



TechREPORT

# Metaverse

November 2023



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# TechLab

The TechReports are an initiative of the Emerging Technologies Laboratory of the IDB’s IT department, known as TechLab, which is in charge of exploring, experimenting, and disseminating information about new technologies to learn about their impact on the IDB Group and the LAC region.

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# 1. Executive Summary

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The metaverse is defined as a set of technologies that create an interconnected web of highly immersive virtual worlds. The use cases and opportunities offered by this new and evolving concept are still being defined, but it is already demonstrating promising potential observed in efforts underway at the Inter-American Development Bank (IDB) Group.

Enhanced collaboration between remote teams, a closer link between technology and virtual environments, an immersive experience that enables real or virtual spaces to be used for training staff or students, as well as supporting impact and development purposes are all potential applications being explored at the IDB Group.

At the same time this set of technologies also carries certain risks and limitations that should not be overlooked. Data protection, access by minors, ethical issues, inclusivity, local regulations or access to virtual reality devices are some matters to be considered.

The IDB's emerging technology laboratory, TechLab, together with teams working with these technologies, has created this report to share conclusions, lessons learned, and best practices for preparing a project with immersive technologies such as the metaverse.



Image taken from the IDB Group's Metaverse application "Ciudad BID", used for the onboarding of new employees.

## 2. Definition

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Metaverse, an evolving concept, refers to a virtual environment that uses various emerging technologies to create an immersive and interconnected experience. Using technologies such as virtual reality (VR), augmented reality (AR), artificial intelligence (AI), 5G, and blockchain, the metaverse enables interaction, exchange, and the development of real experiences in a connected world.

The Metaverse is defined as a shared virtual space where people can interact through avatars, which are digital representations of themselves. These digital representations or avatars are designed by the user, giving them the freedom to define their identity.

Users can access this space through computers, video game consoles, virtual and augmented reality devices, and even mobile devices. The connectivity of the Metaverse enhances and fosters collaboration between teams across locations, and the multi-access democratizes the use of this technology (as VR devices are not required to enter and participate in these virtual worlds).

Today, multiple platforms coexist with different audiences and experiences. Metaverses divide in two types depending on the impact on the participant's experience: centralized and decentralized. In centralized metaverses, an entity is in charge of the platform and its participants join the already existing virtual world, while in decentralized environments the platform is shared, which allows any user to design and be the owner of those spaces.

Examples of centralized metaverses include Horizon World<sup>1</sup> (Meta), Mesh<sup>2</sup> (Microsoft), VR Park<sup>3</sup> or Spatial<sup>4</sup>. In addition to these centralized platforms, users can create their own custom-developed spaces. Sandbox<sup>5</sup> or Decentraland<sup>6</sup> are examples of decentralized metaverses.

However, the concept is still under development and there is no single definition or concrete implementation of it.

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<sup>1</sup><https://www.meta.com/us/es/horizon-worlds/>

<sup>2</sup><https://www.microsoft.com/en-us/mesh>

<sup>3</sup><https://www.vrpark.online/>

<sup>4</sup><https://www.spatial.io/>

<sup>5</sup><https://www.sandbox.game/en/>

<sup>6</sup><https://decentraland.org/>

## Metaverse

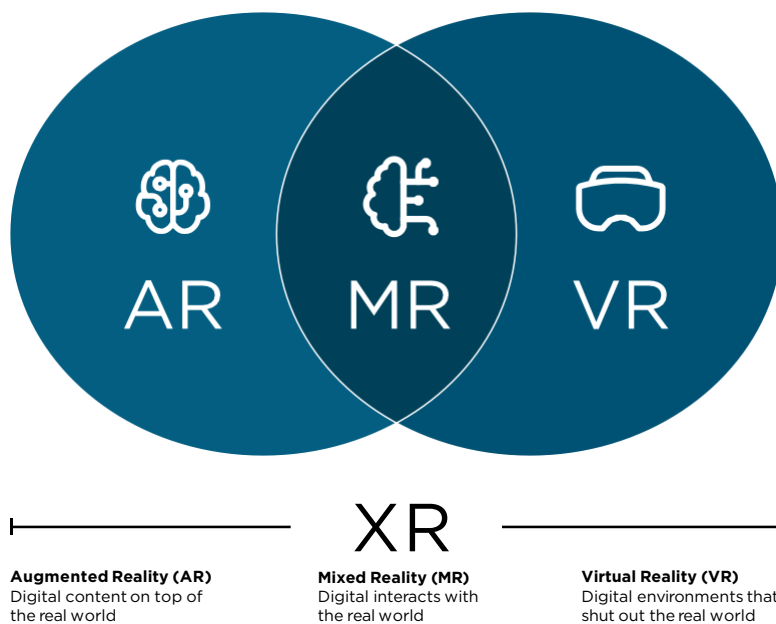
Some of the technologies that enable the Metaverse are:

**a. Virtual Reality:** Although often confused with the Metaverse, this is just one of its components. VR refers to the use of computational technology to simulate immersive three-dimensional environments. The experience takes place in a partially virtual and fully immersive context, engaging all the participant's senses in the virtual environment.

**b. Augmented Reality:** Unlike virtual reality, which creates a simulation of an artificial world, augmented reality creates digital layers on top of the real world that include artificial objects.

**c. Mixed Reality:** A combination of the features of virtual reality and augmented reality. While in virtual reality the participant interacts with the simulation, augmented reality simply places digital layers on top of the real world so that they are visible to the individual. And mixed reality allows both to be experienced at the same time.

**d. Digital Twins:** Digital representations of a physical object, process, organization, person or any other element that exists in the real world. Groups of digital twins can be created to build a view of real-world entities, such as a city, and the processes that connect them within the city.



## 3. Applications

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The use of the Metaverse is still being explored, but current existing platforms have started adapting their applications to their audiences. According to World Economic Forum<sup>7</sup>, there are three types of Metaverse: the Consumer Metaverse, the Enterprise Metaverse, and the Industrial Metaverse.

**The Consumer Metaverse:** built around the world of online gaming that is now enabling users to collaborate and interact.

**Enterprise Metaverse:** from Microsoft Mesh to Meta Workrooms, available on any device to create digital workspaces and immersive meetings.

**Industrial Metaverse:** powered by real-time data and sensors, AI and AR/VR, digital twins to drive efficiency and bring to scale the productions floors or surgical rooms, among others.

Within these categories, the Metaverse offers a variety of potential use cases. A few examples are:

**1. Education:** The use of the Metaverse as a platform for online education, allowing students and teachers to engage in an enriched virtual space that helps them explore complex topics in an interactive manner through simulations and immersive experiences. These experiences can help students learn about new environments and, for example, prepare for internships. This concept is called Metaversity.<sup>8</sup>

**2. Public Services:** The use of immersive technologies to create virtual environments where citizens can interact with public authorities in a more efficient and convenient way than traditional face-to-face services.

**3. Tourism:** The use of the Metaverse to promote regional tourism by allowing governments to offer immersive virtual experiences for visitors to explore tourist attractions before visiting in real life. This is particularly useful when physical travel is restricted or dangerous.

**4. Construction:** The use of the Metaverse for training, allowing construction workers to interact in a simulated virtual environment to practice dangerous situations safely and without putting themselves at risk. It can also help monitor and respond to emergencies such as natural disasters or civil unrest.

**5. Healthcare and medicine:** The provision of healthcare virtually such as telemedicine or using digital models to plan or carry out surgical procedures are some examples of the benefits of the Metaverse for medical uses.

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<sup>7</sup> <https://www.weforum.org/agenda/2023/02/metaverse-use-cases-industrial-consumer-enterprise/>

<sup>8</sup> [https://www.youtube.com/watch?v=GZOCBc-yxrw&ab\\_channel=AntonioDelgadoP%C3%A9rez](https://www.youtube.com/watch?v=GZOCBc-yxrw&ab_channel=AntonioDelgadoP%C3%A9rez)





## 4. Featured Global Projects

**1. At Johns Hopkins Hospital<sup>9</sup>**, neurosurgeons have performed the institution's first augmented reality surgeries on live patients

**2. Barbados will establish the world's first embassy in the Metaverse<sup>10</sup>**: Gabriel Abed, Ambassador of Barbados has communicated that the Ministry of Foreign Affairs and Trade is exploring the possibility of establishing the Embassy of the Government of Barbados in the metaverse.

**3. JP Morgan<sup>11</sup> has become first major bank to enter the Metaverse** as it opened a room in the popular blockchain-based universe Decentraland, one of the most popular metaverses.

**4. BBVA opens its first meeting room in the Metaverse<sup>12</sup>**: Banco Bilbao Vizcaya Argentaria (BBVA) has opened a room in the Metaverse for remote meetings, to help design specific banking services by analyzing the potential of these spaces and how it changes the way users interact in them.

**5. The United Nations Population Fund (UNFPA) has developed a VR platform to train doctors<sup>13</sup>**: Virtual reality (VR) training platform developed by UNFPA in Timor-Leste

**6. Mercedes uses AR/VR to train employees and improve user experience<sup>14</sup>**: Mercedes-Benz designers, engineers, and manufacturers make use of VR technology in a number of ways during the process of conceptualizing and constructing vehicles.

**7. FDA Authorizes Virtual Reality System for Chronic Pain Reduction<sup>15</sup>**: The U.S. Food and Drug Administration today authorized EaseVRx, a prescription-use immersive virtual reality (VR) system that uses cognitive behavioral therapy and other behavioral

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<sup>9</sup><https://www.hopkinsmedicine.org/news/articles/2021/02/johns-hopkins-performs-its-first-augmented-reality-surgeries-in-patients>

<sup>10</sup>[https://www.youtube.com/watch?v=nnQA1Vh-9ic&ab\\_channel=CoinMarketCap](https://www.youtube.com/watch?v=nnQA1Vh-9ic&ab_channel=CoinMarketCap)

<sup>11</sup><https://fintechmagazine.com/banking/jp-morgan-becomes-the-first-bank-to-launch-in-the-metaverse>

<sup>12</sup><https://www.bbva.com/es/innovacion/bbva-abre-su-primera-sala-de-reuniones-en-el-metaverso/>

<sup>13</sup><https://asiapacific.unfpa.org/en/innovation-vr-timor-leste>

<sup>14</sup><https://www.forbes.com/sites/bernardmarr/2023/05/12/how-mercedes-benz-uses-virtual-and-augmented-reality-to-sell-cars-train-staff-and-create-new-customer-experiences/?sh=5f1f22af5f4f>

<sup>15</sup><https://www.fda.gov/news-events/press-announcements/fda-authorizes-marketing-virtual-reality-system-chronic-pain-reduction>

## 5. IDB Group Projects

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The IDB Group is experimenting with the Metaverse through prototypes to explore the use of these immersive technologies in the organization:

### **An office in the Metaverse**

The IDB Group in Trinidad and Tobago created the “Office in the Metaverse” to share information about projects, and activities and host external visits in their virtual offices. Office in the Metaverse includes IDB Group Virtual Offices, Exhibition Halls, private rooms, and spaces for workshops.

### **Onboarding New Employees**

The Inter-American Development Bank (IDB) Office in Costa Rica, Human Resources, and the emerging technology laboratory TechLab, developed a Metaverse onboarding prototype called “Ciudad BID”. This prototype has allowed for an improved and more interactive experience for new employees, and, currently, its scalability to the Group is under evaluation.

### **Virtual Exhibits**

Virtual reality exhibition of African American art at the IDB Gallery using the Metaverse platforms to engage with employees and provide a more immersive experience.

The Interamerican Development Bank fosters the development of Metaverse projects in the LAC Region:

### **MedixLabs**

Medix Lab is an immersive interface that provides a VR laboratory with visual, audio, and tactile effects to better train nursing students. This project was as a prototype driven by BID Lab and the health division of the IDB.

### **Metaverse Communities**

In a joint effort, Meta and IDB Lab intend to support communities currently using or planning to use the augmented and immersive capabilities of the Metaverse to foster greater connection with their network of members.



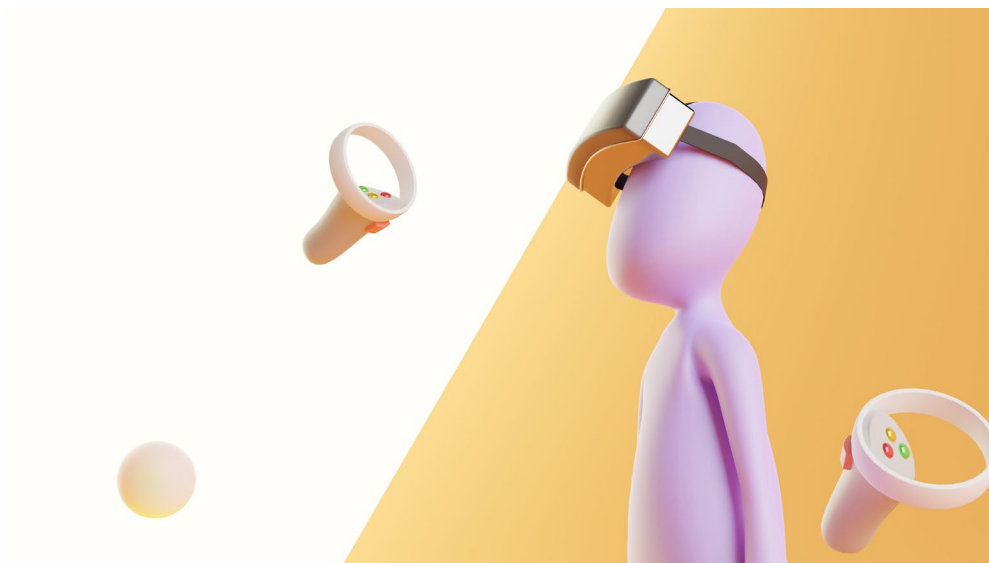
## 6. Requirements and Observations

In the case of collaborative work environments, it is important to consider whether the Metaverse will match or improve the experience in terms of efficiency and productivity for everyone. Not only should everyone have the same experience, but it should be better than a traditional videoconference or face-to-face meeting.

There are also important considerations regarding accessibility. For a truly immersive experience, the Metaverse requires equipment such as virtual reality headsets. These devices are still not widely available in Latin America and the Caribbean, so access to the Metaverse through VR devices in the region is limited. However, these devices are not always necessary to access the Metaverse, as many of the platforms can also be entered from a computer or laptop.

Connectivity in the region is also a critical consideration and it is important to remember that some applications presented in the Metaverse require broadband. Connectivity of rural areas should be evaluated before developing a project in the Metaverse that is intended to have an impact on these populations.

Finally, the digital gap in the region is another factor to consider when working with immersive technology. Not all citizens in the region have the same level of digital education or access to immersive platforms. It is important, before developing a project with immersive technology, to incorporate training as part of ensuring a better experience and learning.





## 7. Best Practices

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In the project planning phase, special consideration and importance should be given to the selection of a Metaverse platform, as well as to project monitoring, training, and technical support for deployment and maintenance of the solution.

When developing a project in the Metaverse, it is important to follow best practices to ensure a positive and rewarding experience. Some of the best practices to keep in mind are:

- **Understanding the Metaverse environment:** Before starting a project in the Metaverse, it is essential to understand how the specific platform or Metaverse works. This means understanding technical features, the available tools, platform policies, and technical and content limitations.
- **Create an immersive and engaging experience:** This is key to success in a Metaverse project and requires consideration of virtual world design, user interface management, navigation and interaction, as well as the creation of content and activities that interest and engage users.
- **Encourage participation and social interaction:** One of the most appealing aspects of the Metaverse is the ability to interact with other users. Therefore, it is essential to encourage participation and social interaction through implementing chat tools, creating multiplayer activities and games, and fostering collaboration between users.
- **Consider security and privacy:** Adopting a privacy-by-design mindset will help ensure that privacy is top of mind throughout the project's development. Measures should be put in place to protect the privacy of individuals and the security of their data to the greatest extent possible, as well as to ensure that the technology is transparent and fair regarding the use of personal information. Conducting a Data Protection Impact Assessment (DPIA) before starting a project in the Metaverse will help identify potential privacy risks and propose appropriate measures to mitigate or control them.
- **Keep up to date with Metaverse trends and developments:** The Metaverse is a constantly evolving technology, so it is critical to stay abreast of trends, innovations and changes in the industry. This means keeping a close eye on technological advances, metaverse platform updates and user expectations.



## 8. Privacy and Security

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The Metaverse presents new and unique privacy concerns that are still not fully understood or resolved. Some of the principal concerns relate to data collection and ownership (e.g., the rights of individuals over their data), anonymity and pseudonymization, and data portability and sharing. In addition, there is currently no specific regulation to enforce privacy protection in a Metaverse context, which raises questions about the applicability of different privacy laws for events taking place in the Metaverse.

Data collection and ownership concerns relate to the vast amount of personal data that is shared in a Metaverse environment as users engage in activities, especially when minors' data is involved, for example in educational use cases. This data includes explicit personal information, as well as behavioral and even biometric data, which can be considered special category data and as such requires even stronger protection. Who owns this data and who has access to it should be made very clear to users, as well as their consent options and rights.

Concerns around anonymity and pseudonymity relate to the opportunity provided by the Metaverse for users to develop different sub-identities, while safeguarding the real-world identities behind them. Traceability, or the ability to trace virtual life activities and identities back to real people, is an important privacy consideration. First, although users can create and interact through anonymous avatars, the platform owners still retain information about who created what avatar. Second, behaviors and knowledge shared through the sub-identity can still leak information about the real-world identity of the individual behind it.

Data portability and sharing concerns arise as a result of the existence of multiple Metaverse platforms and the fact that users interact across these different platforms. Data portability (the ability for users to easily move their data from one platform provider to another) and ensuring secure transfer of data, are important considerations that require both policies and technical security measures.

The Metaverse enables new forms of interaction that carry with them new risks to the privacy of individuals. Some of these are already emerging and others will present themselves as we move forward. How individuals will be protected or receive recourse in the event of privacy violations is an important question.

## Metaverse

The Metaverse also brings cybersecurity risks fueled in part by the mentioned lack of regulation, anonymity, and pseudonymity, which gives cybercriminals more freedom in the Metaverse to apply scam tactics and techniques used on the Internet and social media. The good news is that most of the security best practices we already know can also be applied in the Metaverse to keep ourselves, our customers, our information, and the organization safe.

Following are some of these risks and how they can be mitigated:

- **Phishing.** Like traditional phishing delivered through email, phishing in the Metaverse will try to trick the user into downloading malicious files, clicking malicious links, or providing sensitive information. The difference would be the delivery method, in the Metaverse any communication channel, such as chats, or objects that a user can interact with, could be leveraged by malicious actors to phish users. In order to protect themselves, users can apply the same security practices for phishing; checking the sources of information, avoiding clicking on unfamiliar links, being alert of messages trying to manipulate the user.

- **Websites “spoofing”.** These are website URL addresses created by cybercriminals that look similar to real ones, just changing a few letters or the domain name, such as “.io” instead of “.com”. Considering the novelty of the Metaverse and the number of new sites, it would be easier to mistype or fall for a fake website, with the same look and feel of the real one. Users could then inadvertently provide credentials or other information that cybercriminals will use to get in the real site to gain access to highly sensitive information such as banking credentials and contacts information or use it to phish other users. Users should always check the links, spelling, and use trusted search engines as some will indicate if it is the official site.

- **Access Control.** Users should protect their identity such as user name and password, enable multifactor authentication if available, and follow well known password best practices.

In general, be wary of any suspicious offering, requests for information, as this can be attempts to defraud or steal your information.



## 9. Ethical Considerations

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The psychological effect of using the Metaverse is an important element to consider. There is already evidence of negative effects on users who use social networks, where their self-image is negatively affected by unrealistic images. Metaverse adds another layer on top of an existing problem that has not yet been solved.

The potential for disrespect, discrimination, verbal abuse, and harassment is another concern. For example, while sexual harassment of women in social networks is an ongoing issue, an immersive environment could exacerbate it if the technology is not designed with these lessons learned in mind.

In centralized metaverses, the network owner can create and enforce rules to manage offensive behavior among participants and their privacy. In decentralized networks, safeguarding personal information is the responsibility of the participants.

The Metaverse raises a number of significant ethical considerations to keep in mind. The following are some additional ethical considerations in the Metaverse:

- **Discrimination and exclusion:** the Metaverse should be an inclusive and equitable space where all users have equal opportunities. It is important to avoid all forms of discrimination and exclusion, as well as to ensure equal access to technology and content.

- **Safety and emotional well-being:** the Metaverse can affect users' emotional health and well-being, especially when it comes to gaming and more immersive experiences. It is crucial to consider psychological and emotional risks, and work to ensure that users are always safe and protected. The Research Department and the emerging technologies laboratory, TechLab, at the IDB prepared this article on the behavioral effects of the Metaverse<sup>16</sup>.

- **Intellectual property and copyright:** the Metaverse is a space where users can create and share original content. It is paramount to ensure that users' intellectual property and copyrights are protected, as well as to prevent illegal copying and distribution of content.

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<sup>16</sup><https://blogs.iadb.org/ideas-matter/en/is-the-metaverse-better-than-zoom-for-brainstorming/>

## Metaverse

- **Accountability and transparency:** content creators and application developers are responsible for guaranteeing the quality and security of the content and technology they generate. Transparency and accountability are key in the way content and technology are handled, in order to ensure that users are properly informed about the risks and benefits involved in their participation in the Metaverse.

- **Autonomy and freedom:** the Metaverse should allow users the freedom to express themselves and explore without excessive restrictions. It is paramount to provide autonomy and freedom in how users interact with the technology and content, as long as they do not harm other users or violate applicable laws and regulations.





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