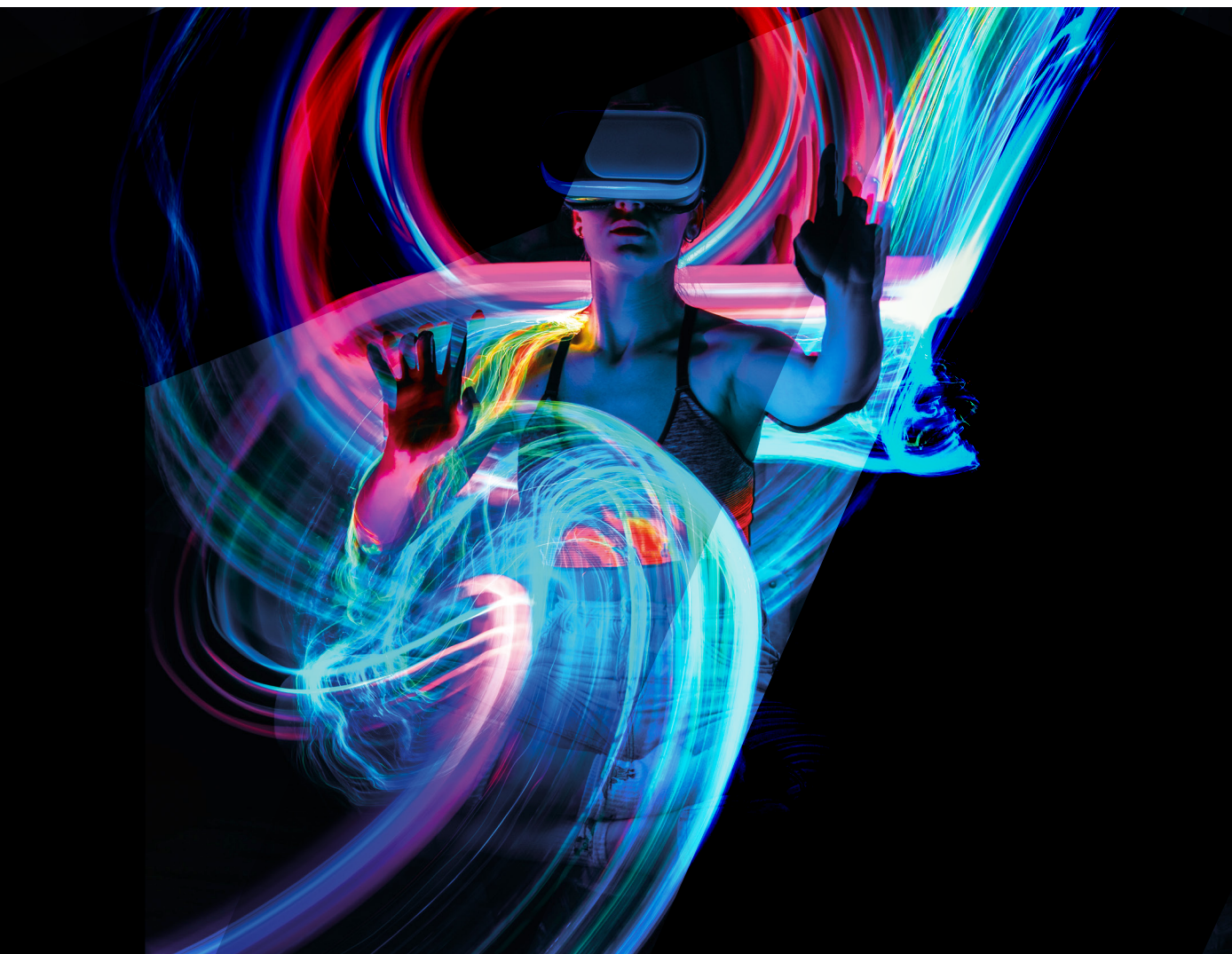
Authors	2
Foreword	4
Executive summary	5
1 Metaverse – origins, current state and the future	6
1.1 Investment inflows	6
1.2 Value and market size	7
2 What is the metaverse?	8
2.1 Broad definitions	8
2.1.1 Interconnected virtual worlds	8
2.1.2 Inhabitants and assets	8
2.1.3 Applications, protocols and utilities	8
2.2 Web2 vs Web3 metaverse ecosystems	9
3 Structure of the metaverse ecosystems	10
3.1 Multiple micro-metaverses with limited connectivity	11
3.2 Multiple, connected metaverse ecosystems	11
3.3 Single macro metaverse	12
3.4 Outlook	12
4 Participants of the metaverse ecosystem	13
4.1 Users	14
4.2 Corporates	14
4.3 Solution providers	14
4.4 Enablers	15
5 E-commerce opportunity on the metaverse	16
5.1 Customer engagement	16
5.2 Tokenised assets	17
5.3 2030 market outlook	18
5.4 Core services from financial intermediaries	19
5.5 Consumer experience as decisive factor	20
5.6 Product design and testing ecosystem	20
6 Examples and motivation of retail companies in the metaverse	21
6.1 Extended connection between customer and brand	22
6.2 New revenue stream	23
6.3 New channel for information and communication	23
7 Key challenges to address	24
7.1 Data privacy	24
7.2 Digital safety	25
7.3 Digital identity and credentials	26
7.4 Intellectual property and applicable jurisdiction	27
8 Where next?	28
9 Glossary	29

## Foreword

“Metaverse” Google searches and mentions have skyrocketed since October 2021 when Mark Zuckerberg announced Facebook’s name change to Meta. Many firms have established their presence on metaverse platforms, including some financial services institutions.

Among all this heightened interest, several questions remain. What is the definition of metaverse? How does it help individuals and corporates? What value, financially and qualitatively, can it deliver? How mature is the technology and when will it be ready to enable mainstream adoption? What are the risks and challenges faced? How can they be mitigated? What is the role of corporates, regulators, and government?

Further to our short article, *“Metaverse – the next e-commerce revolution”* published in July 2022<sup>1</sup>, this paper provides a deeper dive into a landscape that is rapidly evolving and answers some of the questions covering the definition, structure, use cases and risks. The paper also explores the e-commerce opportunities that the metaverse presents.



## Executive summary

The metaverse, roughly defined as 3-D virtual worlds that mimic the real world, has drawn much attention since late 2021. Certain well-known global firms, such as J.P. Morgan, HSBC, Standard Chartered (banking), Samsung (technology), Adidas (apparel) and PwC (consulting) have created a presence on the current metaverse platforms The Sandbox and Decentraland. Ever since Facebook’s announcement of its rebranding and name change to Meta in October 2021,<sup>2</sup> the investment on metaverse has continued despite a contraction in the cryptocurrency market.

Many different metaverse ecosystems exist today. Examples include Roblox, Fortnite, Minecraft, Decentraland, The Sandbox, Horizon Worlds. Currently, there is limited interoperability and connectivity across these ecosystems. We believe that the most likely scenario in the future is one of multiple metaverse ecosystems but which allow interoperability through standard solutions and protocols for digital identity, credentials, and asset ownership.

The metaverse could, we believe, usher in the next e-commerce revolution as it gains traction with advances in technology and becomes more mainstream. Financial services firms have a significant role in powering this evolution. As at September 2022, we estimate the future global retail e-commerce market size on the metaverse to be around US\$2trn by 2030. Of that US\$2trn, US\$1trn would be newly generated from the metaverse ecosystems based on virtual reality (VR), augmented reality (AR), haptic and other technologies, with the other half being realised on the metaverse ecosystems accessed on mobile and desktop channels.

Several challenges need to be addressed before the metaverse can realise its full potential. These include:

- a) Maturity of core technologies including AR, VR, haptic, 5G & edge computing;
- b) Measures to address concerns related to data privacy, security and financial crime;
- c) Intellectual property (IP) rights management and broader framework for dispute resolution; and
- d) Digital identity and verified credentials, as an enable for interoperability.



1

# Metaverse – origins, current state and the future

The term “metaverse” first came up in 1992 as part of the science fiction novel *Snow crash* by Neal Stephenson. Arguably, Second Life (officially launched to the public by Linden Lab in 2003) was the first avatar-based, virtual world built only for social interaction. The most unique aspect of Second Life was that residents could do things very similar to what they did in real life – buy or sell objects, watch movies, listen to music, play games, and create new content.

## 1.1 Investment inflows

Significant investment on the metaverse has poured in more recently. Most notably, Meta Platforms committed to invest US\$10bn in its Reality Labs division (as stated in the Facebook Q3 2021 results)<sup>3</sup> and employ 10,000 new people (called as ‘Metamates’ by Meta), and Microsoft’s proposed takeover of Activision Blizzard, announced in January 2022 is, at US\$70bn,<sup>4</sup> the largest ever tech acquisition. Nvidia is granting free licences (costing US\$9,000 annually for corporate customer) for its Omniverse software to creators and artists. Businesses ranging from large technology organisations, start-ups, venture capital and private equity firms have already allocated more than US\$120bn in 2022 to tap into the metaverse, more than double the US\$57bn investments made in 2021.<sup>5</sup>

“We’ve gone from desktop to web to mobile; from text to photos to video. But this isn’t the end of the line, the next platform will be even more immersive – an embodied internet where you’re in the experience, not just looking at it. This is what we call the metaverse”

Mark Zuckerberg, CEO, Meta (formerly Facebook)



## 1.2 Value and market size

Market estimates vary as to the value that the metaverse will create, but they are all sizable. Estimates range from US\$8trn–US\$13trn as predicted by Citibank,<sup>6</sup> to McKinsey’s estimate of up to US\$5trn by 2030.<sup>7</sup> An average of the market estimates suggests an overall metaverse economy market size of US\$8trn by 2030<sup>8</sup> (see Figure 1).

Figure 1: Estimated metaverse value by 2030 (US\$trn)

	Min	Max	Average
Citi	8	13	10.5
Goldman Sachs	6.9	9.3	8.1
McKinsey	5		5
Morgan Stanley*	8.3		8.3
Overall average			8
* General potential of total customer expenditure total addressable market in the US			

Source: Research conducted by Citi, Goldman Sachs, McKinsey & Co, Morgan Stanley

## 2

## What is the metaverse?

There are several definitions of the metaverse that exist today. No one can confidently say what the metaverse will look like in the future, therefore setting out definitions is only a way to provide some structure to this rapidly evolving landscape.

### 2.1 Broad definitions

This paper defines the metaverse as a combination of the following (see Figure 2):

- Interconnected virtual worlds or ecosystems that imitate real-world characteristics using technology (e.g., virtual reality, augmented reality, 5G/6G, haptics (also known as 3D touch), edge computing and others).
- Virtual representations (avatars) of humans, together with the (verified) credentials and assets that they own.
- Interactions and experiences of these avatars.

#### 2.1.1 Interconnected virtual worlds

The first part is what we most commonly understand metaverse to be. XR (eXtended Reality) forms a critical part of the technology that enables the metaverse experience. XR technologies can be understood as an umbrella term comprising any sort of technology that alters reality by adding digital elements to the physical or real-world environment by any extent so that the lines between the physical and digital world are getting blurred<sup>9</sup>. XR includes augmented reality (AR, digital layer over physical elements), mixed reality (MR, digital elements can interact with physical elements), virtual reality (VR, fully immersive digital environment), and any other technology located within the virtuality continuum<sup>10</sup>. Additionally, with haptic technologies, edge computing, 5G/6G communications and processing power, immersive digital experiences are being developed such that physical and virtual experiences are woven with each other. While the experience on the metaverse ecosystems today is still quite clunky, in time, the 2D experiences will, in our opinion, be replaced with 3D experiences. Connectivity across the metaverse ecosystems is also a critical issue and this is discussed further in *Section 3: Structure of the metaverse ecosystems*.

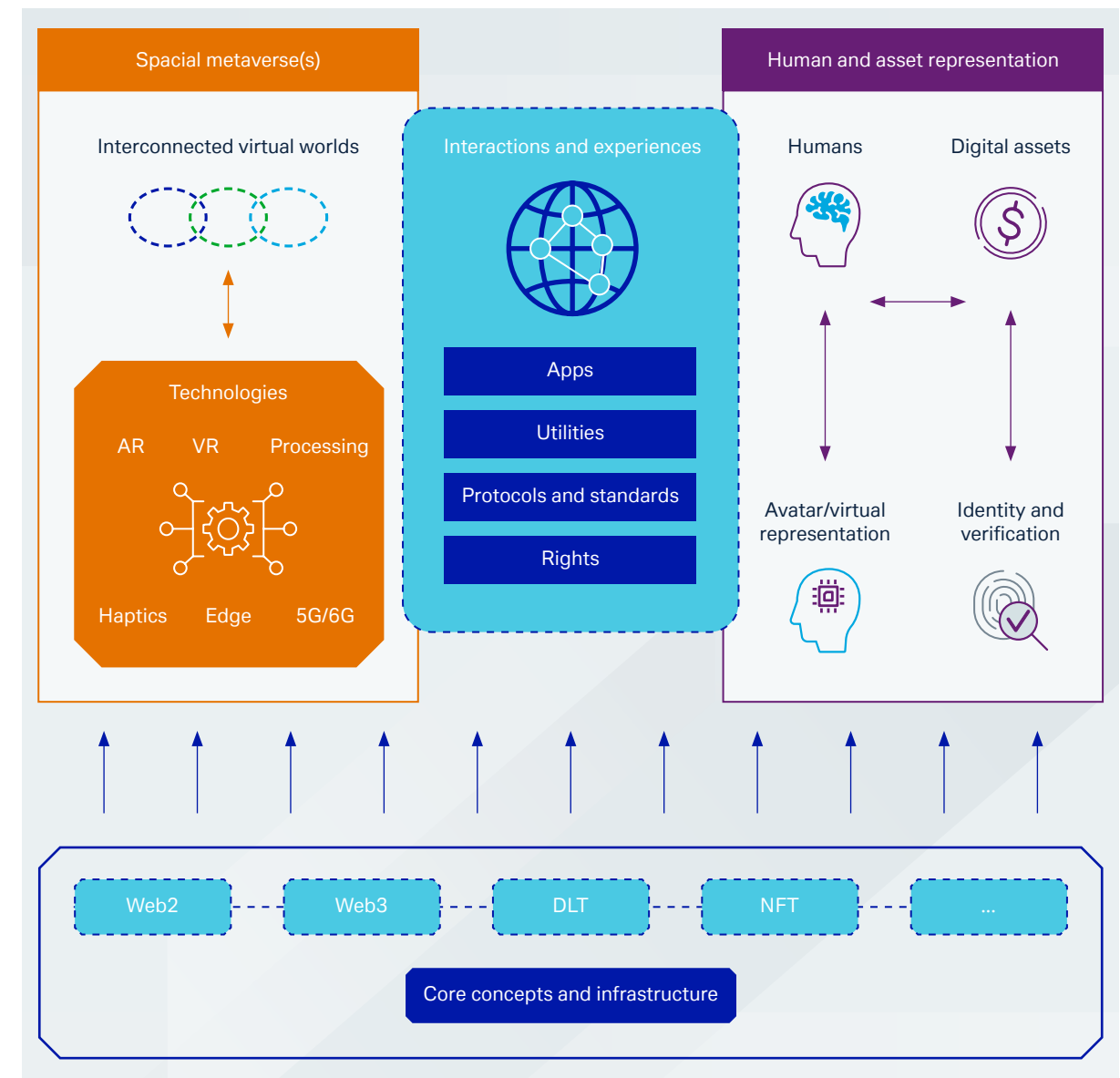
#### 2.1.2 Inhabitants and assets

The second part of the definition is who or what exists in this virtual world. Human representations in the form of avatars are one critical part. Also, representation of assets is required to participate in the metaverse economy. The assets could either be digital representations of what exists in the real-world ('digital twins') or digital only representations.

#### 2.1.3 Applications, protocols and utilities

The third part contains the applications, protocols and utilities that enable the interactions and experiences of these objects in this virtual world. This also includes security, privacy, identity and credentials (that can be verified) to allow safe and secure interactions.

Figure 2: Components of the metaverse



Source: Deutsche Bank

## 2.2 Web2 vs Web3 metaverse ecosystems

The metaverse ecosystems that exist today differ primarily on one characteristic – whether they utilise a blockchain network for the underlying infrastructure or not. We define Web2 metaverse ecosystems as the ones not based on blockchain. Typical examples include Roblox, Minecraft and Fortnite. Similarly, we define Web3 metaverse ecosystems as the ones built on blockchain. Examples include Decentraland and The Sandbox. These ecosystems are in their relative infancy, however a convergence across Web2 and Web3 metaverse ecosystems is evident. Web2 metaverse ecosystems pre-date mainstream adoption of distributed ledger (DLT) technologies, but these ecosystems are integrating token-based assets within their ecosystem.

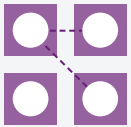


3

# Structure of the metaverse ecosystems

When people think about the metaverse, the initial thought is often that of a macro metaverse, a single open platform – but this is not the only scenario. At this stage, at least three different metaverse scenarios are identifiable. These have been adapted from those put forward in the news article, *How will the metaverse unfold?* published by AR content service provider Blippar<sup>11</sup>, and are summarised in Figure 3.

- 1) Multiple metaverse ecosystems with limited connectivity.
- 2) Multiple, connected metaverse ecosystems.
- 3) Single metaverse.

Figure 3: Structure of the metaverse ecosystems

	Multiple micro-metaverses with limited connectivity	Multiple, connected metaverse ecosystems	Single macro metaverse
Scenario			
Description	Competing closed platforms	Open and interoperable platforms	A single 'open' decentralised platform
Advantages	Focused delivery for specific services and/or user groups	Focused delivery AND interoperability	Full interoperability with more control for individual users and contributors
Challenges	Little or no interoperability or ability to transfer value	Data ownership and privacy	Numerous technical, regulatory and ownership challenges, plus lack of commercial incentives
Illustrative example	Individual employer metaverse ecosystems where assets cannot be transferred	Assets across Roblox and Minecraft are transferable	'The metaverse'
Most likely scenario			

Source: Adapted by the authors from 'How will the metaverse unfold' From Blippar

## 3.1 Multiple micro-metaverses with limited connectivity

In the first scenario, there are multiple micro-metaverses with limited connectivity between them. Each micro-metaverse is established using its own independent design approach to focus on specific sets of services or user groups, in direct competition with any comparable platforms. Items issued within an individual micro metaverse generally cannot be used within other platforms, or only on a limited basis within a select few platforms – they have not been developed as general cryptocurrencies. Access and identity are managed just as they are today, for example, social sign-on (a form of single sign on that uses existing information from social network providers such as Google, Meta etc). Data that is generated and captured remains with the companies that run the individual metaverses and it is monetised in essentially the same ways as in today's web platforms, but potentially with more personalised advertising.

A focus on developing micro-metaverses for specific sets of services or user groups helps to develop crisp, well-defined, propositions which are easy to understand while also being increasingly immersive, real-time, and intimate. Users can seek out 'best of breed' experiences to create, play, collaborate and shop in a virtual world.

However, users seeking convenience and a seamless experience between different parts of the virtual world will be frustrated by the lack of interoperability between micro-metaverses – challenges in finding the best platforms and moving value off or between would increasingly be an issue for many users. Likewise, numerous micro-metaverses using rich data sets, potentially including real-time and biometric data, could result in an overload of what some users may be regard as invasive advertising.

## 3.2 Multiple, connected metaverse ecosystems

In this scenario there are multiple metaverses, but importantly they are interoperable, with data sharing between different metaverse platforms. Digital identities and wallets enable easy movement across virtual worlds, with platforms adopting standard formats and protocols to share data and transfer value – for example using NFTs and other DLT-based tokens for digital assets. Data ownership and management remains with the companies that run the individual metaverses, but is made more complex and challenging, with greater risks resulting from platform interoperability. Just as in the first scenario (see Section 3.1), monetisation follows a familiar pattern to current web platforms, but with the potential for more personalised advertising.

Interoperability is the key additional advantage for users in this scenario, as it means they can use the same identity and value tokens across numerous different metaverse platforms. This greatly increases convenience for users and reduces the risk of losing value locked-in to platforms they no longer use.

However, increased data sharing between separate platforms could fuel user concerns about data ownership and privacy, particularly if a small number of major players are able to exploit early mover advantages and 'network effects' to secure dominant positions in the connected metaverse ecosystem.



3.3 Single macro metaverse

In this scenario there is a single ‘open’ platform, which is fully decentralised. This means it is not owned or controlled by any singular company or organisation, rather it is developed and run for and by its population of creators and users, using open standards. Common standards and technical architectures enable a fully integrated network and economy that is persistent and spans the digital and physical worlds.

Individuals have a single identity, albeit potentially with multiple avatars/personae, that retain context as they move through and interact with (or are interactive with) different parts of the metaverse. Companies can offer their own set of services, as part of the fully functioning economy, with value being transferred via tokenised formats.

Proponents of the single macro metaverse scenario often see it in relation to an emerging vision for Web3 in which trust is decentralised and value creation and exchange become more ‘democratised’, in other words removing the need for various types of central authorities and intermediaries. Irrespective of whether that vision is fully realised a single macro metaverse would, in theory, provide a seamless, persistent, and synchronous experience across the digital and physical worlds.

In practice significant technical, commercial, regulatory, governmental, and even societal challenges arise and would need to be resolved. Technical challenges would include the creation of interoperability standards and protocols to enable portability of assets, and standardised file/storage formats. Even then, obligations and responsibilities like self-custody may not be suited to the ‘average’ user. Consumer protection in a decentralised world is one of many issues, at the nexus of social societal and regulatory considerations, that would need to be addressed.

3.4 Outlook

We believe that a single macro metaverse is unlikely due to many of the challenges we discuss in this paper (regulation, technology, ownership etc.). Our view is that, in the longer term, multiple, connected metaverse ecosystems is the most likely outcome.

During the initial phase, we anticipate a highly fragmented market of competing metaverse ecosystems provided by the large entertainment and technology companies. Currently these players have few near-term incentives to establish and support interoperability in their ecosystems – but this fragmented and incompatible set-up causes paralysis for consumers and corporations confused on where to place their bets in deciding which ecosystem to buy into. Although this may initially slow engagement with the metaverse technologies, eventually consumers will begin to adopt the platforms that provide the greatest balance of convenience and functionality.

For the major platforms, the incentive for interoperability and compatibility will more than offset the fear for the loss of current profitable competitive advantages and current metaverses will begin to adopt new metaverse standards (such as the Metaverse Standards Forum<sup>12</sup> and WEF Defining the Metaverse initiative<sup>13</sup>) to enable this. It is at this point platforms that do not adopt openness and interoperability could start to become obsolete.

4

Participants in the metaverse ecosystem

A thriving metaverse economy requires that the various participants of the metaverse ecosystem are engaged and contributing towards extracting the value. We assess who these different participating groups are, their current level of engagement on the metaverse and the outlook. See Figure 4.

Figure 4: Key participants of the metaverse ecosystem

	Description	Current activity or maturity	Outlook
Users	Humans (their avatars) that are registered and/or active on the metaverse ecosystems	<div><div></div></div> Low number of users on Web3 metaverse ecosystems, high number of users on Web2 ecosystems	<div><div></div></div> User adoption predicted to significantly increase as technology and use cases mature
Corporates	Corporates that have a presence on metaverse ecosystems	<div><div></div></div> Luxury retail segments most active; Some firms in mass-market retail also active; Some banks have created a lounge on the metaverse	<div><div></div></div> Corporate presence predicted to continue to improve
Solution providers	Technology solution providers that are supporting the adoption and use the metaverse ecosystems	<div><div></div></div> Significant investment being able made by large tech orgs., start-ups, venture capital and private equity firms	<div><div></div></div> Likely to continue to remain strong – industry or use case specific solutions likely to emerge
Enablers	Industry consortiums, regulators, and other institutions to define common standards, laws regulation and guidance	<div><div></div></div> Low degree of harmonisation and common standards; Positive development in the recent formation of Metaverse Standards Forum	<div><div></div></div> Further focus of the industry needed to overcome the challenges regarding common standards and interoperability
<div><div></div>Limited activity or maturity<div></div>Very significant activity or maturity</div>			

Source: Deutsche Bank

## 4.1 Users

Users are defined as the human avatars registered and visiting the metaverse. Currently, there is a low penetration of users on the Web3 metaverse ecosystems, although there is a high penetration on Web2 metaverse ecosystems. As of December 2021, there were 300,000 monthly active users and 18,000 daily active on Decentraland, one of the most popular platforms<sup>14</sup>. However, Roblox, Minecraft and Fortnite have much higher penetration. Roblox has 40 million daily active users, Minecraft had 141 million active players in August 2021<sup>15</sup>, and Fortnite had 350 million registered users in May 2020<sup>16</sup>.

The number of Decentraland and The Sandbox users have slightly declined during 2022, with one potential reason being the contraction of the cryptocurrency market since the start of the year.<sup>17</sup>

Moreover, the utility of the metaverse hasn't significantly improved during the period, resulting in waning user interest since Facebook's change of name to Meta which saw a significant spike in user interest. In their paper, *Metaverse and Money*, Citi predicts that there will be five billion unique users on the metaverse by 2030.<sup>18</sup> While that might seem to be a huge increase from the penetration today, we believe that is possible.

## 4.2 Corporates

The corporates provide the supply of products and services on the metaverse where, currently, there are relatively few of them with a presence. The most active residents serve luxury retail (and some firms in mass-market retail) segments. These include firms such as Gucci, LVMH, Dolce & Gabbana, Burberry, H&M, IKEA, Nike, and Adidas. See also *Section 6: Examples and motivation of retail companies in the metaverse*.

Financial institutions such as JP Morgan, HSBC, and Standard Chartered have an established presence on the metaverse. We launched the Deutsche Bank metaverse in October 2022. According to research conducted by Newzoo, over the past year, the number of companies working on the metaverse grew from 200 in July 2021 to more than 500 a year later.<sup>19</sup>

As technology matures and use case adoption starts to happen, an increasing number of corporates will begin to establish not only a presence but look to find ways to do business on the metaverse. Going forward we see this playing out in the same way that internet adoption did – now that every corporate has a web presence, every corporate will also have a presence on the metaverse.

## 4.3 Solution providers

A number of challenges remain unresolved on the metaverse. These range from technology solutions related to metaverse user experience and metaverse economy, building solutions to allow seamless user experience as they move across the metaverse ecosystems, digital identity, and many others. There is already significant investment to attract technology talent to help solve these challenges and some of the largest technology firms have committed to investment in the metaverse. According to McKinsey, businesses ranging from large technology organisations, start-ups, venture capital and private equity companies have already allocated more than US\$120bn in 2022; more than double the US\$57bn investments made in 2021. Consulting firms are also investing in building metaverse capabilities.<sup>20</sup>

The global investment on the metaverse has been and will continue to remain strong despite a significant decline in the cryptocurrency market since November 2021. As the underlying solutions are built over the coming years, we might see an industry specific (e.g., retail, industrials) or use-case specific (e.g., virtual training, experiences) provider ecosystem.



## 4.4 Enablers

Regulators, government institutions and industry consortiums play a critical role in defining the standards to address challenges around data privacy, security, interoperability and identity, and provide oversight for smooth functioning of the metaverse ecosystem.

There is currently a low degree of harmonisation across the standards used across various metaverse ecosystems. Recently, the Metaverse Standards Forum has been established which provides a venue for cooperation between standards organisations and companies to foster the development of interoperability standards for an open and inclusive metaverse, and accelerate their development and deployment through pragmatic, action-based projects.<sup>21</sup> In the two months following its launch in June 2022, 1,500 companies and standards development organisations joined. Beginning with more than 200 topics as suggested by the members, the topics have been grouped into several domains.<sup>22</sup> For example: interoperable 3D assets; privacy; safety; security and inclusion; user identity; avatar and apparel, etc.

Regulators should also understand and mitigate the systemic risk posed by increased use of the metaverse. Consumer protection and financial stability framework for the metaverse will be important, specially as metaverse economy starts to gain significant size. This has also been highlighted by Bank of England researchers.<sup>23</sup>

Some governments around the world have started to assess the potential of the metaverse. Seoul, South Korea, was the first city to articulate its ambitions for the metaverse in November 2021.<sup>24</sup> It aims to have a metaverse environment for all administrative services by 2026, including economy, education, culture and tourism. Middle Eastern cities are also keen. In July 2022 Dubai announced its ambition to be one of world's top 10 metaverse economies. Kuwait-based Warba Bank entered the metaverse setting up two sites (one on Decentraland and another on The Sandbox) and became the first Islamic bank to enter metaverse.<sup>25</sup> In August 2022 Qatar University became the world's first university to enter the metaverse.<sup>26</sup>

Addressing metaverse specific risks and challenges will require multiple parties to come together to find solutions. These risks and challenges have been covered in more detail in *Section 7: Key challenges to address*.



## 5

## E-commerce opportunity on the metaverse

While e-commerce touched mainstream in the early 1990s with the first online bookstores for consumers (for example, Book Stacks Unlimited, created by Charles Stack in 1992), it is now a driving force of the world economy and many big businesses have been built on e-commerce. Following significant growth in recent years the global retail e-commerce market has been estimated at around US\$4.6trn in 2021.<sup>27</sup>

### 5.1 Customer engagement

The metaverse will bring the e-commerce experience to a new level by making it more personal, more real, and more immersive. Value can be extracted out of two domains:

- A combination of experiences from traditional brick and mortar stores with face-to-face on-site advice and customer services;
- Enhanced availability and reachability enabled digitally.

Significantly tighter connection between the experiences in metaverse is a distinguishing factor to existing e-commerce. Clearly, there will be some limitations based on the operated business (for example, a repair business relies heavily on physical inputs) – however, businesses and marketing using omni-channel strategies to sell products and services can benefit strongly from another channel fuelled by a visual, immersive experience.

The e-commerce experience on the metaverse will be characterised by ultra-personalisation/ customisation and user-designed products, going beyond just product recommendations offered on the internet currently. Users are not just able to configure the product based on colour, prints, etc., but actually design it themselves. Retailers that provide such winning personal experience could charge a price premium. User returns, estimated by CBRE Supply Chain to be 30% during 2021 holiday season in the US<sup>28</sup>, would reduce as users ‘try’ the product virtually or see how a particular furnishing might fit in their homes using augmented reality. There is likely to be much higher (virtual) footfall as users can go into stores at the click of a button and outlets could attract custom in ways not possible within the constraints of the physical world (for example, watching an exclusive live show at the store).



### 5.2 Tokenised assets

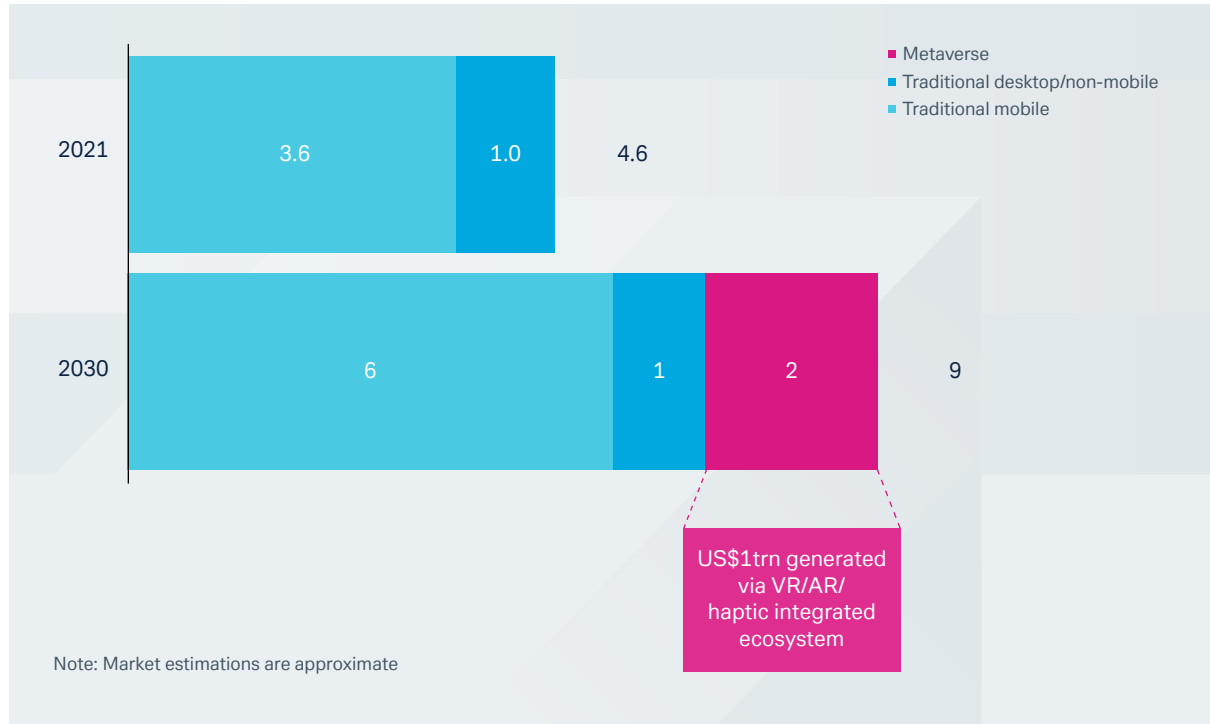
Tokenised assets – primarily non-fungible tokens (NFTs) – open up markets that did not exist before.

Imagine the following experience:

- A user enters the metaverse showroom of a retailer.
- The retailer drops an NFT to the user’s wallet as a reward (e.g., most frequently visiting user). The NFT entitles the user to put on a branded jumpsuit on the avatar and allows him/her to redeem a physical jumpsuit as well.
- The user really likes this one-of-a-kind, unique product.
- The user wears the jumpsuit on the avatar and redeems the offer for a physical jumpsuit (after making a payment), which arrives the next day.
- The jumpsuit has a chip (already linked to the NFT) and a hologram (as a certificate of authenticity).
- The user allows the retailer to capture data for its physical movements as well as the movement of the avatar on the metaverse.
- The retailer analyses user’s movement on the metaverse, considers the user to be an influencer and further rewards them with a free ticket to a concert.

While the scenario might sound fictional, much of it can already be realised today. The integration of a physical object and a digital object using an NFT to prove ownership and provenance and a chip to link the physical object with the NFT opens up possibilities for revenue streams while creating a brand following through superior customer experience.

Figure 5: Projected development of retail e-commerce market (US\$trn)



Source: Deutsche Bank

### 5.3 2030 market outlook

By 2030, we estimate that global retail e-commerce value from the metaverse to be US\$2trn a year, which is around 20% of the total retail e-commerce value across all channels given that retail e-commerce value is estimated to be US\$9trn.<sup>29</sup>

Across the three core channels of retail e-commerce on the metaverse (metaverse on mobile, metaverse on desktop, and metaverse on VR/AR/haptic integrated ecosystems), we estimate US\$1trn to be generated from the metaverse on VR/AR/haptic ecosystems (see Figure 5).

The estimates are driven by certain expected trends – the following being two of the main ones:

- Increase in time spent in the metaverse. According to Gartner Research, by 2026, 25% of people will spend at least one hour a day in the metaverse for work, shopping, education, social and/or entertainment.<sup>30</sup>
- There will be a shift in the channel usage for retail e-commerce – mobile will continue to be an important channel also for the metaverse next to desktop access. However, with the advancement in technologies (such as VR, AR, and haptic), a new channel providing access to metaverse will have sizable value. Early observations from retailers have shown that a spatial product experience on the metaverse can significantly boost conversion<sup>31</sup>.

### 5.4 Core services from financial intermediaries

These developments are driven by transactions that require payment services to be supported by financial institutions. The core services would broadly need to cater for two scenarios:

- Support transactions that do not have blockchain-based tokens on either end of the transaction (i.e., sender and receiver). Many such transactions occur today on the Web2 Metaverse ecosystems (e.g., buying a proprietary in-game asset on Roblox).
- Supporting transactions on Web3 Metaverse ecosystems that are built using blockchain-based tokens and need conversion between these tokens and fiat currencies. As an example, Decentraland, which is built on the Ethereum blockchain, allows users to buy plots of lands (as NFTs) using its native currency MANA. One way to buy MANA is to make a payment of ETH (Ethereum’s cryptocurrency) via an exchange and store it in a browser-based wallet. Obtaining ETH requires a fiat to cryptocurrency transaction using an exchange. Buying NFTs on Web2 Metaverse as collectibles or wearables would also fall in this category.

Core solutions to support the first scenario already exist (i.e., current payment rails). However, there are still opportunities for providing solutions to close the sales loop directly on the metaverse. Moreover, driven by both the user volume and transaction volume, the e-commerce transactions are likely to also grow on the Web 3.0 metaverse ecosystems. Solutions, integrated in the metaverse with the required scale and low transaction costs, are needed for token transfers and token-fiat currency exchange. NFTs play a critical role in the metaverse, providing the rights for digital ownership and provenance of purely digital assets as well as digital twins (i.e., a digital asset with a physical world equivalent). Beyond the core solutions, we are also likely to see financial services players offering financing and lending solutions.

Payment providers and fintechs have already invested in the metaverse and started to offer these services:

- American Express seeks to engage in virtual payments and electronic business transactions for digital media and NFT.
- PayPal allows users to buy, sell and hold crypto.
- Stripe’s new application programming interface allows businesses bi-directional fiat-crypto conversion, including KYC and identity verification.
- Mastercard announced in June 2022 that it is working with NFT marketplaces to allow NFT purchases.<sup>32</sup>

5.5 Consumer experience as decisive factor

Where the existing internet-based shopping activity was fuelled by retail consumerism (and social media), the metaverse will be fuelled by experience.

Going forward, ownership will be important but that is not necessarily translating into a transaction to buy goods and services. In addition, shared or solo experiences will become critically important: concerts, playing sports/games, exploring some part of the world virtually with others will be valued. Experience as an amplifier in the metaverse could also lead to a world that is more polarised where metaverse dwellers will seek out platforms and venues where those likeminded people can meet (political, social groups etc.). Furthermore, customers need to gradually benefit from good new shopping experience in the metaverse – bad examples and repetition from existing 2D such as generic chat bots will not be sufficient and can deter even loyal customers from buying and spreading the word. Until proven otherwise, more complex sensory shopping experiences beyond basic haptic replication for the user will not be realistic in the near future – therefore, a balanced omni-channel marketing strategy will be required. To counter some of the (short-term) deficiencies largely based on the lack of maturity of technology, retail companies can explore ways to engage customers in a more social way together with other shoppers, ultimately building a nuanced community engagement that might be driven by younger generations.

5.6 Product design and testing ecosystem

Creative collaboration will lead to new products and services not found in the economy today. The metaverse enables creator ownership with fewer intermediaries which is the main leap from the current internet experience. But collaboration is boosted through the fidelity of the metaverse where people from around the world can come together to jointly work on a project. There are similarities to networks such as Wikipedia with the difference that more sustainable monetisation can be realised. Also, innovation is mostly around open-source code and permissionless blockchains today which has potential for further growth. The ‘sandbox-like’ environment of the metaverse can be useful to further enhance risk management practices. Instead of engaging in expensive and sophisticated real-life tests (such as crash tests in the automobile industry) replicated environments – rather like aircraft flying simulators – have advantages. If a significant virtual economy is building up gradually, marketing strategies but also certain stress testing applications might be possible.

Ultimately, the metaverse will not be a substitute but rather complementary to the physical world because it will allow cheaper and faster experimentation. This will spur innovation and technological advancements as companies or individuals can dispose of their failures before developing the product in the real world. Before bringing a new cordless vacuum cleaner to the market Dyson had to make 5,127 prototypes<sup>33</sup> – metaverse product testing could significantly reduce the number of iterations required as designers and test users will be able to experience the product in different ways. Apart from enabling new product testing opportunities many NFTs represent a conduit between digital and physical spheres which can provide the user with the opportunity to create some trainers digitally and if desired receive a pair in real life (‘IRL’) to wear afterwards.

6

Examples and motivation of retail companies in the metaverse

Many retail companies have entered the metaverse either via the presence of a digital store or, more broadly, by offering digital or physical goods on a particular platform. They typically chose one specific metaverse for their presence and establish a partnership instead of using cross-metaverse universal offerings. Figure 6 sets out examples of retail players active on the metaverse – with website links to their metaverse assets.

Figure 6: Selection of retail companies active in the metaverse

Primary focus	Companies	Metaverse	Intention/Examples
Extended connection between customer and brand	<div>— Burberry</div> <div>— Louis Vuitton</div> <div>— Nike</div> <div>— Ralph Lauren</div> <div>— Zara</div>	<div>— Decentraland</div> <div>— Roblox</div> <div>— ‘The Game’</div>	<div>Create greater connection to customer and enhance brand and community experience</div> <div>— Louis Vuitton: Distribution of NFT to celebrate 200th birthday (<a href="https://nftplazas.com/louis-vuitton-gamified-nfts-celebrate-birthday/">https://nftplazas.com/louis-vuitton-gamified-nfts-celebrate-birthday/</a>)</div> <div>— Zara: Release of ‘Meta Collection’ (<a href="https://de.fashionnetwork.com/news/Zara-dringt-weiter-ins-metaversum-vor,1392146.html">https://de.fashionnetwork.com/news/Zara-dringt-weiter-ins-metaversum-vor,1392146.html</a>)</div> <div>— Ralph Lauren: Virtual shop for Avatars on Roblox (<a href="https://t3n.de/news/ralph-lauren-shop-roblox-1441623/">https://t3n.de/news/ralph-lauren-shop-roblox-1441623/</a>)</div>
New revenue stream and channel	<div>— Adidas</div> <div>— Balenciaga</div> <div>— Dolce &amp; Gabbana</div> <div>— Forever 21</div> <div>— Gucci</div> <div>— H&amp;M</div> <div>— Ikea</div> <div>— Sotheby’s</div> <div>— Tommy Hilfiger</div> <div>— Vans</div>	<div>— CEEK</div> <div>— Decentraland</div> <div>— Fortnite</div> <div>— Roblox</div> <div>— The Sandbox</div>	<div>Boost revenues via complementary sales in many cases together with physical goods</div> <div>— Balenciaga: Provides possibility for users to produce digital objects themselves and transform into physical items (<a href="https://www.gq-magazin.de/mode/artikel/warum-ist-die-modewelt-so-besessen-vom-metaverse">https://www.gq-magazin.de/mode/artikel/warum-ist-die-modewelt-so-besessen-vom-metaverse</a>)</div> <div>— Sotheby’s: Users can curate and sell digital artwork or NFTs with the aid of metaverse branch (<a href="https://www.sothebys.com/en/articles/next-stop-the-metaverse">https://www.sothebys.com/en/articles/next-stop-the-metaverse</a>)</div> <div>— H&amp;M: In a concept cooperation with CEEK City customers have the opportunity to order clothing from physical stores after orientation in the metaverse (<a href="https://www.textilegence.com/en/ceek-presented-hm-metaverse-concept-store/">https://www.textilegence.com/en/ceek-presented-hm-metaverse-concept-store/</a>)</div>
New channel for information and communication	<div>— Carrefour</div> <div>— P&amp;G</div>	<div>— Own environment</div> <div>— The Sandbox</div>	<div>Drive corporate communication and product information</div> <div>— P&amp;G: Consumer can interact with multiple brands for information purposes (<a href="https://us.pg.com/blogs/designing-for-the-future-metaverse/">https://us.pg.com/blogs/designing-for-the-future-metaverse/</a>)</div> <div>— Carrefour: Host virtual career events (<a href="https://themediaverse.com/supermarket-carrefour-is-now-holding-job-interviews-in-the-metaverse/">https://themediaverse.com/supermarket-carrefour-is-now-holding-job-interviews-in-the-metaverse/</a>)</div>

Source: Deutsche Bank



There are several motives for retail companies to engage in the metaverse with potential overlaps – however, we identify the following as the primary factors:

- Extended connection between customer and brand.
- New revenue streams.
- New channel for information and communication.

6.1 Extended connection between customer and brand

A core motive of many retail companies is to create a greater connection to the customer and enhance the brand and community experience. This applies to most companies but can vary based on maturity of the offering as well as monetisation effort.

For instance, the global luxury clothing label Burberry sees the metaverse as the ‘new frontier of storytelling’ for brands and believes that luxury fashion brands fit well into the metaverse as natural partners where companies can exchange creativity and create self-expression for customers in a dialogue.<sup>34</sup> In July 2022, Burberry announced the first virtual bag collection for the Roblox metaverse which comes with its distinct “emote” being represented by the avatars unique signature move.<sup>35</sup>

“With Nike Virtual Studios, our vision is to take our best-in-class experiences in digital and build Web3 products and experiences”

John Donahoe, CEO and President, Nike

Sports apparel company Nike views the metaverse as a part of its digital transformation and as a potential revenue stream, having created a significant metaverse presence in 2021 in Roblox called Nikeland. There are numerous activities users can perform within courts, running tracks, stadiums etc. in a detailed and competitive environment. There is also a dedicated showroom where users can experience and purchase digital Nike products while enjoying digital sports competition with other users.<sup>36</sup> A key motive for Nike is to engage with a new generation of younger sports-loving customer groups which can translate into increased sales activity in the real world. New designs and trends can be tested digitally before actual physical rollout of the product in the market. According to the company, by 30 August 2022, Nike had recorded 6.7 million people from 224 countries as having visited the online space and participated in online games while trying on virtual products.<sup>37</sup>

6.2 New revenue stream

Beyond building a deeper connection with the brand, the Metaverse can boost (new) revenues through complementary sales. Designer clothing label Tommy Hilfiger joined the Metaverse Fashion Week in Decentraland in March 2022 advertising its Spring 2022 collection. The fashion brand was hosting a digital retail platform where customers can buy NFTs for their avatars or directly purchase physical items. Via a commerce settlement layer, an easy exchange of digital assets can be achieved for physical products.<sup>38</sup>

Similarly, sport apparel company Adidas has introduced a physical product exclusively for owners of a specific NFT (this NFT is called “into the metaverse”). This first collection established (‘minted’) in December 2021 consisted of 30,000 NFTs. Each NFT sold for 0.2 ETH and was traded in the secondary market with Opensea as a verification platform for the original digital products.<sup>39</sup>

Footwear brand Vans has launched ‘Vans World’ within Roblox in September 2021 enabling customers to create unique skateboarding styles and fashion which can be purchased and worn in the persistent 3D space environment.<sup>40</sup>

Sotheby’s, the world’s largest brokers of fine and decorative art, jewellery, and collectibles, opened a replica of the London branch in Decentraland in early 2022 where users can trade digital artwork or NFTs. In September 2022, a ‘jewellery as art’ sale took place on Sotheby’s platform in a ‘phygital’ manner which represents a combination of the physical and digital world.<sup>41</sup> Similarly, Metagolden, a web3 emporium showcasing digital collectibles, is operating as a platform in Decentraland to provide customers with tangible products effectively selling NFT-paired jewellery on the metaverse.

6.3 New channel for information and communication

Some companies also engage in the metaverse to drive corporate communication and product information. For the Consumer Electronic Show (CES) 2022, Procter & Gamble (P&G) has created a virtual world called BeautySphere which is separate to the other metaverse platforms but can be accessed from any desktop computer, making it possible for the consumer to interact with the multiple brands of the company. With livestream panels and gamified challenges also available after the CES, consumers can inform themselves about the sustainability of beauty products and the values of P&G.<sup>42</sup>

Much experimentation is evident on how the metaverse can support existing processes. In January 2022 French supermarket group Carrefour opened a virtual campus on The Sandbox<sup>43</sup> and tried to interact with potential candidates by hosting job interviews as part of a larger recruitment event. While graphical experience could still be significantly improved, there might be similar attempts in the future to open various means of communication and interaction with different kind of stakeholders.



## 7

## Key challenges to address

Beyond the technology changes required to make the metaverse experience as immersive and real-world as possible, as indicated in Section 4, there are some/several other key challenges to address to enable large-scale adoption and drive value.

### 7.1 Data privacy

VR devices rely upon the collection and processing of sensitive data, including user's biometric data, unique device identifiers, and location information about the interior of homes and businesses. It is estimated that in a single 20-minute session in VR, a headset can generate approximately two million data points and unique recordings of body language.<sup>44</sup> The monetisation potential of data increases the risk of data misuse. Conceptually, there are two categories of the data generated:

1. **Device-specific data.** Data is originated upon using the devices that help generate the VR experience (such as goggles and haptic gloves). These devices would typically have a corporate that build or distribute them, and these corporates would be looking to not just monetise the data but also utilise the data to enhance the product.
2. **User-specific data.** User data, derived from user transactions and experiences on the metaverse platform is not always corporate owned (for example, an NFT transaction, virtual movement of an avatar on Decentraland), and therefore the considerations on the data captured would be different.

It remains to be seen how data privacy and security considerations play out on the metaverse. For instance, there needs to be more clarity to what extent the existing regulation such as the General Data Protection Regulation (GDPR) addresses the data privacy concerns on the metaverse. Metaverse solution providers need to come together to architect the future with data privacy considerations. While it is still early days, society has the collective experience of dealing with similar questions regarding social media now it has become mainstream. These perspectives, knowledge and experience are helpful in addressing privacy and security issues in the metaverse.

Of course, not all economies treat data and privacy in the same way. There is a different level of appreciation of privacy around the world based on social and economic realities which could lead to a disparity of adoption rates in the world and the potential for technology arbitrage.

It is important that data sovereignty is made transparent to users since the location of where certain personal data or meta-level activity tracking data is being stored might differ widely to the location where a certain service provider as well as the beneficiary or user resides (with direct implications or data protection scrutiny). A key challenge is represented by the gap between registering as a user when entering the metaverse (or a specific environment) and later usage, consumption, or any other relevant activity. Initially, it is unlikely that all relevant data privacy rules and conditions have been clarified which can be addressed by a 'notification on event' approach rather than 'information on registration' which is commonly applied nowadays.<sup>45</sup>



### 7.2 Digital safety

Building a trusted, secure and safe environment on the metaverse is essential to its success. Safeguards to eliminate abuse, biases and malicious attacks are needed, although it is unrealistic to assume these will get eliminated altogether.

Meta has a suite of safety features built into Horizon Worlds. One of them is 'Safe Zone', which is a protective bubble that users can activate when feeling vulnerable where no one can touch, talk to users or interact in any way. Successful mitigation requires strong discipline and ability to penalise the aggressors, much like one would do in the real world. The onus of this is on the platform provider, while the tools at the user's disposal provide a way make them feel safer.

One can be sure that different techniques might be used to disguise identities, intentions, and locations, e.g., via further developed Virtual Private Network (VPN) extensions or invisible avatars<sup>46</sup>. A two-pronged approach based on cyber security advancements to address digital safety concerns should be enforced together with a sound prosecution of criminals driven by (local) governments.



### 7.3 Digital identity and credentials

Experiencing a single, interconnected metaverse requires that digital identities, along with the credentials and assets associated with the identity, can move across the different metaverse ecosystems. These identities need to be verifiable to address not just the safety concerns but also to prevent fraud being committed. As currently seen on large internet platforms, one potential threat is social engineering where criminals can impersonate others to obtain access to private information or assets.<sup>47</sup> This is a practice where users are persuaded to expose certain data. More immersive experiences on the metaverse could also foster the use of deep fake methods to lure individuals into situations that expose them or private information.

There is a need for digital identification and verified credentials. Solutions based on decentralised models are being developed. One such example is self-sovereign identities (SSI), where individuals have full control over the data being available on a blockchain or enabled via NFTs. It can be decided on a case-by-case basis what type of information should be shared e.g., sharing data only for specific transactions<sup>48</sup>. In the metaverse, a user might have different parts of his or her identity that they are willing to share at different occasions (e.g., different avatars in a work/professional context vs. gaming context).

A recent proposal was made in the research paper, *Decentralized Society: Finding Web3's Soul* (May 2022) to introduce non-transferable (put possibly revocable by the issuer) 'soulbound' tokens (SBTs) that in principle cannot be transferred out of a holder's wallet and provides connection to real world credentials (e.g. educational experience) as a potential enabler of a decentralised society.<sup>49</sup> This approach could solve some challenges such as those related to uncollateralised lending, voting in decentralised governance (DAOs) and decomposition of property rights. However, it is certain that regulation will be applied as management of public goods without state intervention is highly unlikely. Ultimately, the success of introducing SBTs will largely be dependent on the willingness of users to store core aspects of their identity for the purpose of participating in the metaverse. Some users might feel deeply uncomfortable with that and value the highest level of anonymity – however, for a significant level of participation and associated transactions done in the metaverse, the concept could serve as a blue-print to prove provenance and reputation in a decentralised setting.



### 7.4 Intellectual property and applicable jurisdiction

A driving factor for the metaverse economy will be the creation and utilisation of various forms of intellectual property (IP). While some existing legal schemes and concepts may apply, more work is needed.

In certain circumstances, it is questionable who has specific copyrights to sell underlying (digital) objects or IP via, for example, NFTs. New licensing schemes need to be developed to create clarity on what is allowed and what could be classified as misuse. Effective enforcement could be challenging, yet owners and licensors should apply some effort for monitoring platforms and take action where required. The difficulty in a DLT-based environment however is that digital goods are based on interoperability and unlike any direct claim you could make in relation to the platform (owner), the challenge of enforceability exacerbates due to the linkage of an NFT to a (potential) anonymous individual and/or its wallet.

Following more theoretical considerations regarding the legal nature of NFTs which might differ across jurisdictions, there are first interpretations that NFTs represent ownership (there can be a nuanced debate similar to the example of whether there are rights to own a piece of paper versus owning the rights on the paper). For example, in Germany an analogue interpretation of existing civil law is possible and also the June 2021 law on electronic securities (the eWpG) provides legal clarity for electronic securities and their legal status<sup>50</sup>. Nevertheless, the mere process of selling an NFT does not necessarily provide legal clarity for all parties involved. At an initial state of the metaverse, one can think of the requirement to rely on (independent) third parties providing advice or arbitration and as it matures, universally accepted standards in harmonisation with existing or newly created law should be established for secure, easy, and scalable transactions.

Furthermore, these standards need to be assessed in the context of multiple applicable jurisdictions. It is inevitable that citizens or users may be in disagreement with certain economic processes and transactions where, in most cases, established legal systems with checks and balances are in place to identify who can exert specific rights and settle in the end. For dealing with such instances in the metaverse, a different approach might be required.

Existing international law principles could be applied. On one extreme, territorial jurisdiction where simply the borders of a state are the determining factor (for example, where a server is located) could be applied. On another extreme, 'effects doctrine' of competition law could be applied. Under this, anti-competitive activity outside a jurisdiction with effect inside a jurisdiction (such as within the US or EU) can be addressed by its authorities and action can be taken against extra-territorial offenders.<sup>51</sup> Depending on the case, this could have far-reaching consequences and should be considered by market participants. Other ideas are centred around creating a 'meta jurisdiction' that enables enforcement by many stakeholders apart from states which requires a targeted alignment between technologists, non-governmental organisations, and lawyers<sup>52</sup> but will certainly not be easy to achieve.

Last, but not least, resolving the issue of the funding of law enforcement agents is complex as typically this is done via taxation – a topic with significant complexities related to activities in the metaverse.



8

Where next?

The metaverse economy is at its inception. As a key enabler, technology solutions are required to support the functioning of the metaverse – this includes hardware for XR and haptics, infrastructure build around network/cloud solutions and advancement in communications.

“The metaverse is not just transforming how we see the world, it’s changing how all of us actively participate in it”

Satya Nadella, CEO, Microsoft

While the overall user base is likely to grow over the coming years, there will be several factors determining the speed of adoption. Gaming related experiences will continue to fuel the metaverse in the short-term (e.g., ‘play-to-earn’ models that have already emerged). Price fluctuations caused by general cryptocurrency market movements have an impact on new users as well as the activity of existing users. In general, there is profound backing by significant VC investment and strong focus of large technology corporates such as Microsoft or Meta. However, the prospect of a longer decline in overall economic growth could result in a reduction in the supply of relevant human capital<sup>53</sup> and/or in investment being tied to certain levels of user activity.

Overall, we believe the metaverse is a gamechanger for the global economy and can offer tremendous value to many spheres and industries. No organisation can ignore it, just as none could ignore the invention of computer scientist Sir Tim Berners-Lee – the Worldwide Web.



9

Glossary

<b>AR (Augmented Reality)</b> View of the physical or real world with an overlay of digital elements	<b>E-commerce</b> Electronic commerce refers to transactions by companies and individuals that buy and sell goods and services over the Internet
<b>Avatar/personas</b> Icon, figure or 3D based representation of a person that can reflect the identity of a user. The outer appearance can differ significantly to real-life biometric features based on creativity and community sense	<b>Edge computing</b> Edge computing is an emerging computing paradigm which refers to a range of networks and devices at or near the user. Edge is about processing data closer to where it’s being generated, enabling processing at greater speeds and volumes, leading to greater action-led results in real time
<b>Blockchain</b> A specific type of distributed and decentralised database network in which the transactions are simultaneously accessed, stored in “blocks of transactions” and secured using cryptographic techniques. Blockchain only allows “append-only” data structure and transactions in previous blocks cannot be edited or deleted	<b>Effects doctrine</b> The effects doctrine is used to establish jurisdiction in circumstances of extraterritorial nature and has been established in the context of US antitrust law
<b>Central bank digital currencies (CBDCs)</b> Central bank digital currencies (CBDCs) are an electronic form of money that consumers and businesses hold with their country’s central bank	<b>Ethereum/ETH</b> Decentralised global software platform powered by blockchain technology. It is most known for its native cryptocurrency, ether, or ETH
<b>Cryptocurrency</b> Cryptocurrency is a type of digital asset, which typically does not provide rights, but is used as a mean of exchange – for example, to enable the buying or selling of a good provided by someone other than the issuer of the cryptocurrency, or for investment purposes or for the storage of value. Examples include Bitcoin and Ethereum	<b>eWpG (Gesetz über elektronische Wertpapiere)</b> German Electronic Securities Act reforming German securities legislation and associated supervisory legislation
<b>Decentralised autonomous organisation (DAO)</b> Emerging form of legal structure with no central governing body with the purpose to distribute decision-making, management and entity ownership	<b>Fiat</b> Fiat money (or fiat currency) is currency that a government has declared to be legal tender
<b>Deep fake</b> Manipulation of media in which a person in an existing image or video is replaced with someone else	<b>FinTech</b> Fintech refers to financial technology; i.e. the integration of technology into offerings by financial services companies to improve their use and delivery to consumers
<b>Digital assets</b> A term that generally refers to cryptographically secured digital representations of value or contractual rights that are powered by forms of distributed ledger technology (DLT) and can be stored, transferred, or traded electronically	<b>General Data Protection Regulation (GDPR)</b> Data protection ruling that creates one set of guidance and authority to protect the personal data of all EU citizens
<b>Digital identity</b> A digital identity is an online or networked identity adopted or claimed in cyberspace by an individual, organisation or electronic device. These users may also project more than one digital identity through multiple communities	<b>Haptic (technologies)</b> Allows user to feel objects in a virtual reality
<b>Distributed ledger technology (DLT)</b> Distributed ledger technology is a term that generally refers to a database network for recording and synchronising transactions between parties in different places at the same time. Every node in a DLT network has a copy of the same record. Blockchain is a subset of DLT	<b>‘In real life’ (IRL)</b> A term to differentiate between the virtual world and reality
	<b>Interoperability</b> Ability of different systems, devices, applications, or products to connect and communicate in a coordinated way, without effort from the end user. With this a connection between metaverse economies, avatars and system will be achieved
	<b>Know your customer (KYC)</b> A standard in the financial industry that ensures financial institutions know that their customers are who they say they are and that they are suitable counterparties for the transaction in question

MANA

A cryptocurrency that facilitates purchases of LAND (NFT used to define the ownership of land parcels representing digital real estate), as well as virtual goods and services used in Decentraland

Metaverse

Combination of i) interconnected virtual worlds or ecosystems that imitate real-world characteristics using technology, ii) virtual representations of humans (avatars) together with their credentials and assets they own, iii) interactions and experiences of these avatars

MiCAR (Markets in Crypto-Asset Regulation)

EU regulation for distribution, issuance, and trading of digital assets

MR (Mixed Reality)

Blend of the physical or real-world with digital or virtual elements where physical and digital elements can interact

NFT (non-fungible token)

A record on a blockchain which is associated with a particular digital or physical asset. Ownership can be transferred by the owner allowing NFTs to be sold and traded

Phygital

Phygital is the concept of using technology to bridge the digital world with the physical world with the purpose of providing a unique interactive experience for the user

Self-sovereign identities (SSI)

Digital identities that are managed in a decentralised manner. This technology allows users to self-manage their digital identities without depending on third-party providers to store and centrally manage the data

Soulbound token

Digital identity tokens that represent the traits, features, and achievements that make up a person or entity. These tokens are issued by “Souls” which represent blockchain accounts or wallets, and cannot be transferred

Stablecoins

A cryptocurrency that has been designed to have a relatively stable price, typically by pegging the value to underlying assets

Token/tokenised asset

Digital representations of financial assets

VPN (Virtual Private Network)

Service that creates a safe, encrypted online connection

VR (Virtual Reality)

View of fully immersive digital environment

Wallet

A cryptocurrency wallet is a device or program that stores cryptocurrency keys and allows access to owned coins

Web2

Key characteristic of Web2 is direct involvement of the user in the world wide web without application of DLT where the user not only consumes content online (Web1) but can create and share digital content via direct interaction with other users

Web3

Web3 can be considered as the next generation of the world wide web which is based on blockchain technology and a decentralised virtual economy where the user is at the centre having full ownership and control over personal data and virtual assets being shared and traded

XR (Extended Reality)

Umbrella term of any technology that alters reality by adding digital elements to the real-world environment to any extent

5G/6G

6G (sixth-generation wireless) is the successor to 5G cellular technology. 6G networks will be able to use higher frequencies than 5G networks and provide substantially higher capacity and much lower latency

References

1. <https://flow.db.com/more/technology/metaverse-the-next-e-commerce-revolution>

2. <https://about.fb.com/news/2021/10/facebook-company-is-now-meta/>

3. [https://s21.q4cdn.com/399680738/files/doc\\_news/Facebook-Reports-Third-Quarter-2021-Results-2021.pdf](https://s21.q4cdn.com/399680738/files/doc_news/Facebook-Reports-Third-Quarter-2021-Results-2021.pdf)

4. Filed with the Securities and Exchange Commission in January 2022

5. [Value creation in the metaverse: the real business of the virtual world](#), McKinsey (June 2022)

6. [Metaverse and Money, Decrypting the future](#), Citi (March 2022)

7. [Value creation in the metaverse: the real business of the virtual world](#), McKinsey (June 2022)

8. *Other sources:* Morgan Stanley: <https://www.morganstanley.com/ideas/metaverse-investing>; Goldman Sachs: <https://www.goldmansachs.com/insights/pages/gs-research/framing-the-future-of-web-3.0-metaverse-edition/report.pdf>

9. Beyond AR vs. VR: What is the Difference between AR vs. MR vs. VR vs. XR? | Interaction Design Foundation (IXDF) ([interaction-design.org](https://www.interaction-design.org))

10. What is Virtuality Continuum? | Interaction Design Foundation (IXDF) ([interaction-design.org](https://www.interaction-design.org))

11. <https://www.blippar.com/blog/2022/02/11/how-will-the-metaverse-unfold>

12. <https://metaverse-standards.org/>

13. <https://initiatives.weforum.org/defining-and-building-the-metaverse>

14. ‘What is Decentraland?’ published by XR Today, 3 March 2022

15. <https://www.statista.com/statistics/680139/minecraft-active-players-worldwide/>

16. <https://www.statista.com/statistics/746230/fortnite-players/>

17. See ‘Ethereum’s ‘Great merge’ on <https://flow.db.com/more/macro-and-markets/ethereum-s-great-merge>

18. [Metaverse and Money, Decrypting the future](#) by Citi GPS: Global Perspectives & Solutions (March 2022)

19. <https://venturebeat.com/games/newzoo-more-than-500-companies-are-building-the-metaverse/>

20. KPMG U.S. and Canada Launch Metaverse Collaboration Hub – KPMG Canada ([home.kpmg](https://home.kpmg))

21. The Metaverse Standards Forum ([metaverse-standards.org](https://metaverse-standards.org))

22. <https://metaverse-standards.org/news/blog/setting-course-for-an-open-metaverse-part-1-updates-from-the-first-60-days-of-the-metaverse-standards-forum/>

23. <https://uk.finance.yahoo.com/news/growing-metaverse-poses-systemic-risks-170640274.html>

24. <https://english.seoul.go.kr/seoul-to-provide-public-services-through-its-own-metaverse-platform/>

25. <https://www.unlock-bc.com/88762/warba-bank-enters-the-world-of-metaverse>

26. <https://dohanews.co/qatar-university-makes-historic-first-step-into-the-metaverse/>

27. E-commerce Market Share, Growth & Trends Report, 2020-2027 ([grandviewresearch.com](https://www.grandviewresearch.com))

28. ‘Tis the Stressful Season for Holiday Gift Returns’ [CBRE](#)

29. E-commerce Market Share, Growth & Trends Report, 2020-2027 ([grandviewresearch.com](https://www.grandviewresearch.com))

30. <https://www.gartner.com/en/newsroom/press-releases/2022-02-07-gartner-predicts-25-percent-of-people-will-spend-at-least-one-hour-per-day-in-the-metaverse-by-2026>

31. <https://www.shopify.com/blog/3d-models-video>

32. Simple NFT purchasing: Mastercard brings payments network to NFTs | [Mastercard Newsroom](https://www.mastercard.com/newsroom)

33. Sir James Dyson — Three Life Lessons From 5,127 Prototypes | by Scott Stockdale | Entrepreneur’s Handbook ([entrepreneurshandbook.co](https://www.entrepreneurshandbook.co))

34. <https://www.madfestlondon.com/insights/burberry-metaverse-storytelling>

35. <https://en.cryptonomist.ch/2022/07/15/burberry-launches-virtual-bag-collection-in-the-roblox-metaverse/>

36. <https://www.nike.com/kids/nikeland-roblox>

37. Nike records nearly 7 million visitors to its metaverse store – Latest Retail Technology News From Across The Globe – Charged ([chargedretail.co.uk](https://www.chargedretail.co.uk))

38. <https://www.pvh.com/news/tommy-hilfiger-metaverse-fashion-week-2022>

39. <https://www.adidas.co.uk/metaverse>

40. Vans Launches “Vans World” Skatepark Experience in the Roblox Metaverse – [Roblox](https://www.roblox.com)

41. Next Stop: The Metaverse | Sotheby’s Magazine | Sotheby’s ([sothebys.com](https://www.sothebys.com))

42. P&G takes first step into the metaverse with BeautySphere | [Marketing Dive](https://www.marketingdive.com)

43. [campus\\_metaverse](https://www.campus-metaverse.com) | Carrefour Group

44. <https://www.wirewheel.io/blog/privacy-ai>

45. [https://www.bitkom.org/sites/main/files/2022-07/220714\\_LF\\_Metaverse.pdf](https://www.bitkom.org/sites/main/files/2022-07/220714_LF_Metaverse.pdf)

46. Metaverse or Metaworse? Cybersecurity Threats Against the Internet of Experiences ([trendmicro.com](https://www.trendmicro.com))

47. See *Cybersecurity and fraud protection: exposing bad actors* – Deutsche Bank ([db.com](https://www.db.com))

48. <https://www.leewayhertz.com/metaverse-self-sovereign-identity/>

49. [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=4105763](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4105763)

50. [https://www.bitkom.org/sites/main/files/2022-07/220714\\_LF\\_Metaverse.pdf](https://www.bitkom.org/sites/main/files/2022-07/220714_LF_Metaverse.pdf)

51. <http://www.ipglossary.com/glossary/effects-doctrine/#.YwTxIHZByUk>

52. <https://thehill.com/opinion/technology/583529-why-we-need-meta-jurisdiction-for-the-metaverse/>

53. <https://www.bloomberg.com/news/articles/2022-07-29/metaverse-jobs-are-disappearing-as-hiring-slows-at-google-facebook>

Deutsche Bank Research reports referenced

*Metaverse & the five Ws: Why, What, Who, When, Where?*, by Marion Laboure and Galina Pozdnyakova; DB Research (June 2022)



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