CHAPTER 4

Metaverse Reality vs Natural Reality. The Impact of the Type of Reality on Legal Concepts

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1 The Concept of the Metaverse/the Metaverses

The formation of the word "metaverse" derives from the Greek root, "*meta*", which has a dual meaning: (i) "after, what is beyond the physical reality" (like in Aristotle's *Metaphysics*) or (ii) "that [which] is changed". The presence of humans in the metaverse manifests through the use of avatars. The term *avatar,* in its original sense, derives from Hinduism, where it means "a manifestation of a deity or released soul in bodily form on earth; an incarnate divine teacher." In Hinduism, an avatar is not just a mere appearance, an illusion; it is real[1].

At the time of its first use, in the 1992 novel of Neal Stephenson *Snow Crash,* the word *metaverse* was just merely invented to designate a non-physical reality in the imagination-space of a book. There was however an anchor of such imagination in reality, as in 1992, we were already in the age of worldwide use of online gaming dominated by the products of companies like Nintendo and Sega. *Avatars* as a functionality in online gaming existed even before, since the early 1970s, on a number of multiplayer games developed on the PLATO platform of the University of Illinois, to culminate with the 1979 game named *Avatar*. Looking at the later variety of sci-fi references when referring to metaverse, such as Stephen Spielberg's *Ready Player One*, there is no wonder that most of the associations new-comers in the field make when thinking about the metaverse is simply concerning the massively multiplayer online games (MMO).

The use of the word "metaverse" has however evolved to much more than sci-fi literature and then gaming, it evolved into a virtual world with all the complexities that such a world entails, one not only consisting of coordinates of the physical reality for human interaction (either in a playful or in a serious manner), but also the development of digital assets, digital curren-

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cies, and ultimately a specific economic ecosystem. Such metaverses are now in place, such as *Decentraland*[2] and *Metaworld*[3] for example. Even if some of the metaverses are still defining themselves as games – for example *Sandbox*[4] or *Roblox*[5], when looking at the actual functionality of the ecosystems, a much more complex economic relationship than just a game transpires.

There are therefore two different types of platforms that use the metaverse and virtual reality-based game-like realities, one being for enjoyment or even opportunities for people to meet. The other is leveraging blockchain technology to create a crypto-economy in virtual reality. This being said, and looking at the metaverse through the lens of economic value, metaverse platforms can include several layers or components that contribute to the overall value-chain, classified in the literature as follows[6]:

- *Infrastructure*, referring to the value deriving from the foundational technologies and hardware that support the metaverse, including 5G, 6G, WiFi, cloud, data centers, central processing units (CPUs), and graphics processing units (GPUs).
- *Human interface*, referring to the value deriving from user interface and interaction with the metaverse, involving devices like mobile phones, smartwatches, smart glasses, wearable devices, head-mounted displays, as well as interaction methods such as gestures, voice commands, and electrode bundles.
- *Decentralization*, referring to the value deriving from decentralized technologies such as edge computing, Artificial Intelligence (AI) agents, blockchain, and microservices, which contribute to a more distributed and autonomous system.
- *Spatial computing*, referring to the value deriving from technologies that enable spatial representation and interaction within the metaverse, such as 3D engines, virtual reality (VR), augmented reality (AR), mixed reality (MR), an overall extended reality (XR)[7], geospatial mapping, and multitasking.
- *Creator economy*, referring to the value deriving from content creation and commerce within the metaverse, including design tools, asset markets, e-commerce platforms, and workflow management.
- *Discovery*, referring to the value deriving from elements and processes that facilitate users to find, explore and engage with content, services and other users, such as advertising networks, virtual stores, social curation, user ratings, avatars, and chatbots.

- *Experience*, referring to the value deriving from activities and encounters that contribute to the overall enjoyment and utility of the metaverse, such as through games, social interactions, e-sports, virtual shopping, festivals, events, learning environments, and work spaces.

The modern use of the metaverse, as ingrained in the general language after being used for no less than 21 times in Mark Zuckenberg's speech at Connect 21[8], no longer refers to multiple versions of such virtual worlds (metaverses) but to a unitary concept (The Metaverse) interconnecting virtual reality applications and relationships.

For the purpose of this chapter, we shall refer to the metaverse in the sense of a virtual world with full complexity. It thus encompasses a general concept that includes a diverse array of realities that can be built and populated across different instances of the virtual space, often referred to as 'metaverses'.

2 The Technologies Used to Create the Metaverse

The technologies that are building the fabric of the new reality in the metaverse are complex. The reflex of the gaming-originating perception on the metaverse looks only at the immersive technologies (XR). However, for the development of a complex metaverse, in the way that also includes an economic ecosystem, there are other relevant technologies to be also considered, of which the most important are: blockchain, smart contracts, automated behavior and artificial intelligence (AI).

2.1 The Immersive Technologies

In simple terms, *"All immersive technologies (XR) extend the reality we experience by either blending the virtual and "real" worlds or by creating a fully immersive experience*."[9] We can include in the immersive technologies all extended reality (XR), including virtual reality (VR), augmented reality (AR) and mixed reality (MR).

Virtual reality refers to the simulated 3D environment, an artificial world, in which the users are fully immersed in a 360 degree perspective, allow-

ing a multi-sensorial experience, with the help of VR headsets – helmets or goggles.

Augmented reality refers to the technology that allows users in the natural world to maintain contact with it, while still being able to experience certain virtual information and/or objects overlaid on it. To access such an experience, devices such as AR glasses, tablets, smartphones or other screens may be needed. One example in this respect is the Pokémon GO game, where virtual creatures were visualized on the streets if smartphones were used as an interface for the actual streets on which the users were walking[10].

Mixed Reality (MR) is a version of augmented reality blended with virtual reality, in the sense that it no longer relies on the need of a screen. For instance, mobile AR, where we use AR filters for Instagram or we see shows with the presence of holographic performers[11].

Such immersion creates a very strong sense of reality: "*The more deeply users can immerse themselves in a VR environment -- and block out their physical surroundings – the more they are able to suspend their belief and accept it as real, even if it is fantastical in nature*"[12].

2.2 Blockchain Technology, Smart Contracts and Automated Behavior

A blockchain can be defined as "*an electronic ledger (record/archive) for recording transactions and tracking assets in a business ecosystem, with the following characteristics, (i) it is encrypted (ii) it is immutable or unchangeable, (iii) the data is stored in the form of blocks connected to each other in a decentralized manner, and distributed through a network of computers, each called a node, where operations are performed on a peer-to-peer basis, validated through a consensus without the involvement of a central authority, and (iv) which may or may not require authorization from a network administrator, central authority or consortium*."[13]

Based on blockchain technology, significant economic and legal developments became possible, such as:

- smart contracts, defined in general as *'programs stored on a blockchain that run when predetermined conditions are met. They typically are used to automate the execution of an agreement so that all participants can be immediately certain of the outcome, without any intermediary's involvement or time loss. They can also automate a workflow, triggering the next action when conditions are met.*"[14] Through smart contracts, the automation of the execution of the contracts in the legal meaning of the word became possible.
- digital assets in the form of non-fungible tokens (NFT), defined as *"a unique digital identifier that cannot be copied, substituted, or subdivided, that is recorded in a blockchain, and that is used to certify authenticity and ownership (as of a specific digital asset and specific rights relating to it)*."[15]
- cryptocurrencies, such as Bitcoin, Ethereum, Tether, etc., independent of a central state authority.

Some authors went on to name blockchain technology *"the soul of the metaverse"*, as it allows the smooth economic operation of metaverse; *"blockchain also enables the metaverse to be a public platform with a decentralized open-source ecosystem that allows users to design applications and conduct digital commerce*."[16]

The blockchain enabled a number of technologies in the metaverse, allowing the development of the business ecosystem of the crypto-economy in the metaverse:

- verification of the quality of the data and data sharing; safe communication of data and interoperability between the various platforms; construction of zero-knowledge proof on the blockchain, that permits the verification of the reality of certain data or operations with data without disclosing the content of such data;
- ownership and control over access to the users' data;
- ownership and control over access to digital assets;
- creation, ownership and transactions with cryptocurrency, that allows transactions with the digital assets in the metaverse.

2.3 Artificial Intelligence

Authors noted the key role of AI in the Metaverse: *"By merging AI with other technologies, such as AR/VR, blockchain, and networking, the metaverse can create secure, scalable, and realistic virtual worlds on a reliable and always-on*

platform.[...] AI *is a pivotal technology working behind the scenes to build a creative and beautiful world, thus bringing a seamless virtual-reality experience to users. [...]*AI *has a silent but important role in the foundation and development of the metaverse."*

AI is fundamental for the Metaverse in a number of functions:

- in building a realistic perception, by transferring data from the real world to the metaverse, through the imaging system for visual perception and multi-sensor perception;
- in the computation of the data, using the specific computation techniques;
- in the reconstruction of the virtual world from the real world, as realistically as possible, through the various reconstruction techniques in which the digital twin is the most important one, based on deep learning;
- in enabling the remote cooperation between users in the metaverse, including facilitating communication methods for sharing information, employing blockchain for decentralized data storage, and implementing cybersecurity measures to ensure the security of these interactions;
- in promoting interaction between the users and the virtual world of the metaverse, through technologies that allow AI for brain-computer interface (BCI)[17] and AI for human-computer interaction (HCI).[18]

3 The Metaverse Reality vs the Natural Reality. The Impact on the Legal Concepts

In defining what a metaverse reality is, we can use as a starting point the excellent summary made by Richard Bartle in the attempt to define the virtual worlds (as opposed to a simple virtual reality or a gaming-only virtual reality): *"Although more abstract versions can, and do, exist, most virtual worlds adhere to certain conventions that distinguish them from related non-real spaces. The most important of these are:*

- *The world has underlying, automated rules that enable players to effect changes to it (although not to the rules that grant them this ability). This is the world's physics.*

- *Players represent individuals "in" the world. They may wield partial or total influence over an army, crew or party, but there is only one game entity that represents them in the world and with which they strongly identify. This is their character. All interaction with the world and other players is channeled through characters.*
- *Interaction with the world takes place in real time. When you do something in the world, you can expect feedback almost immediately.*
- *The world is shared.*
- *The world is (at least to some degree) persistent.*

A chat room would not be a virtual world because it has no physics; a strategic wargame doesn't map the player onto a single character through which that player acts; a play-by-email game doesn't run in real time; a single-player game is not shared; a first-person shooter isn't persistent."[19]

Developing further to this starting point towards a more legal perspective, we shall propose the following parameters of the metaverse-reality:

- the existence of a creator of the metaverse reality;
- the creation of a virtual space, with the help of specific technologies;
- the creation of a specific measurement of time in the virtual space, correlated with the real time;
- the creation of specific forms for the presence of humans in this virtual space, in the form of Avatars;
- the agreement between the creators of such a virtual reality and the users of it, as far as the rules to be applied regarding the relationships in relation to the metaverse.

There are a number of parameters of the natural reality that are the premise of the development of the rules of law, and they may fall into 3 main categories: (i) the philosophical view of the world, (ii) the relevant coordinates of defining the physical reality and (iii) the distinction between the laws of nature and legal norms. Each of these have their own specificity when it comes to metaverse reality and, as we shall further show, this is challenging the current premises of the legal notions we are currently operating in, as well as our mind frame as to the relationship between the various limitations we have and our responsibility for the actions we chose to take.

3.1 The Philosophical View of the World

Except for policy makers, we rarely think about the practical, direct impact our philosophy has when embedded in the law, as a premise for the rules governing human relations. However, our views on fundamental questions such as what we consider this world to be, is there a creator of this world, what is the role of man in the world and what is his relationship with the environment, are the foundation of our thinking when designing not only statutory but also contractual rules, dispute resolution methods or when we are simply deciding what our behavior would be when confronted with an unexpected event in which we need to shape an individual, unregulated behavior.

These are all issues that we must think again about when looking at the metaverse world, as it may be that the (context of the) answers are not necessarily the same. In our view, the best way to understand the relationship between the natural world and the metaverse world is through the model of the layered universe, as in the Greek mythology[20].

What We Consider This World to Be

Without entering into the vast diversity of the philosophical or theological definitions of what a world is, there is one obvious criterion of distinction between the natural world and the metaverse that the majority would agree on: whether it is a serious place or just a game.

We are inclined to consider the natural world as a serious one, with serious relationships and with humans entering into game-based relationships only by exception, in confined limits. Even those that take the view that the natural world is nothing but a cosmic game, or that it would be a dream or a simulated reality, cannot escape the seriousness when talking about the actual life in the natural world. There is no "just a cosmic-game" defense for a serious crime committed in the natural reality.

The metaverse, however, originates in the game industry, and most of the metaverses were developed under this assumption. Most of the users of the metaverse are still looking at it as just a playground. The development towards its perception as an alternative reality in which relationships between humans are to be taken seriously takes much awareness and it is

not entirely shared by the users of the metaverse. That raises a very serious dilemma as to the potential "just a game" defense in the event of violations in the metaverse of natural world legal norms.

We also consider in a vast majority of philosophical currents and religious beliefs that the natural word has a certain stability, though it is not necessarily eternal and may end at some distant moment in future (see for instance the concept of end-of-the-world). However, a metaverse world is not perceived as stable, we all agree and are aware that a specific metaverse may at some point cease to exist, either definitively or perhaps only temporarily, to be restarted after a certain time.

Whether There Is a Creator of the World

We will not present here the vast number of divisive views on the concept of a creator of the natural world between the various philosophical and religious perspectives, from the complete and absolute faith in the existence of divinity as creator of the world to the concept of a self-emerging universe.

But we will simply note that the issues of the creator of the world are not such a distant issue to law as one might have the impression in the modern era. Apart of the individual inner belief of each person, the choice to express the view on the creation of the world can be seen transpiring in various legal contexts, ranging from constitutional provisions, or the persistency of religious texts as a source of law, or religious ceremonies for public positions in the state in some countries, to sworn testimony of witnesses in other courts in the world, to contracts notarized under the heading "in the name of God" in completely secularized states, to end with the mere use in contracts of the expression of "Acts of God" as the equivalent to force majeure.

However, while in the natural world the references to acts of God may be one way to avoid responsibility of a person for a certain act, and the existence of a creator of the natural reality remains a matter of faith or choice of philosophy, in the metaverse world, the existence of a creator is a certainty, and such a creator is a person who programmed the metaverse reality.

A human creator lies at the basis of the different parameters of the environment in the metaverse, and this is begging the question whether the same creator is the one to be ultimately responsible for the flaws of such a reality or perhaps a waiver of liability will become the norm, in the attempt to allow the free flow of creativity.

What is The Position and Role of Man in Relationship with Nature

One other important philosophical and religious distinction regards the relationship between man and nature. One can see nature as a responsibility entrusted to man, as opposed to nature being subject to man's discretion, or perhaps alternatively, as man being completely interconnected with nature, and being an integral part of it. Nature and its elements may also be seen differently, either objectified, or personified, or even of a divine nature.

These philosophical approaches have a direct impact on the development of numerous legal concepts, starting with human rights and continuing to environmental law, animal protection, etc. For example, recently, the approach of natural elements as deities allowed the development of an emerging trend in the legal practice, having elements of nature (rivers, forests) treated as persons with legal standing, allowing lawsuits to be filed on their behalf.

In the metaverse world, man may have a number of completely different roles – it can be the creator of the metaverse, a co-creator, that is a person who is allowed the possibility to create in the metaverse, under certain limits, an inhabitant (in the form of an avatar with full decisional liberty), an actor (in the form of an avatar with a predetermined role) or also a mere observer. All such roles entail different types of relationships, different obligations, different risks and different liabilities. A creator is responsible for how the environment s/he created impacts the people inhabiting that environment, under the contractual terms of access, but also under tort provisions. Flaws of creation may be attributed to the creator; in other words, it is no longer impossible to allocate responsibility to a specific person. A destructive phenomenon in the metaverse, like a tsunami in the natural reality would be, is no longer an act of God, but an act of a human being – the programmer or the designer of the metaverse, and one hence

can think about liability of the metaverse tsunami-maker. A person acting as a mere observer of some events in the natural world may sometimes be held responsible for the inaction, for example in not acting to save a person in certain circumstances, while in the metaverse the observer may be in a physical incapacity to act, according to the programming of the metaverse.

We need to be very clear on how these should be reflected in the legal concepts to be developed for such a multi-role reality, especially given that the primary regulatory framework of the metaverse is contractual.

3.2 The Relevant Coordinates of Defining the Reality

The main relevant coordinates of the natural reality of relevance to the law are space, time and people. That is why we look at the application of law itself from the perspective of its application in space, in time and to people.

Space

From a legal perspective, we see space as relevant in major legal notions such as the notion of territory or real estate property or location of a certain event, etc.

From the natural reality perspective, the major premise of space in the natural world is that it is confined to certain limits that would not change by the will of a person. Earth itself has a limited surface, and we cannot expand it, though we may possibly develop outer space or use more of the surface of the Earth (like deep-sea mining does nowadays). But the very idea of building new land is physically impossible.

In the metaverse, however, it is not. Virtual spaces may be extended, based on the decisions of the owners of the metaverse and the rules that the metaverse reality was built upon, like it was anticipated in fiction literature (In *Harry Potter and the Order of the Phoenix*, we can see that no.12, Grimmauld Place is "hidden" between two normal muggle houses. When you want to get in, the headquarters of the Order of Phoenix gradually appears, stretching out from between the surrounding houses.[21]).

Such a concept of potentially infinite space that we encounter in the metaverse context creates an economic problem, as economic value is also related to scarcity, so the need to address the concept of limited or unlimited space appears to be essential. It also creates, through its indirect impact, a very serious impact on the legal relationships, in which the parties' agreement is founded on the premise that there is a certain value allocated to the assets and its existence is part of the formation of the consent of the parties.

Moreover, as opposed to natural reality, in which the geographical elements of the location of a territory do not change except in rare, cataclysmic events, that fall out of the will of humans, the territoriality in the metaverse is conventional, a specific territorial location may be shifted to another, or its characteristics altered just by changes in the software made by the programmers having access to the platform of the metaverse.

Time

Time is to be found in the foundation of the law in numerous concepts, such as deadline, duration of contractual agreements, limitation period, etc.

In natural reality, we operate on a number of assumptions, based on the current understanding of time in the scientific community, but also on the way the perception of time is included in the fabric of societal perception and reflexes. On one hand, there is a scientific element in the approach of time, reflected in the concept of the linearity of time and the unidirectional flow of it from past to present to future, in which causality between events can only take place from past to present to future. On the other hand, there is also a social contract element in the perception of time, reflected for instance in the measurement of time, in the way we divide it in years/months/days/hours/minutes/seconds. The scientific approach is also in a way conventional, as it is based on the current knowledge of nature, through the eyes of physics. However, quantum physics presents many potential developments that could significantly alter this perspective particularly by challenging the connections between causality and the unidirectional flow of time.

Each of these assumptions are potentially different in the metaverse reality. We may build a different flow of the "metaverse time", in which events behave in another order, moving from a future backwards in time. We see

this possible already in the rewind function of a video player for instance, or in the imagination of fiction authors (one example being the famous Benjamin Button character who was born old so as to live his life getting younger and younger until he died as a baby[22], but there is a vast fiction literature on time travel). Software makes possible the unfolding of events taking place in a different flow of the "metaverse time", or a different agreement as to the units of time for measurement. Conversely, we may build a metaverse time measurement, where users have events happening in completely different time units, or at completely different speeds than in the natural reality.

Also, the placement of the events in a certain linear unidirectional flow of time is the premise of law enforcement, where the whole concept of compensation for damages is based on the premise that one cannot reverse time. However, if one is to enforce decisions in a metaverse with a different flow of metaverse time, this becomes possible, as what would be modified would be the metaverse reality and not the natural reality.

The blockchain permits metaverses based on this technology to apply a natural world time stamp on the events in the metaverse, so that there is a certain "translation" of the metaverse time into natural reality time. However, the legal concepts related to time have to be anchored clearly in one or the other of the realities.

Persons

People are seen from the perspective of the law as the only relevant persons in the modern law (though in the history of law there are situations in which animals were also on trial, or, as mentioned, nature elements or deities).

In the metaverse world, we can face a diversity of characters to potentially be considered persons:

- humans represented in the form of human avatars with behavioral freedom. Moreover, using different avatars in different metaverses, a person may have different identities, or be anonymous, or take the shape of a different object than that of a human. We can move between the different metaverse worlds with different identities. Moreover, an avatar may reflect a person, but also a group of persons, jointly deciding on the behavior of the avatar.

- humans represented in the form of human avatars but with a limited freedom. Smart contracts are enabling users to automate a certain future behavior, predetermining it based on the specific instructions. This creates the possibility even for the human avatars in the metaverse to have a certain pre-programmed behavior, diminishing the range of freedom of choice that a human would normally enjoy in the physical reality. A prescribed behavior in the physical reality would only be a legal obligation or a contractual commitment, from which parties may deviate in their actual behavior, bearing the consequences of liability. However, in the metaverse, one can embed certain instructions in the behavior of the avatar, that limits the manifestation of the total freedom of the behavior of the human who uses the avatar in the metaverse, and hence the embedded automated behavior of the avatar becomes a mandatory manifestation of the avatar, depriving the humans from the possibility – and hence danger – to commit a violation of such prescribed behavior. For instance, an avatar could never be able to take the possession of a digital asset of another avatar, if such behavior of respect of property rights is automated. In other cases, such embedded automated behavior could have no specific moral or legal connotation, but simply be an automated functionality, needed to ensure the specific frameworks of the interactions in a metaverse designed with specific parameters.
- humans presented in the form of non-human avatars, taking various other appearances (animals, objects, etc.) that may or may not lead to the conclusion that the form is controlled by a human being.
- automated human-like creatures: the Non-Playable Characters (NPC) known in the gaming industry as programmed entities interacting with the human avatars develop a new dimension in the metaverse, in which generative AI can autonomously generate new content (text, images, audio, and video) with the full appearance of a person. The NPCs are part of the new virtual reality and have significant autonomy, when based on AI[23], developing emotion recognition, emotional intelligence and a dynamic decision-making process. In such a situation, distinction between the behavior of human avatars and the NPCs will become less obvious, adding an additional layer of complexity to the metaverse (virtual) reality.

In this context, major legal concepts of a natural/legal person and/or that of identity are in discussion. The interactions in the metaverse reality with all these types of entities is potentially generating confusions, leading to discussions on the need for disclosure of non-humanity (or of type of humanity) etc.

Anonymity and simulation are already notions that will need to be properly adapted to the new reality, as the function of the avatar may also be that of an interface that can ensure the anonymity of the person using that avatar. This may have a legitimate but also an illegitimate purpose. Also, due to the fact that avatars allow their users to separate between their real-life identity and their online personas, under the protection of anonymity, the avatar users may be more prone to antisocial or even criminal acts without the awareness that they could face legal consequences for their behavior. Such illegal behavior can escalate to identity deception or even theft, which is particularly dangerous in the context of dispute resolution, in which it Could, for instance, undermine due process, as identify is a fundamental aspect of this concept.

Also, identity of the parties, but also of arbitrators, experts or of various other participants (arbitral tribunal secretaries, interpreters etc.), is supposed to be known for a number of reasons: in order to ensure the communication of all the procedural documents, as well as of the award; for reasons related to the regime of economic sanctions or in some situations anti money-laundering legislation; for verifying requirements of independence and impartiality; for ensuring the analysis on the eventual enforcement of the award, one element that under some arbitration rules may be of relevance also to the decision of the tribunals.

In view of these concerns, it is likely to be expected that dispute resolution platforms would try to protect themselves from such users' behavior, in the attempt to avoid potential liability of their own and hence implement technical tools allowing them to ensure a personal identity verification and a transparency of roles procedure (human creator/avatar/observant/or non-human etc.).

3.3 The Laws of Nature and the Legal Norms

The laws of nature are a silent premise in law-making, but a very important one[24]. We define the limits of the regulatory space by taking what is a possible human behavior from the perspective of the natural laws. We do not regulate unnecessarily. For instance, we do have laws on the interdiction for a pedestrian to cross a highway, but we have no law saying that it is forbidden for the same person to fly over it, as gravity makes that impossible. Moreover, biological reality is also a premise that we take into consideration, when for instance we have laws about the right to sell the internal organs of a person, but we do not have the same for external organs, as bodies are not by their nature in this way.

Also, during their existence, metaverses may change their laws of physics, a feature that the natural reality does not enjoy. For instance, if in a metaverse the avatars could not fly, due to the design of a reality based on gravity, at a later moment in time such design may change, and gravity being removed as an effect for avatars, who then could experience flying, These changes of the parameters of the functionality of the reality in the metaverse is challenging the very premise of reality, as we are used to defining it, that is an environment with continuous non-changeable laws of physics.

Legal concepts such as predictability, foreseeability, force majeure as well as contractual allocation of natural risks, insurance-reinsurance, certain types of bets, contracts etc., have as a starting point a certain stability of the natural reality, with a limited margin of incertitude. Nature with its behavior independent of humans is more profoundly incorporated in our premises of law than we normally perceive. Once that nature is no longer independent of humans but directly created by humans, legal concepts need to be redefined.

Legal relationships in the metaverse cannot incorporate by reflex the premise of a stable reality from the point of view of the natural laws and hence we will need to carefully assess all legal concepts, testing their resilience when confronted with a reality whose laws of physics are no longer stable.

4 Conclusion

Classic legal concepts are profoundly challenged by the development of the metaverse. The very parameters of natural reality are changed around the metaverse. The line between reality and imagination, as a fixed premise of the definition of the classic concepts of physicality is no longer as simple. As opposed to the natural world where there is a clear distinction between the natural laws and the behavioral rules prescribed by statutory provisions, the fabric of the metaverse reality may include not only different natural laws, but also include part of the statutory laws into the natural laws of a specific metaverse, resulting in a mixture of freedom of the metaverse builders and users in shaping both behavioral and natural rules.

Roles of humans in the metaverse reality are complex, ranging from creator to avatar to observer, and the difficulty of conceptualization of such roles is multiplied by the presence of non–playable characters, some of them AI-based, with human appearance.

We need to adapt our thinking to the new complex reality and then either adapt the old legal concepts to this reality, or build new concepts.

The simple premise we need to start from, in this adaptation, is that we no longer have only one world, with a simple natural reality. Instead we have a structure where the natural reality operates under certain laws of physics, but we also have a multitude of other sub-realities, derived from the natural one, but governed by different laws of physics. This is challenging the very distinction between the laws of physics and legal laws, with a plethora of implications in both the statutory as well as contract law levels.

Since humans are to be found both as creators of such metaverse realities, but also as inhabitants of them, or even co-creators and inhabitants at the same time, responsibility is no longer to be avoided for the way in which the laws of physics inside the metaverse are concerned.

We simply need to become multi-dimensional in our thinking, aware of the parameters of the reality that we are in, in specific situations, and assume the responsibility of multiple roles in our lives, more than ever before.

Notes

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