



# THE METAVERSE: A TECH AND POLICY BRIEF FOR INDIA

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# INTRO- DUCTION

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It was the cult classic TV show Star Trek that first helped the public imagine a “communicator” that could fit in one’s pocket. This later inspired the design of the flip phone and the wireless bluetooth speaker. History has demonstrated that science fiction and real life eventually collide. The metaverse is a testament to this. The earliest references to it are found in science fiction, with popular media like film and video-games contributing significantly to its conception and popularity.

A simple explanation would describe the metaverse as a shared and immersive virtual reality. It is imagined as a space where physical identities and interactions can be experienced digitally in 3D. However, more technical and exhaustive definitions often describe the metaverse as a composite of its core technologies, by the various uses it has been put to, as well as its potential. Its growth is expected to be both rapid and exponential across industries. The number of users of Web 3.0 virtual worlds today stands at 50,000 and by 2026

it is estimated that 25 percent of the global population will spend one hour a day in the metaverse for digital activities such as work, shopping, social interaction and education.

## **BUSINESSES HAVE ALREADY BEGUN RESPONDING TO THE ESTIMATED TRILLION DOLLAR POTENTIAL OF THE METAVERSE.**

Though tech giants like Meta (formerly Facebook), Microsoft, and Amazon are investing heavily in the space, non-tech firms are also re-orienting their business models to accommodate their own version of the metaverse. Indian businesses are no exception, with MakeMyTrip, Tanishq, Mahindra and Mahindra using metaverse-related tools and NFTs to expand their business and marketing operations. Social and entertainment use cases, such as metaverse concerts and weddings, are also attracting great attention. Governance applications of the metaverse are also actively being explored through the setting up of virtual embassies, simulating voting, and investing in virtual local administration platforms.

The metaverse's rapid development cannot be divorced from its social, legal, policy, and even personal, implications. The metaverse raises unique concerns about the ethical implications of the lines separating virtual reality and real life being blurred. Furthermore, realising the metaverse is an exercise of collaboration between not just complex technologies, but between corporations, businesses, individuals, and regulatory entities. These concerns are relevant to policy practitioners

and users alike. This primer attempts to contextualize the metaverse and its developments to India.

- It will provide a brief overview of its evolution, core principles, and key components.
- Then, it will explore the various use cases of the metaverse across industries and identify major players in the space.
- Lastly, it will articulate the notable regulatory concerns and policy questions facing regulators in India with the development of the metaverse.

# 2 EVOLUTION OF THE META- VERSE

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The conceptual origins of the metaverse can be traced as far back as the 1930s. Many literary and technological developments since then have contributed significantly to its present form. The term 'virtual reality' was first introduced in 1938 by French poet and playwright Antonin Artaud in his collection of essays 'The Theatre and its Double'. Soon after, in 1945, Vannevar Bush introduced the concept of a computing device called 'Memex' in his 'As We May Think'. Memex would compress and store all media and information in a single, physical desktop for easy access by users. This would eventually become one of the major contributors to, and inspiration behind, Tim Berner Lee creating the World Wide Web in 1989.

In 1962, American filmmaker Morton Heilig's 'Sensorama' machine offered the first known immersive experience of riding a motorcycle through New York, with a 3D movie, vibrating chair, fan, and smells. In 1992, Neal Stephenson became the first to use the term 'metaverse' in his science fiction novel 'Snow Crash' which described a future where user-controlled avatars could navigate a 3D virtual reality. Major developments

occurred in the 2000s, notably with the unveiling of Linden Lab's 'Second Life', a massively popular multi-player and 3D virtual reality platform. Shortly after, in 2006, Roblox enabled users to play and program games created by other users. Virtual reality development was then given further impetus when Google enhanced Maps by introducing the 'Street View' feature that gave an at-scale virtual representation of physical locations.

It was, however, in 2011 that the world at large became acquainted with what a metaverse would look like when Ernest Cline published his science fiction novel 'Ready Player One'. The concept came close to fruition when Facebook bought out Oculus in 2014, to scale up the first low-cost 3D hardware infrastructure for mass use. The gaming industry has been crucial for metaverse development. Pokemon Go became widely popular in 2016 when its use of augmented reality grabbed public attention. This was followed by Fortnite which became the most popular shared virtual world ever. In 2018, Axie Infinity popularised the use of NFTs since it ran on the blockchain and allowed players to earn by trading in mythical creatures.

By 2021, Microsoft had unveiled 'Mesh' as a platform where users could collaborate virtually across devices. In the same year, Mark Zuckerberg rebranded Facebook's parent company as Meta and announced plans for their metaverse, sparking massive public fascination. In 2022, Siemens and Nvidia commenced their partnership on the industrial metaverse and is only one notable example of similar investments happening in the area. Some speculate that the ongoing expansion is likely to revolutionise remote work, entertainment, tourism, and healthcare.

However, skeptics would find reason for pause. They cite Meta's losses on Reality Labs, its metaverse subsidiary, less than ideal returns on core metaverse projects, and declining investments on VR and AR technology. Still, it remains likely that the outrageous metaverse project will make slow progress, but proceed nonetheless. The possibility necessitates a better understanding of this pursuit and a deeper look at the features it is imagined to possess.

# 3 KEY CHARACTERISTICS AND PRINCIPLES OF THE METAVERSE

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The metaverse is multitechnology, social, and hyper spatiotemporal. It is 'multitechnology' because it is powered by the collaborative working of many different mechanisms such as immersive technologies, decentralising technologies like blockchain, and digital twin technologies. 'Sociality' refers to the element of human interaction. The metaverse offers a new kind of reality where all the structures that make up society- legal, economic, and social, can be experienced virtually. 'Hyper spatiotemporality' refers to the metaverse's ability to transcend space and time. It allows a user to be immersed in a different context and is able to separate them from what defines their immediate surroundings.



Different perspectives and visions exist of the metaverse as a final, finished product. However, there is some consensus on the principles it must stay loyal to. The metaverse must be a virtual world that is persistent, scalable, always-on with synchronicity, decentralised, secure, interoperable, and that creates financial allowance. Persistent and always-on with synchronicity refer to the metaverse's ability to be accessible at any moment for any user. These characteristics are not limited to the metaverse as a space, but extend also to control over identities and assets. Interoperability and scalability require the establishment of standards and protocols that can generate compatibility between heterogeneous infrastructures or frameworks.

## **DECENTRALISATION IS A KEY PRINCIPLE OF THE METAVERSE AND ENVISIONS OPENNESS AND TRANSPARENCY, AS WELL AS PRIVACY AND CONTROL OVER ONE'S OWN DATA AND ASSETS. THIS IS CLOSELY TIED TO THE CRITERIA OF SECURITY**

An ideal, open metaverse must be equipped to respond to and mitigate user, business, and asset vulnerabilities. Individual users might require protection from predatory behaviour that can affect their psycho-social well-being, and/or their ability to exercise rightful sovereignty and ownership. Self-sovereign identities (SSIs) have also emerged as a way to ensure both security and decentralisation. SSIs allow users to manage their identity data by giving them control over what they disclose and freeing them from control by centralised or third party entities. Finally, a metaverse would need to be able to support payment processes and operations, as well as ensure interoperability between fiat currency, digital fiat currency, and decentralised crypto-assets emerging from blockchain technology.

# 4 META-VERSE ARCHITECTURE

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Imagine walking your dog through a dog park. You wave at passersby, buy an ice cream for yourself and a treat for your dog from a stall, and make small talk with the owner as you pay for the items. The experience is interrupted by the distant sound of a doorbell and you remove your virtual reality headset to answer the door. The immersive experience of walking one's virtual dog feels and can be just as real as any experience in the physical world. This is because the virtual world is modelled after the physical one and is built to replicate the same sensory and social experiences. These two worlds are not distinct, but connected. An ice-cream that is bought in the metaverse is bought through digital assets that are tied to and interoperable with currency in the physical world. The question then arises of how such a replication and interoperability is possible.

**JUST AS THE PHYSICAL WORLD IS CONSTITUTED OF ITS OWN BUILDING BLOCKS, SO IS THE VIRTUAL ONE. THE MOST FUNDAMENTAL INFRASTRUCTURE FOR THE METAVERSE IS PROVIDED BY THE INTERNET OF THINGS (IOT).**

## INTERNET OF THINGS (IOT) PROVIDES THE MOST BASIC LAYER OF CONNECTIVITY, ALLOWING THE CREATION, SHARING, AND PROCESSING OF INFORMATION WITHOUT PHYSICAL LIMITATIONS.

Improvements in these processes come through innovations in internet technology, such as 5G and 6G, which offer better bandwidth and speed to users. The networking and computing abilities of any virtual world is therefore sustained by certain rudimentary physical infrastructure such as chips and processors, mobile networks and devices, servers, etc. The adoption of the metaverse therefore depends on the development and availability of these hardwares, especially of those hardware devices that enable Extended Reality (XR) technology and provide direct access to the metaverse.

## Extended Reality (AR, MR, VR)

In order to understand the metaverse, we must first understand what XR technology is. When we watch a movie on our laptop or scroll through social media, we are merely interacting with two-dimensional content that is confined to our devices. This content does not directly engage with the physical world. It does not alter how we experience our surroundings because it does not show us anything that is not immediately in front of us. XR changes this by literally extending our experience of reality. It modifies how we view what is around us by imposing elements that are not really there. Most of us already use at least one XR application regularly. Google's Street View, for instance, allows for a 360 degree view of locations across the world. As a user, you can explore roads and monuments in another country by simply moving your camera around. Anybody who has used a Snapchat filter or a virtual background during a Zoom call has also technically used XR technology.

## XR TECHNOLOGY ENCOMPASSES VIRTUAL REALITY (VR), AUGMENTED REALITY (AR), AND MIXED REALITY (MR) TECHNOLOGY.

Important to note is that XR is an umbrella term. It encompasses Virtual Reality (VR), Augmented Reality (AR), and Mixed Reality (MR) technology. VR, AR, and MR all contribute to the features which comprise the metaverse experience. VR technology is what allows immersion and helps a user shut out the physical world by completely filling their vision. It is popularly used to enhance gaming experiences. Even a reference to it often evokes images of gamers donning sleek, futuristic looking headsets like Oculus Rift, submerged in real-world or imaginary simulations. VR technologies are becoming

increasingly sophisticated. For example, the aforementioned Oculus Rift boasts features like movement tracking that translates a user's motions into virtual reality. Wearing the headset while playing a war game for instance would allow you to move, duck, jump with minimal lag and maximum realism. Interestingly, the average VR headset costs about 420 USD in 2022, and is expected to remain at that price level.

While VR changes what you see, AR enhances what you see by adding to it. It superimposes digital elements onto a display of one's surroundings. Most regular users of social media avail AR technology when they apply filters that, for instance, overlay dog ears on their faces. Now, Google allows you to view a 3D model of any animal you search and watch it move through a live feed of your surroundings. Pokemon Go is another very popular example of AR use. In 2016, millions of people took to the streets, moving through their real world, while their avatars mimicked their movements in the virtual world of Pokemon Go. Had Pokemon Go been an immersive game that used headsets to block out the physical world, it would have been a use case of AR as well. This highlights how the two technologies essentially differ. Importantly, AR is becoming increasingly widespread. Beyond just the gaming industry, it is becoming a popular marketing tool. Movies, popular beverage brands, and electronic appliance companies are actively leveraging AR technology as a hook in their mobile-led ad campaigns.

**WHILE VR CHANGES WHAT YOU SEE, AR ENHANCES WHAT YOU SEE BY ADDING TO IT. IT SUPERIMPOSES DIGITAL ELEMENTS ONTO A DISPLAY OF ONE'S SURROUNDINGS. AND THROUGH MR, VIRTUAL OBJECTS INTERACT WITH AND RESPOND TO CHANGES IN THE NATURAL ENVIRONMENT.**

The next element of XR is Mixed Reality (MR) which is a blend of both VR and AR. It helps to think of MR as immersive AR. Virtual reality instruments like headsets or glasses become tools to experience an augmented reality, allowing it to percolate beyond just the user's mobile phone or device. Through MR, virtual objects interact with and respond to changes in the natural environment. For instance, when a surgeon practises a simulated brain surgery, the 3D model of the brain will respond to the movements the surgeon is making in the natural world. The potential of MR, therefore, certainly transcends just the gaming industry. When Microsoft launched its HoloLens in 2016, it postured its MR headset as a tool for increasing efficiency across the domains of education, manufacturing, health and engineering. There may be some veracity to this claim because a construction worker can tinker with a holograph of a building component and assess whether it works

or not, saving the need to invest in a trial and error process with real time and money. However, the adoption of MR technology remains low especially since its costs remain high.

## Artificial Intelligence

Artificial Intelligence (AI) can be understood as that technology specifically designed to not just imitate, but even exceed human abilities and intelligence. With the help of machine learning and deep learning algorithms, artificial intelligence can collect and work with vast amounts of data to solve complex issues, thus replacing the need for human factors to do so themselves. AI has already been leveraged by the gaming industry to improve computer vision and enhance the visual experience of games. Now, AI has become a popular tool for handling wireless communication, human-computer interaction, and finance. For instance, AI is able to undertake optimization tasks such as power saving and network management. Many business websites now provide the services of an AI chatbot that assists customers in navigating products or resolving concerns. Chatbots, which are a form of AI, are one of the more prominent use cases of the technology in daily life. OpenAI launched Chat GPT in 2022 as a conversational chatbot which could verify and answer questions across vast domains.

All this is valuable context to how AI may contribute to the infrastructure of the metaverse, increase its reliability, and play a key role in realising the promise of decentralization.

**IN 2021, JON RADOFF ELABORATED THAT IN ORDER FOR A METAVERSE TO REMAIN VIRTUAL, PERSISTENT, SCALABLE, ALWAYS-ON WITH SYNCHRONICITY, DECENTRALISED, SECURE, AND INTEROPERABLE, ITS PLATFORM WOULD HAVE TO INCLUDE SEVEN LAYERS. THESE SEVEN LAYERS ARE AS FOLLOWS:**

- 1. INFRASTRUCTURE:** 5G, 6G, WIFI, CLOUD, DATA CENTER, CENTRAL PROCESSING UNITS, AND GPUS.
- 2. HUMAN INTERFACE:** MOBILE, SMARTWATCH, SMART GLASSES, WEARABLE DEVICES, HEAD-MOUNTED DISPLAY, GESTURES, VOICE, AND ELECTRODE BUNDLE.
- 3. DECENTRALISATION:** EDGE COMPUTING, AI AGENTS, BLOCKCHAIN, AND MICROSERVICES.
- 4. SPATIAL COMPUTING:** 3D ENGINES, VR, AUGMENTED REALITY (AR), XR, GEOSPATIAL MAPPING, AND MULTITASKING.

**5. CREATOR ECONOMY: DESIGN TOOLS, ASSET MARKETS, E-COMMERCE, AND WORKFLOW.**

**6. DISCOVERY: ADVERTISING NETWORKS, VIRTUAL STORES, SOCIAL CURATION, RATINGS, AVATAR, AND CHATBOT.**

**7. EXPERIENCE: GAMES, SOCIAL, E-SPORTS, SHOPPING, FESTIVALS, EVENTS, LEARNING, AND WORKING.**

In Infrastructure, AIOps (AI for Operations) may play a key role. It has been described as a combination of big data and machine learning for the automation of IT processing that not only eases operations at an infrastructure level but also provides relevant insights to upper layers of activity and other domains. AI can also mitigate the exclusionary potential of the metaverse by making human interfaces more inclusive. This can be achieved through such features as automatic translation, providing audio feedback to assist those with visual disabilities, and through brain-computer interfaces, like the Cognixion One, which is a wearable, augmented reality speech generating device. AI may also contribute to making the smart contract ecosystem fairer, which is important since smart contracts are a linchpin in decentralising control. It can do so by regulating the self-executing nature of smart contracts and by using data to help negotiate the terms of a smart contract.

AI's capacity to sharpen user immersion comes from its ability to render highly physically accurate simulations with real-time accuracy and enabling design collaboration amongst users. NVIDIA's Omniverse is popularly hailed as a testament to this ability. AI has also become a creator in its own right, with the ability to produce art-work and even written pieces through Natural Language Processing models and neural networks. Networking in the metaverse can be laden with discriminatory and predatory behaviour, which AI has the potential to prevent. In fact, it is already being leveraged to prevent hate speech and filter content relevant to minority groups by Indian companies like ShareChat. Lastly, the ability to customise and tailor one's experience of virtual worlds is crucial to the metaverse and will be powered by AI which can offer personalisations and make adjustments suitable to an individuals preferences and needs.

# Blockchain

Blockchain is understood as a digital ledger that holds transaction details and tracks traded assets. What makes the blockchain unique is that it can immediately share and provide transparent information while also enabling protection since the information can be accessed only by network members with permission. In the metaverse, it will essentially play a role in data collection and sharing, data storage and management, and data security and privacy. Large amounts of information and personal data is generated in the metaverse, shared over networks with very little guarantee of security. Some research indicates that AI coupled with blockchain can potentially help mitigate the consequent cybersecurity concerns. The collaboration of blockchain and AI can also potentially contribute to interoperability between different parties using different data infrastructures.

Furthermore, the blockchain can assist transparent transactions because of its ability to record smart contracts and the digital assets they trade. This also allows for digital assets to be traced back to their original owner, a feature that cannot be fathomed in an economy based on non-virtual fiat money. Though the full potential of blockchain remains dubious, its ability to decentralise financial and economic activity is certainly disruptive to existing structures. For instance, Decentraland, a 3D virtual world and marketplace that facilitates trade of digital assets, is built on the Ethereum blockchain. Blockchains like Ethereum eliminate the need for third party oversight or permissions and allow for peer-to-peer transactions. This means that decentralised economies are created through which decentralised virtual worlds can be operationalised.

Decentraland is a useful illustration of how a blockchain powered metaverse will work. Decentraland users can buy plots of virtual land to become digital landowners, host concerts and other events, and interact with other digital avatars. This is made possible by the interoperability and true asset ownership facilitated by the blockchain. Since Decentraland is built on the Ethereum blockchain, a user can sell their virtual land to anybody participating in the Ethereum network. Anybody connected to Ethereum becomes either directly or tangentially connected. For instance, Decentraland's native token MANA becomes connected to other Ethereum powered applications like Axie Infinity's play-to-earn game and Aave's lending platform by virtue of being in the same blockchain network. However, certain issues related to blockchain continue to linger. A

lack of interoperability arises when individual blockchains become siloed and do not communicate with other peer networks due to an inability to share data. Furthermore, some blockchain architectures remain vulnerable to hackers and data manipulation.

## Interconnected Virtual Worlds

Interconnectedness is a key feature of the metaverse and will be facilitated by some of the technologies mentioned so far, as well as more that might emerge over time. For instance, XR/VR, AI, 3D modeling, and blockchain will help create Digital Twins, which are digital representations of anything in the physical world. Digital Twins can be of people as well as objects and assets. The same technologies that help create Digital Twins also create the virtual worlds in which they exist and facilitate the creation, sharing, and recording of virtual assets. Therefore, there remains consistent interconnection between not just the digital world and physical world, but also interconnection between virtual worlds. For instance, in the ideal metaverse, your digital avatar could move seamlessly from a virtual world like Decentraland to another with your identity remaining intact and your transactions remaining seamless with minimum management required. However, such an interconnection requires a high degree of interoperability between avatars, assets, and services that remains a hurdle.

## What does the metaverse have to do with Web 3.0

The development of the internet has been gradual. First came Web 1.0, which centred more on open protocols that were decentralised and accrued maximum benefit to developers and users. Web 2.0, which we rely on today, is characterised by large corporations like Meta and Twitter centralising services and accruing greater benefits from the data they collect and control. They therefore become the primary beneficiaries of the status quo. Web 3.0, however, envisions decentralised ownership and community based control seen in Web 1.0, coupled with the processes and services heralded in by Web 2.0. Distributed technologies like blockchain and distributed autonomous organisations (DOAs) are key to the functioning of Web 3.0. This is what closely ties it to the metaverse. The decentralisation envisioned by Web 3.0 is also a key promise of the metaverse. Both also rely heavily on emerging technologies like blockchain, cryptographic protocols,



digital assets, decentralised finance, and NFTs.

However, despite certain elemental overlaps, it is important to resist the popular conflation of the two as the same. Both Web 3.0 and metaverse are still very much in the making. There are also diverging opinions on what these two will look like once they have been completely realised. While both may somewhere promise users the ability to own some part of the internet for themselves, it is certainly questionable how decentralised the metaverse truly will be. The involvement of big corporations like Meta and Microsoft and their claims of controlling the space could merely be about providing virtual services to users that are premised on decentralising technology, which is different from empowering users with decentralised ownership. The metaverse also requires additional technology like VR/XR headsets and haptic technologies that may not necessarily be a staple feature of Web 3.0.

## Cryptocurrency

Where the convergence between Web 3.0 and the metaverse is perhaps the greatest is cryptocurrencies and other crypto assets. Web 3.0 is orchestrated and operationalised through digital tokens, which will also likely become the basis of economic activity in the metaverse. Cryptocurrencies utilise blockchain technology and allow for payments to be made virtually, instantaneously, without the involvement of a third party, and at close to zero cost. They can either be brought in exchanges or mined, though the latter requires much more technical skill and is therefore harder. Cryptocurrency also employs cryptographic techniques, which allow for encryption and fund protection. There are notable examples of cryptocurrencies operating in, what is currently, video game dominated metaverse platforms. These include SAND (from the Sandbox), MANA (from Decentraland), and AXS (from Axie Infinity).

### **WEB 3.0 IS ORCHESTRATED AND OPERATIONALISED THROUGH DIGITAL TOKENS, WHICH WILL ALSO LIKELY BECOME THE BASIS OF ECONOMIC ACTIVITY IN THE METAVERSE.**

Developments on the adoption and popularisation of digital tokens are happening rapidly in India. The Indian government recently launched the Central Bank Digital Currency (CBDC), which does not operate on the blockchain but signals growing regulatory interest in the domain. It also means that India wants to push itself forward as a serious contender in the virtual currency race. Furthermore, the cryptocurrency

industry in India has been growing since 2012, with several cryptocurrency exchanges operating in India, such as Bybit, CoinCDX, Binance, and WazirX. However, crypto exchanges are subject to the volatility inherent in cryptocurrencies by their very nature. This is because cryptocurrencies are not fiat money, their values are highly subjective and prone to fluctuations in price. The recent FTX crash is a testament to the caution that often must be paid to these virtual currencies.

## NFTs

Tokens are a means of giving users property rights. They provide the ability to own unique digital assets such as avatars, art, music, text, code, and even governance rights. NFTs also exist atop blockchains and can therefore be traded securely and be traced back to their original owner. These assets can be bought and sold on their party exchanges such as OpenSea. In the metaverse, it would be possible to buy an avatar NFT, exist within a world that was bought as an NFT which could be sold by the owner again as an NFT should they wish to do so. To speak to the growth of NFTs, in 2021 their sales totaled \$25 billion compared with \$94.9 million in 2020, and this rapid growth is expected to continue. Notably, NFTs cannot be exchanged for one another. This is what makes them non-fungible. Each NFT is unique and distinct, and are therefore not interchangeable. While individual NFTs are not interchangeable the way one ten rupee note is with another, it can still be exchanged in barter. A user may barter off one NFT in exchange for another NFT, and in doing so will be left with something unique and different from what she gave away, much like trading collectible cards.

## DAOs

**WHEN SEVERAL PEOPLE OWN PARTS OF A VIRTUAL WORLD IN THE ABSENCE OF A CENTRAL AUTHORITY, IT CREATES ISSUES OF OWNERSHIP AND CONTROL. DECENTRALISED AUTONOMOUS ORGANIZATIONS (DAOS) ARE SEEN AS A SOLUTION TO SUCH PROBLEMS OF CONTROL. DAOS ARE BLOCKCHAIN BASED ORGANISATIONS THAT ARE COLLECTIVELY OWNED AND CONTROLLED BY ITS MEMBERS.**

Members are provided with voting rights to approve or disapprove decisions on protocols related to a DAO's projects. Voting rights are issued through tokens provided to investors when they send money to fund a DAO. Smart contracts play a pivotal role in executing

stakeholder decision-making related to a particular project the DAO is interested in undertaking. A voting mechanism is coded into a smart contract, which cannot be altered once the contract goes live on the blockchain. Once the contract is live, a funding period commences where individuals may send money to the DAO treasury in exchange for tokens that grant them voting rights. The DAO starts to operate once members propose and vote on policy and protocol decisions. The Decentraland DAO, for instance, owns the most important smart contracts and assets that make up the virtual world and can vote on policy matters such as content moderation, what kind of wearable items are allowed, and more.

Since DAOs allow for decentralization, different users and collectives can leverage voting mechanisms and smart contracts to define the direction and functioning of communities and initiatives. Such a form of decentralised decision making could also give rise to shared forms of ownership of virtual assets like NFTs, crypto-assets, and even virtual lands. Such a mechanism has the potential to democratise ownership within the metaverse and boost economies by preventing the accumulation of assets under the wealthiest. DAOs further demonstrate the ability to create sub-institutions within larger economies. For instance, the fashion industry is seeing a rise of DAOs like MaisonDAO that acts as a collective of independent designers and brands that supports the launch of their collections. This is a representation of how sub-groups are emerging within the creator economy and supporting artists in providing goods and services within the metaverse.

## Gaming Platforms

The rebranding of Meta may have popularised the metaverse in popular discourse, but it is undeniable that the gaming industry has had as much of a first mover advantage as tech corporations. Minecraft, Fortnite and Roblox have already started offering some form of a metaverse experience to gamers, and some even have cryptocurrency economies tied to their digital world. Examples of this are Robux from Roblox, Linden Dollars from Second Life, and Simoleans from The Sims. A study by Ernst & Young revealed that 97% of executives believe that the gaming industry is central to the development of the metaverse and 49% of gaming companies are prioritising investments in virtual, augmented, and mixed-reality experiences. This reveals that the development of both the metaverse and the gaming industry are closely linked.

# 5 META-VERSE APPLICATIONS

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## Remote Work

The COVID 19 pandemic accelerated the adoption of virtual platforms, like Zoom and Microsoft Teams for work. However, it is unlikely that the evolution of workplaces and processes will halt there. Meta's introduction of Horizon Workrooms offers insight not just into the slow adoption of immersive virtual reality work platforms, but also what workplaces and workers can expect from the metaverse. Horizon Workrooms, for instance, allows its users to don avatars and communicate, collaborate, and socialise with others. The use of the metaverse for work extends also to offering immersive recruitment experiences, immersive job training, and virtual job fairs. An example of this is Mondelez India, which launched a pilot initiative that offers an immersive onboarding experience as part of its recruitment process. Mondelez is leveraging the Meta Oculus VR headset to take its employees on virtual tours of its factories as well as its R&D centres. There are, however, dangers related to data privacy and personal safety for workers online. With

a shift in labour dynamics, and new frontiers of vulnerability, labour regulation and protection measures will need to adapt accordingly.

## Governance

NITI Aayog has already begun exploring the leveraging of metaverse technologies for what it calls ‘meta-governance’. It has described various governance functions happening over meta-meets between politicians, bureaucrats, and stakeholders for both one-way and interactive exchanges of information. Imagine CMs interacting with the PM in a virtual room to discuss best governance practices, or a digital avatar of the PM interacting with students and teachers in a meta-classroom. Virtual twins of bureaucracies and agencies could allow for users to move through virtual simulations of an RTO or passport office for services. While India’s foray into adopting the metaverse for governance remains nascent at best, some individual nations are demonstrating a more proactive approach. For instance, the Pacific Island nation of Tuvalu is responding to the urgency posed by climate change by recreating a virtual twin of the country on the metaverse. As threats to the physical existence of the nation mount due to rising sea levels, the metaverse offers a unique opportunity to transcend geographical and physical restrictions to nation building and sustenance.

## Smart Cities

Urban management is another potential use case of the metaverse. Digital twins of physical cities can help urban planners and governments anticipate problems faced by citizens. This is accomplished through big data which can feed the virtual city with as much information as possible about such factors as air quality, weather, energy consumption, space availability, and even behavioural data collected from citizens. In India, companies like MapmyIndia (collaborating with ISRO), Genesys International and Heliware are working on creating digital twins, GIS-enabled 4D mapping interfaces of urban India. This is also a trend worldwide. In 2021, Seoul announced an investment of \$33 million to set up a virtual reality tool for the administration and management of municipal services, which will allow citizens and businesses to interact virtually with their local administrations. Any government investing in metaverse for urban management will have to consider the high budgets and energy requirements for these projects. Investing in renewable energy to power sustainable metaverse governance projects will

then become a complementary consideration.

## Manufacturing and Retail

The metaverse and its technologies can be applied to various stages of manufacturing to improve outcomes. Immersive and haptic technologies can improve real time collaboration in design and testing, as well as allow highly realistic photo rendering. The creation of digital twins of a value chain can also allow for remote audits to be conducted virtually, across different phases of creation, distribution, and sale. Accurate production plans can also be generated to make the processes more efficient and ensure safer assembly lines. Virtual manufacturing environments can therefore enhance both worker productivity and safety. Rendering realistic and immersive simulations can also improve the experience of products, thus creating a personalised experience for both customers as well as other businesses.

Notably, luxury and retail brands have already begun their foray into the metaverse realm. This is demonstrated through Nike's Nikeland built on the Roblox platform and Balenciaga's virtual store in the Fortnite game. Even Flipkart launched its metaverse, Flipverse, offering an immersive shopping experience. However, the adoption of the metaverse for retail will encounter both infrastructural and demographic challenges. VR headsets remain expensive and awareness of the metaverse and virtual purchasing remains demographically skewed towards younger people. In a survey of individuals with 18 to 59 years of age, only 48% had heard the term metaverse. Another revealed that 75% of Generation Z shoppers have made digital purchases within videogames and 60% believe that brands should actively offer metaverse experiences.

## Decentralised Finance (De-Fi)

As discussed above, technologies like blockchain that decentralise asset generation and management are crucial pillars of the metaverse. This provides the opportunity to overcome shortcomings that arise out of centralised financing such as dealing with third party institutions like banks and middlemen, transaction fees, and transaction limitations. DeFi also allows for relatively secure and private financial activity. Cryptocurrency based financial platforms can facilitate decentralised lending and insurance. An interesting use case of decentralised finance in the metaverse is yield farming which, similar to a savings

account, allows users to gain interest or rewards for lending their cryptocurrencies or NFTs. However, scalability and security remain concerns especially since wide scale adoption of these technologies requires much more support than they currently possess.

## Gaming

Gaming remains an important use case of the metaverse, especially due to the provision of social immersion. The social element of metaverse gaming is a crucial hook, especially since players can build sub-games, engage more with other players, and trade in assets. Gaming industries have already begun building large, decentralized gaming platforms. This has led to a paradigm popularly being referred to as Web 3.0 gaming which allows gamers to move between gaming experiences and environments. Models like the play-to-earn model are incentivising players to add value to the metaverse gaming ecosystem in exchange for currency and assets that have real world value. For instance, Axie Infinity players can earn in SLP which can be sold on the crypto exchange. India has already made some headway in the adoption of NFT games, with 34 percent of the 400 million Indian gamers having already played P2E games, and 11 percent willing to play in the future.

Notably, the proliferation of a token based economy due to incentivising economic models like P2E can be potentially costly to players since these tokens are susceptible to external manipulation. Token volatility and instability might eventually make revenue earning from gaming unsustainable, dangerous, and predatory with little to no recourse. A little known fact is also that women make up a majority of the gaming market. This means that gendered insecurities are likely to be revealed over time and are going to necessitate mechanisms that protect women and other gender and sexual minorities from the online disinhibition effect of gaming platforms.

## Entertainment and Culture

There is no dearth of examples demonstrating how the entertainment industry has taken to the metaverse. BTS, Ariana Grande, Imagine Dragons are popular western artists who have already successfully organised virtual concerts that allow fans from across the world to watch them perform from the comforts of their home. Delev Mehndi became the first Indian artist to have a metaverse concert, attracting nearly 20 million viewers worldwide.

This space is not merely being used by entertainers who derive massive profits from the sale of merchandise on these platforms. Indian antacid brand ENO also hosted a stand-up comedy show to celebrate 50 years of its presence in the country. Furthermore, because of digital twin technologies, digital tourism, sightseeing and exhibitions are expected to gain popularity. Museums and art galleries across the world now have the potential to be explored regardless of one's geographical location. Sports, specifically e-sports, has also combined with the metaverse to provide sports fans with immersive stadium experiences. Despite many use cases by the entertainment industry, costliness of wearable headsets and an inconsistent government response to metaverse technologies remain barriers to faster development.

## Education

Immersion into virtual reconstructions of historical moments, the natural world, or outer space are being actively leveraged to improve learning outcomes for students. Research has demonstrated that virtual reality experiences improved memory recall in children, and augmented reality can improve motivation to learn concepts like gravity, force, and friction in physics. Immersive metaverse experiences can even facilitate social interactions between students. For instance, visiting a simulation of the Indus Valley civilisation as a class can allow students to socially interact with each other in unique contexts while also stimulating critical thinking. While data has demonstrated that children can transfer knowledge relatively better from real-world contexts than from fantasy, the metaverse does allow exposure to contexts that are simply not possible to experience in real life. However, the issue of adopting metaverse for education raises questions of access, accuracy, and inclusivity which need to be anticipated and dealt with by developers and educators alike.

## Healthcare

The metaverse and its technologies can also be leveraged to improve the access to, and quality of, medical services and treatments. Shared virtual realities can allow for collaborative diagnoses and treatments, as well as educational training. Furthermore, Augmented reality can allow for surgical planning and techniques to be finessed. Importantly, data analytics provided by AI can improve the accuracy and speed of medical decisions as well as real time imaging. Virtual assistants and health centres can also improve access to healthcare by connecting patients to the correct services and



practitioners. However, this is not without concerns about data protection, especially due to the absence of frameworks specifically addressing biological and genetic data. Whom such speedy services will be accessible to is also questionable, and raises questions about access and inclusivity. Those who can avail these resources will invariably require certain fixed inputs like headsets but might also have to pay a higher fee for the kind of technology used to render these services.

# 6

# KEY POLICY QUES- TIONS

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Since the metaverse and its technologies are still developing, the current regulatory landscape is not sufficiently equipped to govern the activities in this virtual space. This creates immense stress on existing governance structures since the technologies underpinning the metaverse, and their potential use and misuse, are disruptive. These disruptions can extend to individual users, groups of individual users, businesses, existing regulatory and legal frameworks, the economy writ large, and even the environment. Though there is some evidence of what might eventually become policy challenges, prospective challenges may be estimated by an understanding of the nature of the technologies involved. The following section will explore some of these policy concerns that arise from the metaverse and its potential expansion

## Interoperability

Most experts recognise that interoperability is a key regulatory issue arising from the metaverse. Interoperability refers to the portability of assets and data across platforms. The ability to carry property and information from one platform to another is crucial to a seamless metaverse experience and requires the development of protocol standards. However, a paradox arises since interoperability also erodes the value of processed data. Processed data is unique to each platform and allows companies to compete with one another. Therefore, while companies wish to provide a seamless immersive experience, they have little incentive to work towards interoperability. This holds true for creating interoperability between various ecosystems and hardware as well. For instance, Apple, Meta and Sony are all investing in creating VR headsets. However, this fragments the ecosystem with incompatible and competing technologies and prevents consensus on which is best for large-scale adoption. The Metaverse Standards Forum attempts to address the absence of standards and interoperability, but is likely to be insufficient on its own.

## Data and Consumer Protection

Though portability of information is crucial to the metaverse, the transfer of large quantum of data endangers the data itself as well as user privacy. The operation of the metaverse depends on the collection of very granular biometric data, such as audio or iris recognition and neural data obtained from brain-computer interface technology. While privacy and control over one's data is one of the main promises of the metaverse, often the processing and transfer of this data will be crucial to the metaverse itself. This would mean that consent might need to be circumvented in some situations, or that a user might have to trade-off participating fully in the metaverse in order to protect their privacy.

Identity exploitation is another risk posed to users because of a lack of data security. Skilled cybercriminals may be able to exploit vulnerabilities in the blockchain which can result in fraud, identity theft, and misinformation. Lastly, protection of consumers must also account for the mental and emotional harm caused due to the blurring of boundaries between virtual and real life. This is specifically pertinent in light of various avatar assault and sexual harassment complaints raised during early experiences with immersive virtual reality platforms. Though India still does not possess a formal and final data protection

legislation, MeitY has announced that the Digital India Act will cover crime committed in the metaverse, alongside OTT and social media platforms. Therefore, cyberbullying, sexual harassment of digital avatars as well as block-chain related crime falls within the ambit of this legislation.

In early January 2023, MeitY released draft amendments to the Information Technology (Intermediary Guidelines and Digital Media Ethics Code) Rules, 2021. The rules define an online game as “any game that is offered on the Internet and is accessible by a user through a computer resource if he makes a deposit with the expectation of earning winnings”. The new amendments also seek to establish a self-regulatory body that will provide clearance to online gaming companies to legally operate in India and have disallowed betting on the outcome of games. The draft amendments hope to moderate the content of online gaming and prevent financial fraud. However, these regulations are likely to impact the play-to-earn model currently engaging gamers in India by limiting what kind of assets can be exchanged legally and the acceptable conditions for the same. The impact on metaverse gaming is further exacerbated by the fact that the rules demand user verification through KYC, the infrastructure for which is still not present in the metaverse.

## Disruption to Economy

Economic activity in the metaverse will rely on blockchain technology and decentralised exchange of cryptocurrencies and digital tokens. The blockchain makes it difficult to monitor anti-competitive and anti-trust practices by firms that might use private blockchains to collude. Since the government cannot access the blockchain, monitoring and punishing such activities under the Competition Act, 2002 becomes extremely difficult. It is also likely that different metaverse platforms will introduce their own native currencies and tokens for their own economies which may require circulation protocols. The relative ease with which cryptocurrencies develop is a challenge in itself because they can be mined anonymously but fall outside the jurisdiction of regulations governing fiat currency.

Another issue is posed by an increase in cyber money laundering activities. This is made possible by the privacy measures inherent in blockchain technology that conceal the identities of those carrying out transactions. Therefore, even though it is an accessible

network where anyone can have copies of a transaction, the inability to authenticate the source or holder of a currency enables criminal behaviour. Cash from the real world can also be converted into untraceable or easily hidden currencies. That 17 million Ethereum transactions between 2017 and 2022 were associated with criminal or illicit activities demonstrates that laundering activities require a firm regulatory response.

Since the promise of blockchain is decentralisation, no single entity is responsible for preventing financial fraud and ensuring the stability of the currency. The volatility of crypto-assets has led to the RBI expressing the possibility of a prohibition of unbacked crypto-assets, stable coins and DeFi, while a bill banning private cryptocurrencies is yet to be tabled in Parliament. This comes after the FTX crash and increased anxieties about the risks such events pose to macro-economic stability. Notably, the government also recently introduced new tax laws that impose a 30% tax on capital gains, 1% TDS and the inability to offset losses. This creates barriers on crypto-trading.

## Taxation

When Ariana Grande held her metaverse concert, she made \$20 million from the sale of tickets and merchandise. This ultimately raised questions about taxation and whether the right to tax lay with the jurisdiction of where Grande performed, or the location of each attending member. With an increase in taxable events taking place in the metaverse, there is also an increase in regulatory complexity for both governments and companies. Digital assets do not have the same tax-reporting obligations as conventional investments and bypass regulatory intermediaries. There is also ambiguity whether certain events and transactions are susceptible to being taxed at all. Other concerns include determining what kind of tax is applicable to an event. For instance, would a trade in a plot of NFT real estate require the imposition of VAT or would it be taxed as an increase in income based capital gains.

In India, the Central Board of Direct Taxes (CBDT) recently clarified that NFTs are Virtual Digital Assets (VDAs) and would be subject to the 30% tax on income and 1% TDS. However, some NFTs, such as NFTs of tangible assets like land records, are exempt from taxation. While individual governments grapple with taxing metaverse events and transactions, there have been attempts to arrive at commonly agreed tax frameworks for cryptocurrencies by the OECD. The ambiguity that persists jurisdiction to jurisdiction

regarding what assets and events are taxable have meant that businesses will have to continue to navigate uncertainty till the time some more regulatory clarity is achieved.

## Intellectual Property Rights Infringements

While intellectual property rights do extend to the metaverse, virtual objects may become subject to IPR violations. NFTs reveal such a potential of infringement since ownership over art and other properties can be dubious in some cases. Tradable goods like avatars might be bought with the intention of customising them and reselling them again as NFTs. However, IP law does extend copyright to creators, protecting their work from being rendered for commercial sale. Furthermore, an individual can be protected from being rendered as an avatar to be sold as an NFT under the right of publicity.

