



METAVVERSE AND ITS LEGALITY: A GLOBAL LANDSCAPE

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ABSTRACT

The alternative creation of a virtual environment will mimic a wide range of interactions between people in the physical world which undoubtedly create an easiness and numerous benefits in the minds of the people. However, with the growing technologies certain issues are expected to raise several important legal considerations that jurisdictions may not be fully ready to address, for example, the developers and creators of the metaverse, intellectual property is a key priority - in an environment where multiple users and creators interact to change the surroundings and create new content, authorship and ownership of particular objects may be difficult to establish under certain circumstances. Metaverse related intellectual property concerns are already been addressed before courts, such as digital replicas of Swiss watches, including Cartier, and shopping bags by Hermès on platforms like Second Life have been well documented and have been the subject matter of intellectual property infringement suits. In the Indian context, however, such challenges have not yet been judicially tested. Another important issue needs to be address is data privacy, where lots of personal or sensitive information of a data subject being captured on the metaverse platform and can be used for promotional activities or selling the data to third party and in India there are no stringent laws to mitigate such issues. In this paper, the authors will discuss the concept of metaverse, it's evolution, legal and ethical challenges and global judicial approach.

Keywords: Metaverse, Judicial, Legal, Ethical, Global, Data Privacy

1. Introduction

The development of Metaverse has changed the whole world, a dynamic change in the life of every individual which can impact the everyday life in various forms. The term “Metaverse” is not new in the market, it can be traced back in 1992, when the term was coined by Neal Stephenson’s in his fiction novel “*Snow Crash*”. Metaverse is nothing but a VR (virtual Reality) Space at a advanced level where an individual can interact with a computer generated environment and other users that feels them that they are actually in that space¹. Metaverse has changed the view of the world and helps every businesses and individuals in various ways such as it allows brands to create meaningful and unforgettable experiences by taking consumers on a product journey, allowing them to interact with it in a more immersive way which will help the organizations to improve and sell their products more or in a digital healthcare, metaverse proven to be a useful tool for performing challenging surgical procedures and improving patient care².

As the technology getting advance more and more legal or ethical challenges are arising. Despite of having numerous laws/acts/standards, challenges still exists. One of the major challenges that metaverse facing is increase in personal data collection which can rise to different types of cyber-crime such as identity theft/fraud, impersonation and so on³. Nowadays, each and every country is having their own cyber and privacy law in place. One of the major laws is GDPR (General Data Protection Regulation) based out from EU to protect the rights of the EU citizen’s personal data that can be impacted through digital mode but there is no law to deal the metaverse technology and any risks arising out of the misuse of metaverse technology that may harm the life of individual⁴. The author has performed detailed analysis to identify the loopholes existing in metaverse and how to overcome such loopholes.

2. Concept of Metaverse

2.1. Definition

Every organizations and individual define metaverse in their own opinion there is no globally acceptable definition of it. In layman terms, the metaverse can be defined as internet 2.0. In fact, it resembles a parallel universe within our own in which we are able to defy death by playing outdoor games at home, getting around without a car, going to school, purchasing land, making money, and more. A person is drawn into a more interesting augmented reality via the metaverse, which is an immersive experience. It is an online environment that can be created using one's imagination and utilizes the internet, augmented reality, and virtual reality⁵.

¹ Mystakidis, S. (2022). Metaverse. *Encyclopedia*, 2(1), 486-497.

² Oh, H. J., Kim, J., Chang, J. J., Park, N., & Lee, S. (2023). Social benefits of living in the metaverse: The relationships among social presence, supportive interaction, social self-efficacy, and feelings of loneliness. *Computers in Human Behavior*, 139, 107498.

³ Wang, Y., Su, Z., Zhang, N., Xing, R., Liu, D., Luan, T. H., & Shen, X. (2022). A survey on metaverse: Fundamentals, security, and privacy. *IEEE Communications Surveys & Tutorials*.

⁴ Turdialiev, M. (2023). Legal Discussion of Metaverse Law. *International Journal of Cyber Law*, 1(3).

⁵ Bafna, S. What Is The Metaverse And Where Does India Stand!. Retrieved Oct 14, 2023 from <https://tradebrains.in/whatis-the-metaverse/>.

However, the most important organization which has named it on behalf of metaverse is Meta which says that metaverse is the next evolution in social connection and the successor to the mobile internet⁶.

2.2. Benefits

Metaverse can provide numerous benefits to an individual as well as a business, below are the some major benefits that will impact⁷:

- **Improbable and even impossible experiences:** Few people have the courage to ascend the Himalayas, surf the biggest waves, or travel to the far reaches of space. However, it is anticipated that the metaverse will offer realistic experiences like this to the general public in private settings. Daniel Mintz, chair of the IT department at the University of Maryland Global Campus, which has conducted immersive learning experiences utilising VR headsets, said that one benefit of the immersive experience is that it enables you to have experiences you otherwise wouldn't be able to.
- **More equal access to virtual experiences:** The metaverse may act as an equaliser by opening up experiences that were previously out of reach due to barriers like cost, location, or physical limitations. "A lot of things are possible today, like taking a ride over the Grand Canyon, but not everyone has the time or money to do that," said Sachin Mittal, executive director of Singapore's DBS Bank. You can live the life you wish to live thanks to the metaverse, he continued.
- **Heightened social connections and lifelike interactions:** In addition to having new experiences in the metaverse, users can anticipate being able to share those experiences in real time with friends, family, or anybody else they choose, just as if they were physically present together.

According to J. P. Gownder, vice president and lead analyst at Forrester Research, the metaverse would provide "a richer social experience" than the current internet and even contemporary gaming platforms. Aspects of social interactions in the actual world will also be replicated in the metaverse in ways that the current 2D internet cannot, he added. Today's video conferencing will appear, and more significantly, provide the impression that everyone is there in the same place. Like humans do in real-world social situations, avatars might congregate as a single group or separate into smaller groups.

- **More accurate representations of physical objects in the virtual world:** According to Gownder, the metaverse will improve people's ability to perceive and interact with actual physical items. For instance, a car buyer may visit an auto dealer on a completely immersive spatial web, look at automobile models, and test drive them just like they would in real life.
- **Better collaboration and co-creation:** People will be able to cooperate as if they were all in the same room since the metaverse promises to emulate real-world social interactions and properly portray physical items in three dimensions. In fact, utilising VR headsets and real-time support from surgeons in their own nations, surgeons in Brazil successfully divided conjoined twins. Thomas Olsen, partner

⁶ Meta. What is the Metaverse?. Retrieved Oct 14, 2023 from <https://about.meta.com/what-is-the-metaverse/>.

⁷ Pratt, K. M. Metaverse pros and cons: Top benefits and challenges Retrieved Oct 14, 2023 from <https://www.techtarget.com/searchcio/tip/Metaverse-pros-and-cons-Top-benefits-and-challenges>.

and worldwide co-lead of the Web3 and metaverse practice at management consulting company Bain & Company, added that people will also be able to collaborate and co-create in new ways in the metaverse.

- **More effective, efficient testing and training:** The metaverse will offer a whole new level of testing and training with remarkable efficiency in addition to supporting remote work and cooperation across geographical and physical barriers. Instead of using actual resources, teams will be able to train and practise in the metaverse while also testing ideas. The method was originally practised in virtual reality by the surgeons who split conjoined twins. According to Emmanuelle Rivet, vice chair of U.S. TMT and global technology leader at PwC, many companies see this kind of application as a way to enter the metaverse.
- **New business opportunities:** The endless potential of the metaverse extends beyond IT firms and gaming hubs. Businesses are starting to leverage experiences that resemble the metaverse to connect, engage, and interact with customers in novel ways. Luxury fashion firms are already selling virtual copies of their products in digital department stores, while Fidelity Investments developed an immersive experience in Decentraland to educate and engage consumers.

On the path of metaverse, there are certain potential roadblocks which an individual and businesses must be aware. Below are some major concerns that can arise:

- **Limited participation for some:** Users may feel simulator sickness, a type of motion sickness, while participating in immersive activities. Rivet emphasised that technological advancements alleviate the latency concerns that result in motion sickness, but she admitted that some people may encounter difficulties with completely immersive experiences in virtual environments. It's possible that people with visual or aural impairments will struggle in the metaverse.
- **Higher equipment costs:** To access the metaverse, both individuals and businesses will need to pay a fee. To participate, people will need to purchase the necessary equipment, such as VR headsets. According to Gownder, businesses are considering higher expenses as they decide how they'll use the metaverse, when to start investing, and what capabilities they'll need to buy to achieve their goals.
- **Potential for bullying, harassments and assaults:** Bad behaviour has happened in existing metaverse-like experiences just as it has in the real world, online, and on social media. For instance, some women claimed that their avatars had been touched. According to Olsen, organizations will need to consider the likelihood of such difficulties and the precautions and policies they'll need to put in place to deal with them. For instance, the maker of the virtual world online game Horizon Worlds, Meta, the parent company of Facebook, has added a Personal Boundary default bubble to its avatars "that will give people more control over their VR experience."
- **Additional privacy concerns and security issues:** There are still unanswered questions on how businesses will handle privacy in the metaverse. For instance, will businesses demand that avatars reveal their true identities always or just occasionally? Will they keep and use the copious amounts of

information they get on specific users in the metaverse, or will users or government regulators try to restrict the use of information? And how will companies protect the metaverse given that new technologies like VR headsets will increase the risk of security breaches?

- **More reasons for addictive behavior:** Some people looking for an escape may find the metaverse to be more addicting than video games. Mintz cautioned that they might lose "the ability to distinguish between reality and virtual reality."

3. Evolution of Metaverse

Early works like William Gibson's novel *Neuromancer* and the 1982 film *Tron* introduced the idea of a metaverse in science fiction in the 1950s. These tales spoke of a realistic virtual world that people may visit. If you broaden this meaning to include "Virtual Reality," then French poet Antonin Artaud used the phrase in his essay collection "The Theatre and its Double" as early as 1938. Then, in 1962, "Sensorama," a device that replicated the sensation of riding a motorbike around New York City using a 3D movie, a vibrating chair, even fans and smells, became the first true simulation. Neal Stephenson invented the term "Metaverse" in his best-selling book *Snow Crash* in 1992, after the first attempts at virtual reality.

He saw it as a virtual multiverse where individuals interacted with one other and experienced shared virtual worlds in a dystopian future. Richard Garriott, a well-known video game creator, coined the phrase in 1997 to describe an online role-playing game he was creating called *Ultima Online*. The game was published a year later and is largely recognized as the first MMO (Massively Multiplayer Online) game. In order to enable individuals to construct virtual worlds, interact with them, and exchange virtual commodities, the online virtual 3D world known as "Second Life" was launched in 2003. Only three years after its debut, Roblox quickly became popular because it allowed users to easily create virtual worlds (using "blox" blocks) or use those produced by other users to play in them. As time went on, an increasing number of tech firms explored the idea of virtual reality and produced iterations of this new digital world⁸. The first affordable 3D headset for the general public, Oculus, launched in 2012 and was acquired by Facebook in 2014, just two years later. Faster smartphones, internet connections, and devices led to the birth of platforms and games like *Fortnite*, which today has over 250 million people playing in its virtual MMO game world, or *Pokemon Go*, which blended augmented reality and real-life gameplay with the virtual game. When Facebook changed its name to "Meta" and Microsoft unveiled the "Mesh" platform in 2021, the buzz surrounding the metaverse's subsequent stages began. Microsoft "Mesh" and Facebook (Meta) Worlds both try to persuade businesses to utilize VR and virtual worlds for meetings, workshops, and other purposes. The trend persisted, and each year, new technology and software are launched, making VR headsets lighter, faster, and, most significantly, less expensive⁹. Although there are still many challenges to be overcome, broad acceptance has not yet occurred. Since Facebook changed its name to Meta in 2021, the Modern Metaverse has been a recurring "buzzword" in the technology sector. Due to the increase in investment into the Metaverse market, blockchain companies

⁸ Mystakidis, S. (2022). Metaverse. *Encyclopedia*, 2(1), 486-497.

⁹ Bale, A. S., Ghorpade, N., Hashim, M. F., Vaishnav, J., & Almaspoor, Z. (2022). A comprehensive study on Metaverse and its impacts on humans. *Advances in Human-Computer Interaction*, 2022.

are now attempting to link their philosophy to the Metaverse. However, due to the fact that the idea of "limited land" or "limited goods" doesn't apply in a digital space and renders it unscalable, these attempts have not yet significantly improved the space. In spite of this, firms like Microsoft and Meta (with Oculus) are providing corporate solutions, the first virtual classrooms, and virtual worlds like the updated Second Life platform, among others. This rise of VR/AR platforms and social VR experiences has also continued to increase. It is crucial to remember that the Metaverse is still in its infancy, and adoption has been slow because of a lack of computing power, bad user experiences, expensive hardware, and the technical restriction that only a small number of users can congregate in one space at once before the system reaches its limit¹⁰. This is merely the tip of the iceberg; in order for the Metaverse to realize its full potential, a number of technological obstacles must be overcome. The creation of large-scale persistent worlds in high resolution for millions of users will require the development of haptic sensors, improved VR headsets (lighter weight, better resolution, and more computing power), smaller processors that can fit into glasses or VR headsets, and overall computing power (servers)¹¹. Below fig 1. provides the complete road map of the Metaverse evolution:

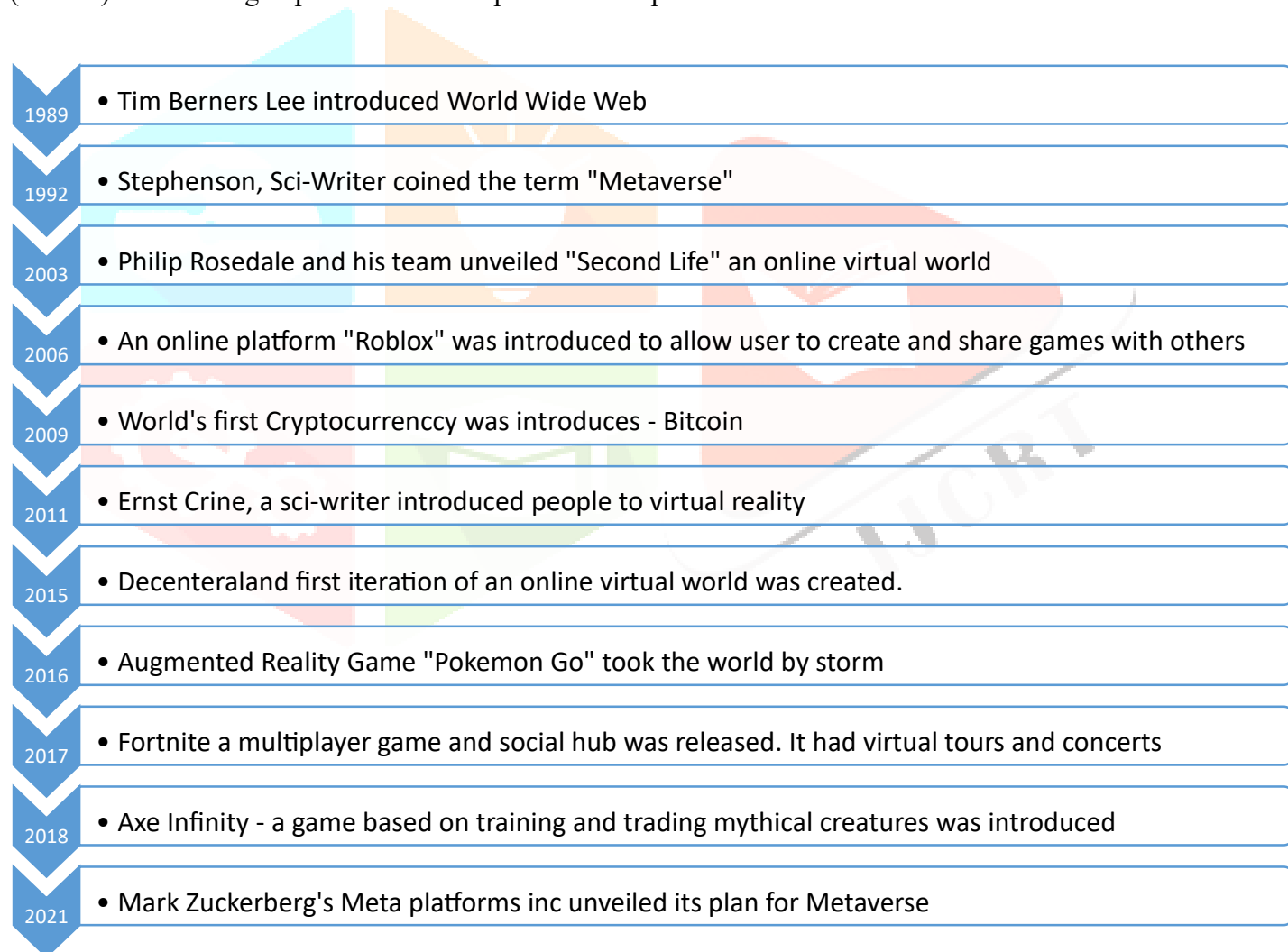


Figure 1: Metaverse Evolution Road Map

¹⁰ Talin, B. History and Evolution of the Metaverse Concept. Retrieved Oct 14, 2023, from <https://morethandigital.info/en/history-evolution-of-metaverse-concept/>.

¹¹ Chen, Z., Gan, W., Sun, J., Wu, J., & Yu, P. S. (2023). Open Metaverse: Issues, Evolution, and Future. arXiv preprint arXiv:2304.13931.

Kaddoura, S., & Al Hussein, F. (2023). The rising trend of Metaverse in education: challenges, opportunities, and ethical considerations. *PeerJ Computer Science*, 9, e1252.

4. Legal and Ethical Challenges

4.1. Legal Challenges

Virtual space is basically impossible to imagine without imagining a crime or quasi-crime, and the metaverse is no exception to this rule. In the metaverse field, we witness crimes against people such as murder, violent crime, and rape. In addition to crimes against people, such as fraud, transfer of property, theft, and abduction, there are also crimes against property, such as sexual activity, revelation of secrets, impersonation, and kidnapping, as well as crimes against national security, such as spreading terrorism propaganda, etc. Each of these offences has a specific legal framework that is outlined in the laws of each nation. The cited already exists in the actual world, but can similar rules be applied to crimes committed in the metaverse as well? There isn't a unique regulation. For instance, if someone kills a citizen in the real world, they could face the death penalty or life in jail, depending on the country's laws. What is the punishment for the victim's avatar if the murder occurs in a metaverse setting? The difficulties in law and regulation will expand and change alongside the metaverse's useful applications as technology advances. The metaverse is created to be highly interwoven, seamless, and unanchored in physical location, further complicating an already intricate field of play. Practitioners will need to navigate questions of jurisdiction, territoriality, and conflicts of laws for each of the legal issues covered below; none of these issues have been satisfactorily resolved for the current internet, much less fully developed virtual worlds with an even higher level of interaction and user immersion¹².

➤ Data security and privacy

The most important legal concerns for platform owners will be those related to digital security and privacy. Tech companies, which come under increased regulatory and public scrutiny, are familiar with these issues. But as technology becomes more pervasive in all facets of consumers' life, data in the metaverse will become exponentially more valuable than it already is. Existing rules will be put to the test by this emerging technology, and there will be more pressure on regulators to keep up with it. Furthermore, isolated, different metaverses won't need interoperability standards, but a single metaverse run by several companies will.¹³ Given the vulnerabilities involved in data porting from one application to another, user information will be particularly vulnerable to exploitation. Platform operators will need extensive agreements to regulate data transfers, information security standards, and responsibility for compliance. The emergence of the metaverse may prompt increased scrutiny and action from antitrust authorities. Major technology corporations are already subject to major antitrust scrutiny and growing legislation around the world. Industry standards are necessary for interoperability between platforms, which is commonly regarded as a crucial element of the

¹² Dizaji, A., & Dizaji, A. (2023). METAVERSE AND ITS LEGAL CHALLENGES. *Synesis* (ISSN 1984-6754), 15(1), 138-151.

Wang, Y., Su, Z., Zhang, N., Xing, R., Liu, D., Luan, T. H., & Shen, X. (2022). A survey on metaverse: Fundamentals, security, and privacy. *IEEE Communications Surveys & Tutorials*.

¹³ Chen, Z., Wu, J., Gan, W., & Qi, Z. (2022, December). Metaverse security and privacy: An overview. In *2022 IEEE International Conference on Big Data (Big Data)* (pp. 2950-2959). IEEE.

metaverse. ¹⁴While standard-setting can raise antitrust issues, in general, antitrust law permits enterprises to collaborate on pro-competitive technical certifications, such as standards that enhance interoperability. Cooperation agreements and industry standards run the risk of constraining output and can break antitrust laws if they are not properly tailored to their pro-competitive goal, in addition to issues about a fair standard-setting process. Major technology corporations may face accusations of antitrust violations and greater scrutiny from antitrust enforcers and legislators as they work to develop the metaverse's infrastructure.

➤ **Fintech**

The metaverse will see an increase in legal fintech-related challenges, particularly as more businesses start selling digital goods and services. Cryptocurrencies and other digital assets are currently being used to purchase virtual items, and these sales may eventually be supported by the same blockchain technology that enable the metaverse's fundamental interoperability features. Brands can offer identical products to numerous users (like branded pairs of trainers) or rights or proofs of ownership to specific products, like a one-of-a-kind work of art, to distribute digital "goods" in the metaverse. The latter's buyers may buy such items as investments or for their personal collections, and they may even put them on display in a virtual setting. Through NFTs, the authenticity of the art may be validated on the blockchain in a manner akin to how the value of the cryptocurrency is validated. Legal issues with proper ownership verification, potential infringement, and conversion of genuine and verified purchases will undoubtedly surface. Consumers will face difficulties using cryptocurrencies as payment for digital goods if it is viewed as a financial instrument or security, which appears to be the case in some jurisdictions. As more people acquire digital assets, platform owners will probably have a responsibility to take reasonable precautions to keep those assets safe.

➤ **Intellectual property and trademark**

The metaverse uses real-world brands as well, like McDonald's, Benz, and BMW automobiles and restaurant chains. Does the metaverse universe fall under the purview of intellectual property laws? The following are a few legal issues with Metaverse: The fact is that Mughnavi's ownership in all of its manifestations has the support of the legislators, and this support extends to both the digital and the physical worlds. The Metaverse is also an advanced level of the Internet, and any activities involving or promoting intellectual property must have the consent of the property's owners. Consequently, the metaverse space can be covered by intellectual property regulations. A user who violates this right through his avatar can be prosecuted criminally and legally in accordance with the laws that are in effect in the real world because copyright law grants the owner of the work the right to print, distribute, and display the work, and the owner of the work may transfer this right to others. If a person's intellectual property is violated in the metaverse environment, there is no question that the perpetrators will face legal action. Laws have been established to protect the rights of authors, authors, and inventors.

4.2. Ethical Challenges

One of the key ethical issues around AI in the metaverse is bias. Because biased people create AI algorithms, they can be developed to follow their creators' thought patterns and principles, which can then be multiplied. Hundreds of articles have been written about this topic where artificial intelligence systems, based on bias, might lead to undesired/unlawful discrimination of vulnerable groups. Black people were treated differently than white people in the American justice system, women receiving smaller loans from banks and getting hired less by companies just because of their gender, etc. The metaverse will be full of applications that use artificial intelligence for prediction and classification, and therefore this challenge is also a challenge for the metaverse.

145. Judicial Approach

On 15th Feb 2023, first trial held on the Metaverse at Colombia's Magdalena Administrative court. The lawsuit was a traffic incident that the local transport union brought against the police. In the two-hour hearing, attorneys and parties wore virtual reality headsets to take part in the trial where their actions were mimicked by avatars in the Meta Platforms-owned Horizon Workrooms. Magistrate Maria Quinones Triana's avatar even wore black robes, creating the impression that the proceedings were taking place in a real-life courtroom. Visit the YouTube recording of the live stream to see the entire trial. The prospect of conducting legal procedures in the metaverse has drawn both support and opposition. On the one hand, detractors challenge the validity of the procedure. Despite Magistrate Quinones' repeated affirmation of this type of proceeding's constitutional propriety, 70% of trial watchers disapproved of it. One viewer said, "I feel it takes away from the seriousness," in response to another's reluctance. Is it acceptable if I wish to imagine myself as a dinosaur character? ¹⁵In addition, issues with due process have been raised, much to the worries about using Zoom for trials. The absence of widespread access to the technology required to enable these metaverse legal proceedings is particularly alarming. Juan David Gutierrez, a professor of public policy at the University of Rosario in Colombia, claimed that the "hardware" needed for metaverse legal proceedings is something that very few people possess. And that raises concerns about equality and access to justice. He also criticised judges for using these kinds of technology solutions to try and deal with the issue of an overburdened court system, which may have the reverse impact of what was intended, rather than making things more effective. On the other hand, proponents laud the technology and the advantages it might offer. ¹⁶Magistrate Quinones has been a steadfast supporter of keeping the forum open for legal issues. "An academic experiment to show that... it's possible," she dubbed the events, which she wants to continue in the metaverse. Magistrate Quinones found the metaverse trial to be an amazing experience that "felt more real than a video call... [during which] many people turn off their cameras, [and] you have no idea what they're doing," especially given the recent push to hold trials on zoom and other video conferencing platforms as a result of Covid-19. She argues that by "facilitating and expediting these processes (of executing justice)," "[t]he use of information technology in... judicial proceedings" actually lessens the backlog of open cases. She also emphasised how these metaverse trials will allow participants to share a room without having to physically see one other in some of the more delicate circumstances, like abuse cases. Additionally, "digital justice" could be carried out while sparing participants from potentially difficult travel or schedule problems. Colombia may be the first nation to perform court proceedings in the metaverse, but it is not the first to test the viability of a government there. The world's first Metaverse Embassy was authorised by the Cabinet of the Barbados government on August 12th, 2021. Barbados' choice to establish an embassy in the metaverse does not restrict its operations in the real world; rather, it seeks to lead the development of international diplomacy and improve ties with governments all

¹⁴ Far, S. B., & Rad, A. I. (2022). Applying digital twins in metaverse: User interface, security and privacy challenges. *Journal of Metaverse*, 2(1), 8-15.

¹⁵ Tan, A. (2021). Metaverse Realities: A Journey Through Governance, Legal Complexities, and the Promise of Virtual Worlds. *Legal Complexities, and the Promise of Virtual Worlds (December 9, 2021)*.

¹⁶ Allouzi, A., & Alomari, K. (2023). Adequate legal rules in settling metaverse disputes: Hybrid legal framework for metaverse dispute resolution (HLFMDR). *International Journal of Data and Network Science*, 7(4), 16271642.

around the world. Barbados managed to move through with their rebranding as a "world hub for digital transformation and technology innovation" despite Covid's disruption of diplomatic channels. Given the high level of technological development in the countries Barbados seeks to establish partnerships with, a digital strategy is essential to their communications. Barbados will use the platform as a place to collaborate with their long-standing allies, forge new alliances, and "deepen engagement in the diplomatic arena; the investment, business, tourism, and cultural sectors; and people-to-people interaction." Additionally, Barbados wants to help other countries launch their own embassies and engage in "meta-diplomacy." The country of Tuvalu is investing even more in the metaverse; it intends to build a digital replica of itself there to prepare for a "worst case scenario" due to climate change and increasing sea levels. According to government officials, Tuvalu's "digital twin" would enable the country to continue to exist as a sovereign state even if it were to become submerged and have its citizens dispersed all across the globe. A nation living only in the metaverse raises several problems, among them: Is it possible? Will the country have true sovereignty? Is it an effort to spread the word about climate change? Are these indeed the world's problems' solutions? It is clear that as the metaverse expands, nations are using it to further their possibilities and reach. The metaverse provides governments a burgeoning option to study and expand, whether it be to provide an alternate arena for legal procedures, advance diplomatic relations, or provide a getaway from the harsh realities of climate change that may result in the breakup of a nation.

6. Conclusion and Suggestion

¹⁷In conclusion, the idea of the metaverse has drawn a lot of interest recently and has ramifications for many other fields and facets of society. This study examined the history, foundational technologies, prospective advantages, and difficulties related to the metaverse. It is clear that the metaverse has the power to fundamentally alter the ways in which we live, work, play, and learn online.

¹⁸The following ideas for additional study and advancement in the metaverse:

1. Ethical Considerations: Look at the metaverse's ethical ramifications, including privacy issues, digital identity, and digital addiction.
2. Security and Safety: Investigate methods to improve metaverse security, addressing challenges like cyberattacks and the potential for harm in the real world.
3. Investigate methods to make the metaverse inclusive and accessible.

¹⁷ Mystakidis, S. (2022). Metaverse. *Encyclopedia*, 2(1), 486-497.

¹⁸ Wu, T. C., & Ho, C. T. B. (2023). A scoping review of metaverse in emergency medicine. *Australasian emergency care*, 26(1), 75-83.