

# Issue

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# Brief

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# Exploring the Metaverse: Challenges and Opportunities for India in the ‘Next Internet’

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## **Abstract**

The metaverse is a real-time, three-dimensional world that is accessible through Virtual Reality (VR) head-mounted display. Called ‘the next Internet’, the metaverse is multi-technology and incorporates hardware infrastructure with immersive technology, blockchain technology, computer vision, and ubiquitous interfaces. Globally, metaverse is still in the nascent stage as stakeholders work to figure out its innovative and practical applications apart from the gaming industry. This brief examines how India could capitalise on the opportunities presented by the metaverse.

**M**etaverse is a portmanteau of the words ‘meta’ and ‘universe’ that describes a virtual environment created using technologies like blockchain,<sup>a</sup> computer vision,<sup>b</sup> pervasive computing,<sup>c</sup> scene understanding,<sup>d</sup> and ubiquitous interfaces.<sup>e</sup> It is a new form of the internet that is emerging as the very nature of user experience is changing with Web 3.0. For the public, video games and e-gaming is considered to be an entry-point to the metaverse. The growing Indian gaming industry has the potential to leverage this opportunity to shape the metaverse technology and become a global frontrunner. There are a few countries that have had some headstart in exploring the uses of the metaverse. In South Korea, for example, the metaverse is used for hosting virtual meetings using Ifland, a platform developed by SK Telecom where users can participate through their digital avatars. In the United Arab Emirates (UAE), a virtual version of Dubai city, called ‘MetaDubai’, is being built in the metaverse.

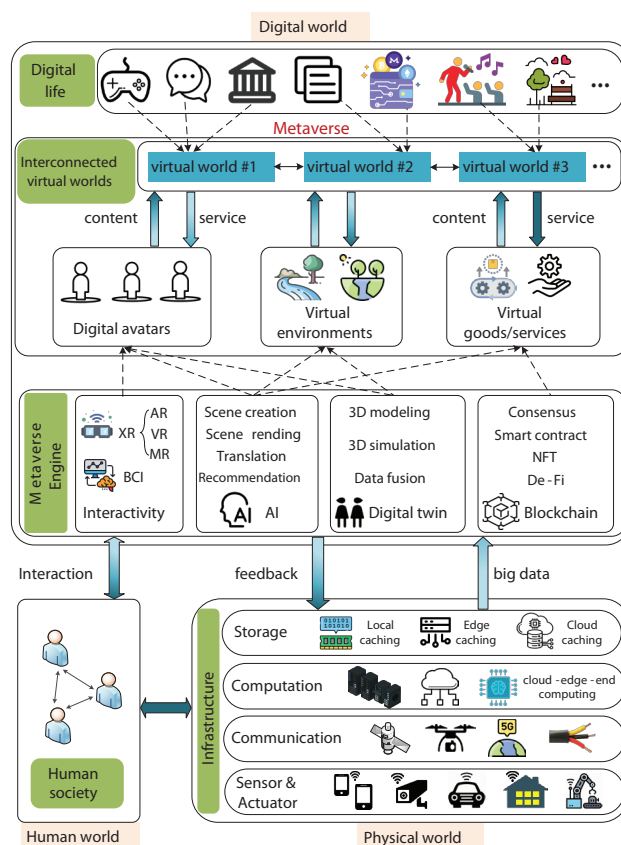
This brief explains the cutting-edge metaverse technology, including its applications and characteristics, and outlines its intersection with the gaming industry. It highlights recent advancements in the technology, and the opportunities and challenges they present to India.

### **An Emerging Concept**

The architecture of the metaverse is a combination of the human, physical, and digital worlds (see Figure 1).

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- a A blockchain is a type of Digital Ledger Technology (DLT) that consists of growing list of records, called blocks, that are securely linked together using cryptography.
  - b ‘Computer vision’ is a field of artificial intelligence (AI) that enables computers and systems to derive meaningful information from digital images, videos, and other visual inputs.
  - c ‘Pervasive computing’ is an emerging trend associated with embedding microprocessors in day-to-day objects, allowing them to communicate information.
  - d ‘Scene understanding’ is the process, often real time, of perceiving, analysing and elaborating an interpretation of a 3D dynamic scene observed through a network of sensors.
  - e ‘Ubiquitous Interfaces’ refers to computing paradigm in the multi-situation, multi-device, multi-modal, multi-user, and multi-application environment using software and hardware.

**Figure 1:**  
**Architecture of the metaverse**



Source: Wang, Yuntao et al., "A Survey on Metaverse: Fundamentals, Security, and Privacy."<sup>1</sup>

While equipped with a Head-Mounted Display (HMD), users control their digital avatar that interacts, plays, and socialises with other avatars using immersive technology. To build a virtual world, physical infrastructure such as sensors and actuators for multi-sensory data perception, a high-speed communication network for transmission of data, and high computation processing capabilities and storage are equally important to provide a seamless experience for the transition to the virtual world.

Communication networks, chips, processors, and cloud computing will also be active participants in the evolution of the metaverse, making it multi-technology. Hyper-spatiotemporality is another characteristic of the metaverse—i.e., it breaks the boundaries of time and space. Though metaverse creates a virtual world parallel to the real world, unlike in the real world, metaverse breaks the limitation of space and time as it operates on a space and time that is distinct from the real world. It allows transcending the constraints of both, time—by returning to the past and approaching the future, and of the physical space by crossing space in the metaverse.

AI helps enrich the metaverse ecosystem by empowering users in content creation through recommendations and performing personalised avatars. AI and analytics help derive knowledge about the user and model the services according to their preferences to offer a more vivid and unique experience. Meanwhile, technologies such as blockchain help in monetisation of content and trading between avatars. Digital assets such as Non-Fungible Tokens (NFT)<sup>e</sup> act as a barter commodity in the metaverse that can also be converted into currencies in the real world.

In the virtual world, a completely new universe is open to users. Virtual Reality is a type of immersive technology<sup>f</sup> that includes 360-degree viewing, Augmented Reality<sup>g</sup> (AR), and Mixed Reality (MR). While VR isolates the users from the outside world using a head-mounted display, 360-degree viewing and AR extend the reality. AR is in use in many industries, including social media in Snapchat filters, and gaming such as Pokemon Go.

Extended Reality (XR), meanwhile, creates a computer-generated three-dimensional world that allows humans to experience and communicate in the virtual world which is a persistent universe that does not switch off with the device. Leveraging the technologies of VR, AR, and MR, the metaverse will evolve with enhanced functionalities with the help of blockchain, AI, and connectivity technologies.

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f Non-fungible tokens (NFTs) are cryptographic assets on a blockchain with unique identification codes and metadata that distinguish them from one another.

g 'Immersive technology' is a technology that extends reality and creates an environment that interacts with users.

h Augmented reality (AR) is the integration of digital information with the user's environment in real time.

# Introduction

Activities in the initial stages of the metaverse are imitations of their real-world counterparts in the virtual world, where two parallel spaces are present. In the second stage of the metaverse, users can create native content such as avatars that are only present in the virtual world. This stage provides an opportunity for massive content creation, promoting innovation in the digital world that can transform the process of the physical world, thereby blurring the lines between the two spaces. The mature stage of the metaverse will be a self-sustaining surreal world that subsumes the real world into itself. The complete integration of the virtual and real worlds can be experienced in the mature stage of the metaverse.

“The metaverse breaks the limitation of space and time as it operates on a space and time that is distinct from the real world.”

# Recent Advances in the Metaverse

There are five key vectors for metaverse advancements: hardware, infrastructure, content, community, and currency. Given the vast coverage of technologies that the metaverse needs, international organisations working in the field of technology and communication have started making guidelines for maintaining standards. The most important technology required for the metaverse to spread will be the blockchain. In 2019, the International Telecommunication Union (ITU) published the first set of international standards for blockchain. For uniformity, in 2020, the Institute of Electrical and Electronics Engineers (IEEE) released the IEEE standards for Data Format for Blockchain Systems.<sup>2</sup> Individual countries, meanwhile, are also trying to make policies on metaverse and related technologies. The South Korean government, for instance, is among the first to invest in metaverse—devoting some US\$ 177.1 million to the country's nascent metaverse industry.<sup>3</sup> Other countries like the United States (US), China, Japan, and the UAE have framed regulations for crypto trading and the use of blockchain for digital currency.<sup>4</sup>

India, too, by drafting the National Strategy on Blockchain, has taken the first step in that direction.<sup>5</sup> India is also rolling out the 5G testbed,<sup>6</sup> working on Central Bank Digital Currency (CBDC),<sup>7</sup> and testing quantum communication technology.<sup>8</sup>

# The Metaverse Economy

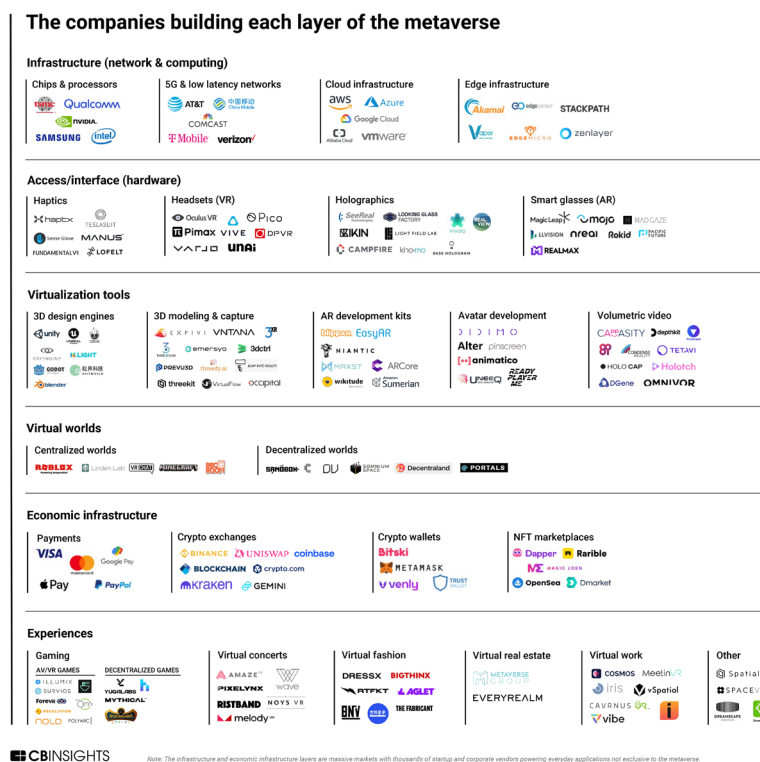
The application of metaverse includes building a smart city, entertainment, gaming, remote working, education, tourism, and social networking. The COVID-19 pandemic; the penetration of internet and smartphone; the development of the blockchain technology; and the growth of Web 3.0 combined have given way for metaverse to take shape. Though many technology companies are exploring new initiatives, gaming is considered to be the entry point to the metaverse world. Brands are utilising the scope provided by gameplay to engage with in-game surroundings for audience expansion and exposure in the form of metaverse stores and NFTs. Industries such as music, fashion, cosmetics, sports, and education, are already partnering with gaming industries to incorporate their brands into the gameplay. Other industries such as transportation, defence, and smart cities are soon arriving in the metaverse world.<sup>9</sup>

A survey of 29 countries conducted by multinational consultancy firm, Ipsos, found that in India, more than 70 percent of adults are of the view that over the next 10 years, the development of metaverse applications like virtual learning, entertainment, gaming, socialisation, and tourism will change the way people lead their lives.<sup>10</sup> With the evolution of the metaverse, new business models, new content, and novel ideas for interaction will emerge for gamers and non-gamers alike.

According to CB Insights' *Industry Analyst Consensus* published in April 2022, the metaverse could be worth US\$1 trillion by the end of the decade.<sup>11</sup> Other industries as shown in Figure 2 will help shape the metaverse. Chips and processors will back the computational and processing requirements of the metaverse. Semiconductors will be the staple of the new internet. Low latency computing networks with increased computing efficiency of the chips are the necessities of the metaverse, and 5G and cloud computing advancement will help power it.



## Figure 2: Industry players in the metaverse



Source: “The metaverse could be tech’s next trillion-dollar opportunity: These are the companies making it a reality”, CB Insights.<sup>11</sup>

This opens job opportunities in multiple verticals of technology such as developers, testers, animators, AI-developers, and data analytics. India is taking steps to make the best use of the opportunities. With respect to chip-making, India has set up a National Semiconductor Mission. For blockchain, India has a National Strategy on Blockchain, released in December 2021.<sup>12</sup> For emerging technologies like AI and Quantum too, India has set up a National Mission for AI and a National Mission for Quantum Frontier, respectively. Other initiatives include 5G trials; setting up an Animation, Visual Effects, Gaming and Comic (AVGC) Centre for Excellence in collaboration with IIT Bombay; budgetary allocation to the AVGC sector; and allowing 100-percent FDI for the gaming industry.

# Metaverse and India's Gaming Industry

India is a growing gaming market, with mobile and computer video games making up a large portion of it. In 2020, the country marked 450 million users, second only to China. India's young demographic—46 percent of the population are under-25—is a significant contributor to the user base. The pandemic-related lockdowns and the spread of internet connectivity gave the gaming industry a thrust to expand. According to 2021 data, the Indian gaming industry is mainly a mobile-gaming industry with more than 90-percent share, while PC gaming has 9 percent, and console gaming, 4 percent.<sup>13</sup> Most users in India are casual gamers who play games that do not require proficiency in the game and involve less monetary rewards, if at all. While the mobile-based casual-gaming industry generated nearly US\$0.7 billion in 2021, the e-sports sector<sup>i</sup> earned US\$ 26 million. For holistic development of the metaverse industry in India, both casual and e-sports industries will have to grow.

Hardcore games such as e-sports provide a platform for the virtual world to introduce content relevant to the game in a more generic way with similarities to the real world, which the metaverse seeks to leverage. With online games such as Minecraft, players get the power to create a virtual world. In India, this has given rise to a Minecraft content-creating community that streams their virtual world on YouTube and monetises it. This allows the content creator to make a variety of content for sharing and use it for streaming or selling as NFT.

The Indian gaming and animation industry has taken the first step in developing content that is unique to India.<sup>14</sup> Loka, for instance, is a New Delhi-based start-up which is the country's first multiplayer gamified virtual metaverse. It has created a 3D map of real-world cities and geographical spaces.<sup>15</sup> OneRare is another start-up which has launched its first play-to-earn food metaverse game in March 2021.<sup>16</sup>

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i eSports, also known as e-Sports, egames, or electronic sports is organised competitive video gaming.

# Metaverse and India's Gaming Industry

Indian metaverse developers can harness the power of the country's epics and folklore as premise for games. Ikonz, a Singapore-headquartered start-up by entrepreneur Abhinav Kalidindi, for example, is creating NFTs for iconic characters from graphic novels published by Amar Chitra Katha.<sup>17</sup> Raji, an Indian game that is centred around mythological stories, has also been released.<sup>18</sup> A Gurugram-based start-up, Totality Corporation, is building its own gaming engine called Zion that enables users to make avatars and digital assets like weapons in the game for NFT based on the Ethereum blockchain framework. The virtual world built using Zion is called the ZionVerse, where the user owns the intellectual property and digital assets. NFTs for metaverse released by ZionVerse are Trimurti based on Hindu deities, and the LakshmiZionVerse claims to have sold more than 5,000 NFTs in 19 days to more than 3,000 users.<sup>19</sup> This shows the interest of buyers in the Indian NFT market.

**M**etaverse comes with its own set of potential challenges that will require attention as countries explore the utility of this technology.

## 1. Safety

Even before the rollout of Meta's metaverse globally, in its VR social media platform Horizon Worlds, an assault on a beta tester<sup>j</sup> cautioned people about the ugly side of the technology.<sup>20</sup> Since metaverse blurs the line between virtual reality and reality, and is unsupervised and unregulated to a great extent, harassment can take place in the virtual world.<sup>21</sup> The first report of a VR-related death has come from Moscow, where a 44-year-old died after falling through a glass table while wearing an HMD headset.<sup>22</sup> With the increased engagement of people in immersive technology, early safeguarding of users will benefit the individual users and platform, and address the trust deficit. Companies working in the immersive technology domain can be incentivised to create more applications for a safer environment in the metaverse which will allow a wider demographic of users to experience the technology.

As the metaverse is considered to be an attractive entertainment field for children, a particular challenge will be to keep them safe while they use the technology. Unsupervised time in the open social metaverse can expose them to abuse. In the US, research by the Centre for Countering Digital Hate (CCDH) published in December 2021 on Facebook's VR metaverse app, shows that in the metaverse, children are more prone to abusive behaviour including bullying, being forced to repeat racist slurs and extremist talking points, and being exposed to traumatic experience like threat of violence.<sup>23</sup>

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<sup>j</sup> According to Meta, on November 26, a beta tester reported that she had been groped by a stranger on Horizon Worlds. On December 1, Meta revealed that she had posted about her experience in the Horizon Worlds beta testing group on Facebook.

Indeed, even adults are not immune to the dangers that VR can cause, as the line between reality and the virtual world is blurred. Lousie Eccles of the *Sunday Times*, for example, was confronted with simulated sex and pornographic questions during her first metaverse experience in Altspace.<sup>24</sup> Multiuser social spaces in the metaverse are more likely to have targeted instances of racist, homophobic, transphobic language, and virtual groping.

## **2. Interoperability and privacy**

Another challenge is the risk that the metaverse will be controlled by a few Big Tech companies like Google, Amazon, Meta, Apple, and Microsoft. The economics underpinning metaverse will then be linked to the capture of user data and conservation of privacy will be a massive challenge.

## **3. Assigning accountability**

Assigning accountability in a metaverse platform is difficult as the technology transcends geographical boundaries. To deal with the challenge of content moderation, for one, four main areas can be considered in governance with special focus on accountability: individual, community, platform, and government. Metaverse will produce data, captured at a higher level like gaze, gesture, speech, and biometric data. This private information needs to be localised and their storage will be a task which the state needs to handle.

## **4. Data security**

Sharing of data across boundaries for processing can pose a threat to national security as the metaverse can be used as a platform for recruitment by terrorist groups, and for radicalisation, extortion, and social polarisation. Data through the metaverse or personal HMD can lead to fraud and identity theft. For example, by hacking VR headgear or glasses, hackers can steal personal information.

## 5. ‘Cyber-syndrome’

Open issues of metaverse include high computation power leading to higher electricity usage and the experience of ‘cyber-syndrome’.<sup>k</sup> NFT and blockchain technology in the metaverse economy require high computation for maintaining the ledger and validating it. In blockchain technology, the mining process in itself consumes a lot of electricity and has an environmental impact as they use high-end computation. With the development of immersive technology and smaller and portable devices, there will be a rise in cyber-syndrome cases as more people would likely be spending long hours on the Web 3.0.

“The metaverse will be an attractive entertainment field for children, and keeping them safe is going to be a massive challenge.”

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<sup>k</sup> ‘Cyber-syndrome’ is the physical, social, and mental disorders that affect a human being due to excessive interaction with the cyberspace.

# Focus on Regulatory Challenges

A new challenge for Intellectual Property (IP) rights will arise with the metaverse. Ownership of art and properties in the real world is a different domain from that in the virtual, and this has to be protected so that the Animation, Visual Effects, Gaming and Comics (AVGC) industries can thrive. NFTs can raise legal concerns over intellectual property ownership and rights. Due diligence on the terms and smart contract that is a part of the NFT transaction needs to be exercised to avoid IP theft.

India is largely unequipped to deal with the issues arising from metaverse technology, among them the protection of privacy. The notice and consent mechanism under the draft Data Protection Bill (DPB) may just prove ineffective as users will move between different virtual environments, rendering user consent highly onerous. Thus, future-proofing the DPB is required to make it fit for the metaverse. Balance needs to be maintained between data sharing with trust, and data to be processed within the geographical boundaries of a country. Limitations on data sharing and processing can hinder the development of metaverse and might slow down the growth of the technology. Homomorphic encryption, or the conversion of data into cipher text, can be used to share data beyond boundaries without the fear of misuse. IP rules, with a touch of metaverse, have to be introduced to prevent piracy of content. Platforms can address the issue of privacy; methods like disguising, invisibility, and mannequin can be used where users have the option to switch avatars, become invisible, or replace the avatar with some bot to avoid being tracked.

# Conclusion

**F**or the Indian metaverse and gaming industry, one of the biggest challenges is the lack of human resources and skills required for chip-making and AVGC development. With the new National Semiconductor Mission and task force on AVGC, India is attempting to bridge the gap and provide training to attain the skills set required to excel in the field.

The possibilities offered by the metaverse can be limitless. To allow early adoption of metaverse, the Indian gaming industry and regulations introduced by the government have to be in sync. Metaverse might take time to reach its full potential but if achieved, it can be a wellspring of new business opportunities. With increasing technological influence and demographic advantage, India has the opportunity to make the most of the metaverse. [ORF](#)

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