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Course of Data Protection Law

Walk on the Metaverse Side:

Data Protection in the Virtual Worlds

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Introduction

Since Mark Zuckerberg, founder of Facebook, announced the new business name (today Meta) and his pledge to create the Metaverse in October 2021, a primarily specialized subject has gained public attention. It might be argued that the Metaverse, an immersive virtual environment where people gather to socialize, play games, and work, is not particularly novel. Virtual worlds that are social and immersive have existed for at least 20 years, thanks to the video game and film industries. Numerous technological businesses, from major giants like Microsoft and Google to smaller organizations like Emblematic, have chosen to invest their resources in creating technologies, even though the Metaverse may look like a science fiction invention or something away from real-world applications. Simultaneously, as public interest in immersive technologies and their many applications rises, they are beginning to take center stage in discussions and debates about innovation. It is understandable that approaching such a revolutionary and genuinely forward-looking technology while still looking for solutions to the huge challenges the Internet raises can cause a little concern. The debates around the Metaverse today spark a variety of issues and new concerns for society, which when resolved will lead to what we refer to as "responsible development".

Presence and Persistence are crucial elements when it comes to the Metaverse, but both elements require meticulous large-scale data collection: potentially tracking physical data, locations, gestures, biometric data, and more. This new wave of information will likely allow developers and advertisers to personalize a user's Metaverse experience. Adhering to the Metaverse will likely mean entrusting the security and digital well-being of users to these companies without a strong understanding of the potential profiling of user behavior. Many commentators are concerned about the collection of new and even richer data sets combined in the Metaverse. There is a possibility that some of this data will be classified as a special category or sensitive data, requiring additional safeguards under data protection laws.

In this context, the following thesis proposes:

The first chapter will outline the phenomenon of the Metaverse and point out that there is not just one platform, but multiple. Access to the Metaverse varies from platform to platform: the user can enter the Metaverse with just a computer or smartphone, while other platforms require augmented reality glasses.

Data protection issues will be discussed in the second. A major concern related to the Metaverse is the amount of personal data that will be collected and processed. As users navigate virtual environments and interact with other users, data will be generated, including users' behavior, preferences, and personal information. This data

can be incredibly valuable to companies trying to improve their products and services, but it can also be used to get a cast of the user. Another issue is how to classify, for example, biometric data, inferred data, and neurological data when using VR headsets. The result will be a much deeper level of user profiling.

The third chapter will answer to the research question i.e., is the purpose of using this data explained in a way that justifies the potential profiling, not only of movements but also of personal and sensitive data? To verify this, what better way is there than to enter the Metaverse? What is proposed is a documentation of the experience in the platform, and the study of data protection, as a walkthrough (terminology used for video games that serve as a step-by-step guide for the player). The platforms chosen are Decentraland and Horizon Worlds. It is pointed out that the fattening in the Metaverse is not restricted solely, to as many may think of VR headset use, but also solely with access through the computer.

Through qualitative, empirical methodology, we will try to explore some points such as: if there is a crisis relating to the Metaverse, why privacy by design is important in this matter, and opportunities and risks related to it.

Chapter 1

Welcome to the Metaverse!

1.1 What is the Metaverse?

Given that the nature of the Metaverse is unknown, it is difficult to describe a project that is currently little more than an idea. Instead, one can only make a number of predictions and interpretations for a tool that, if it is successful, will affect people more profoundly than the combined effects of the use of mobile devices and the expansion of Internet connectivity[1].

There is no clear definition of the concept known as the "Metaverse," which has been the subject of much discussion in recent years. Its explanation is even more challenging. Metaverse is a compound word of the Greek word Meta, which means beyond, and the word universe, by putting them together means "universe beyond the physical world"[2].

If the experience of using the Internet today is two-dimensional, the Metaverse offers a three-dimensional alternative, allowing users to "walk" through the two intertwined worlds using glasses or headphones that are connected to a computer, enabling them to create or take part in any desired universe in the virtual world. In reality, the term "Metaverse" refers less to a specific technology than to the evolving relationship we have with it that allows the virtual and physical worlds to coexist[3].

The Fourth Industrial Revolution[4], which is understood as the organic complex of numerous and unabated advances in human knowledge in the fields of artificial intelligence and the Internet of Things, robotics and blockchain, quantum computing and new computational technologies, is also at its highest point of manifestation in the Metaverse[5].

1.2 What are the properties of the Metaverse?

The ability of the Metaverse, which is still in its early stages, to respond to real consumer needs by creating new markets and products (industrial, health, educational Metaverse, etc.) and the technological infrastructure

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[1] Maggi, L., Cavalloni, A., Flora, M., Giordano, M. T., Ricci, S., Vertua, V., & Vaciago, G. (2022). *Metaverso: La Guida Pratica: Manuale di sopravvivenza giuridica al Web3* (Vol. 2). 42 Law Firm (Pag. 10-12)

[2] Mystakidis S. Metaverse. *Encyclopedia*. 2022; 2(1):486-497.

[3] Ibidem note 1.

[4] The Fourth Industrial Revolution, Milan, 2016, by SCHWAB, founder and executive chairman of the World Economic Forum, uses the phrase "fourth industrial revolution" to refer to a technological revolution that "erases the boundaries between the physical, the digital, and the biological."

[5] Cassano, G., Scorza, G., & Mazzetti, A. (2023). *Diritti degli utenti – piattaforme digitali – privacy – diritto d'autore – profili penali – blockchain e NFT*. Pacini Giuridica. (Pag. 383)

(quantum computing; ultrawide bandwidth, etc.) that will have to support scalable volumes of Internet traffic at affordable costs will determine the Metaverse's success.

Furthermore, the Metaverse should not be confused with virtual reality as it is currently understood. In fact, in the latter, users interact with each other only within a specific environment, such as a video game, if they are using the same tool, such as a 3D viewer or another.

As a result, these restrictions make it difficult to communicate with users who are using different virtual environments or tools. On the other hand, the Metaverse is a vast, open-ended digital community where, in the words of Mark Zuckerberg, "people in the guise of 'avatars'-work, play, and develop interpersonal relationships while meeting according to the normal dynamics of everyday life"[6].

<u>Because of this, it is important to understand the Metaverse's development and characteristics before explaining its properties on a technical level in order to better comprehend how complex it is.</u>

The Metaverse is an advancement in social technologies that enable avatars, or digital representations of people, to interact in different environments. The Metaverse provides a space for endless interconnected virtual communities to use smartphone apps, augmented reality (AR) glasses, virtual reality (VR) headsets, or other devices, whether at work, attending concerts or sporting events, or even trying on clothes.

The Metaverse's purpose is to create a shared online environment in which users, represented by digital avatars, can communicate and collaborate as effectively as they would in the real world[7].

Three significant steps led to the development of the Metaverse:
- digital twins (relate to digital representations or replicas of objects, systems, or procedures)
- digital natives (refer to those who were exposed to digital technologies at a young age and have lived through the digital age.)
- coexistence of real life and virtual reality, or "surreality."

The virtual and digital twins are connected via their data, and the digital twins reflect the characteristics of their physical counterparts.

Key enabling technologies, such as blockchains, computer vision, distributed networks, etc., as well as the re-embedding in the new avatar ecosystem, along with content creation, data interoperability, social acceptance, security, privacy, and trustworthiness, enable the connection between the physical world and the Metaverse through digital twins.

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[6] Cassano, G., Scorza, G., & Mazzetti, A. (2023). Diritti degli utenti – piattaforme digitali – privacy – diritto d'autore – profili penali – blockchain e NFT. Pacini Giuridica. (Pag. 39)

[7] Cassano, G., Scorza, G., & Mazzetti, A. (2023). Diritti degli utenti – piattaforme digitali – privacy – diritto d'autore – profili penali – blockchain e NFT. Pacini Giuridica. (Pag. 40)

Artificial intelligence, interactive technology, cloud and edge computing (potentially quantum computing), 5G and 6G, and the Internet of Things are just a few of the new technologies that the Metaverse incorporates. In line with the "democratic" architecture of blockchain, which lacks a higher hierarchical entity, the Metaverse also relies on decentralization based on technologies like distributed computing and distributed storage[8].

Regarding its characteristics, it should be pointed out that:

The main component of the Metaverse is the "Extended Reality" collection of three technologies, or rather, three interactive and immersive experience tools, encompassing virtual reality, augmented reality, and mixed reality.

The view of the physical world is replaced by a scene created digitally in virtual reality, which can be a replica of the real world or a location in an entirely fictitious universe.

Wearable devices like visors, headsets, gloves, and cybersuits are used in conjunction with software that is downloaded to computers or smartphones to create an immersive experience in the virtual world.

On the other hand, augmented reality enables the addition or removal of elements from the real-world view; for instance, it enables the placement of furniture selected from a digital catalog on an image of a real space.

Finally, Mixed Reality combines Virtual and Augmented Reality by allowing the real and virtual worlds to merge, resulting in new environments where people, physical and digital objects coexist and interact in real time[9].

So far, the development and its characteristics have been described, but what are its priorities?

The Metaverse is the next evolution of connectivity, where NFT, decentralization, and cryptocurrencies all start to come together in a seamless universe so that virtual life is lived in the same way as physical life.

Technically speaking, this is known as Web 3.0.

Before delving into Web 3.0, it is important to briefly discuss "Web 2.0," or the Internet as it is now. In this read/write environment, users can easily send data across borders and interact with the Web. A shared "state" connected to the user's identity is what is most lacking. Centralized service providers like Google, Meta, and Microsoft have been able to gather user data and use all of its value because there isn't a shared state in place. As shown by numerous hacks, violations of the "trust" between users and platforms, and inappropriate selling and sharing of user data that "gatekeepers" were supposed to protect, this data centralization has had many unfavorable and malicious effects for users.

A network that is open and, in theory, unfettered by a central authority is at the heart of Web 3.0, which is considered to be the next generation of the Internet.

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[8] Cassano, G., Scorza, G., & Mazzetti, A. (2023). Diritti degli utenti – piattaforme digitali – privacy – diritto d'autore – profili penali – blockchain e NFT. Pacini Giuridica. (Pag. 42)

[9] Cassano, G., Scorza, G., & Mazzetti, A. (2023). Diritti degli utenti – piattaforme digitali – privacy – diritto d'autore – profili penali – blockchain e NFT. Pacini Giuridica. (Pag. 43)

This network enables users to interact while directly controlling their data and protecting their privacy. If so, the Web 3.0 paradigm would be successful in destroying the data "silos" of centralized service providers and returning ownership of users' data, identities, and representations to them.

Web 3.0 not only offers countless opportunities in business, education, and healthcare but its primary framework will be based on the use of NFTs or non-fungible tokens. NFTs are unique and irreplaceable bits of data that are kept in a digital "ledger" on blockchain and can represent a variety of different digital assets. Companies and users will have a wide range of opportunities to bring real-world assets into the 3D digital world thanks to the convergence of Web 3.0 and NFTs[10].

So far, the properties and characteristics have been discussed or better described at the technical level, and these can be included in the four pillars of the Metaverse, which are described as follows:

The development of four fundamental pillars is inextricably linked to the full realization of the Metaverse: realism, ubiquity, interoperability, and scalability.

- Realism is sought in the Metaverse to aid a user's psychological and emotional engagement with the environment. The level of immersion a user experiences in a virtual environment, as well as how transparent the boundary is between their physical actions and those of their avatar, are key factors in how realistic that environment is deemed to be.

- The concept of ubiquity in virtual environments is closely related to the fundamental requirement that a fully developed Metaverse must provide a setting for interpersonal communication that is psychologically engaging for the user.

- Interoperability allows disparate heterogeneous networks and subnetworks to exchange or transport avatars, behaviors, and objects in the virtual world while also enabling transparent communication between them.

- The most difficult virtual world feature to implement is scalability, which is why growing the platform's user base is crucial. A fully realized Metaverse must provide an environment for human interaction.[11]

As a result, the term Metaverse should be interpreted to include all declinations of digital ecosystems that may be created and disseminated on the Web[12].

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[10] Maggi, L., Cavalloni, A., Flora, M., Giordano, M. T., Ricci, S., Vertua, V., & Vaciago, G. (2022). *Metaverso: La Guida Pratica: Manuale di sopravvivenza giuridica al Web3* (Vol. 2). 42 Law Firm (Pag. 12-13)

[11] Dionisio, J. D. N., III, W. G. B., & Gilbert, R. (2013). 3D virtual worlds and the metaverse: Current status and future possibilities. *ACM Computing Surveys (CSUR)*, *45*(3), 1-38.

[12] Cassano, G., Scorza, G., & Mazzetti, A. (2023). *Diritti degli utenti – piattaforme digitali – privacy – diritto d'autore – profili penali – blockchain e NFT*. Pacini Giuridica. (Pag. 137)

1.3 How to join the Metaverse & Description of the Platforms

The means by which access to new digital ecosystems will be made possible will be a key factor in the growth of Metaverses. With some clarifications, the above-mentioned virtual reality (VR) and augmented reality (AR) devices are currently essential to achieving the goal of delivering increasingly immersive experiences. The devices represent the tools that enable the platform to collect a large mass of even sensitive personal data, despite the fact that the ever-expanding commercial offerings of technological devices have not yet made them affordable enough for mass adoption. At the same time, however, such devices are also more vulnerable to cyber-attacks and have functional and technical limitations.

Accordingly, access to the platforms should be made possible by brain-computer interface (BCI) technologies that rely on an infrastructure that, in order to simulate physical life, should guarantee a persistent immersive environment, i.e., one that is always active and changes even when the user is disconnected, necessitating the use of high-capacity mobile networks and, consequently, the involvement of additional operators who should manage personal information and data[13].

Everyone is allowed to enter the Metaverse no special computer skills are required. Only a few tools are needed to gain access, again taking into account current levels of development all one has to do is register on sites/download apps that allow one to live this type of immersive experience and only possibly equip oneself with a visor or an accessory that allows one to experience one's projection into the virtual world in an even more immersive manner. It's crucial to navigate the different Metaverses that already exist. As one might expect, there is a race between different companies or brands to create the most beautiful and immersive Metaverse. It is necessary to map out this complex environment to better understand it. This mapping divides digital worlds into two categories: the technology used to access the Metaverse (browser/app or virtual reality/VR tools) and the operating technology of the Metaverse's internal economy (blockchain or not).

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[13] Cassano, G., Scorza, G., & Mazzetti, A. (2023). Diritti degli utenti – piattaforme digitali – privacy – diritto d'autore – profili penali – blockchain e NFT. Pacini Giuridica. (Pag. 151)
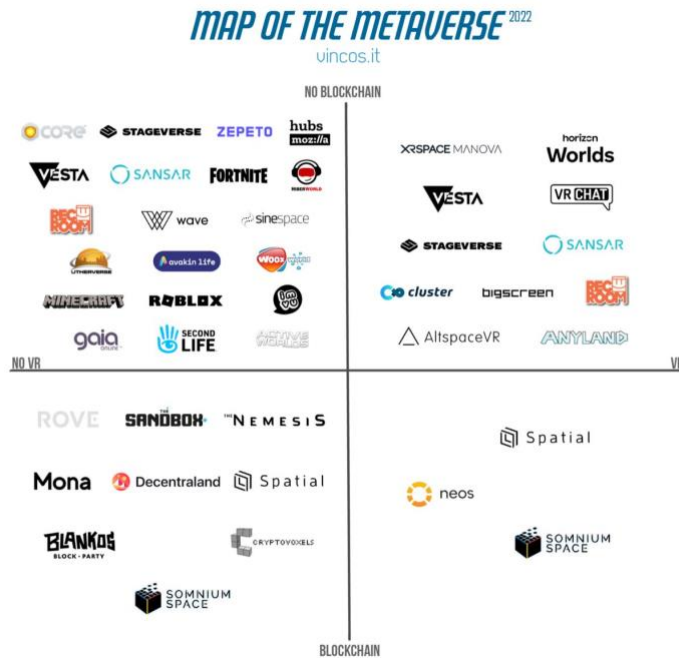
Figure 1: Map of the Metaverse [14]

Virtual Reality Metaverses (no blockchain)

The first quadrant includes worlds that can be explored by wearing a VR headset (stand-alone or connected to a PC) and any other devices. These applications do not use blockchain technology. Horizon World is located in the first quadrant:

"Meta Horizon Worlds is a free app for your Meta Quest headset. A virtual universe with thousands of experiences for you to explore. Hang with friends, meet new people, play games, and attend events[15]".

Desktop/Browser-based Metaverses (no blockchain)

Worlds that can be accessed through a browser or by downloading a desktop or mobile application are located in the second quadrant. This is the largest group because it contains a variety of solutions, some of which date back many years, like Second Life.:

"Second Life is a free 3D virtual world and original Metaverse where users can create, connect, and chat with others[16]".

Desktop/Browser-based Metaverses (on the blockchain)

The third quadrant includes universes made with blockchain technology and reachable through a browser or application (desktop or mobile). In these universes, land and tokenized items (NFT) can be bought using the

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[14] Map of the Metaverse. (2022, April 17). Vincos - Il Blog Di Vincenzo Cosenza. https://vincos.it/map-metaverse/

[15] Meta Horizon Worlds. https://www.meta.com/it/it/horizon-worlds/#overview

[16] Second Life - Virtual Worlds, Virtual Reality, VR, Avatars, and Free 3D Chat. https://secondlife.com/

cryptocurrency that each service has issued. The relevant Metaverse also has a market value for these NFTs that exists outside of traditional trade. These environments are still not widely used as a result of the entry barriers associated with a lack of familiarity with the crypto world. Decentraland can be found here:

"The first fully decentralized world, Decentraland is controlled via the DAO, which owns the most important smart contracts and assets of Decentraland. Via the DAO, you decide and vote on how the world works[17]".

<u>Virtual Reality Metaverses (on the blockchain)</u>

The fourth quadrant includes universes created on blockchain, only reachable through VR devices. Spatial is located here:

"is dedicated to helping creators and brands build their own spaces in the Metaverse to share culture. We empower our users to leverage their beautiful spaces to share eye-popping content, build a tight-knit community, and drive meaningful sales of their creative works and products. We also empower our users to create beautiful and functional 3D spaces that they can mint as NFTs and sell/rent to others looking to host mind-blowing experiences[18]".

As explained previously, drawing a complete map of the Metaverse is difficult due to the numerous features involved, such as the Metaverse's centralization and decentralization.

A critical factor is the degree of user control over the environment and content. Some Metaverses are centralized and controlled by the platforms, while others are controlled by the users. In centralized Metaverses like Horizon Worlds, which provide 3D VR experiences, users are constrained within the boundaries established by the entity. The virtual community is limited to a centralized managed environment. The elements of the environment are not under the user's control or ownership, despite the fact that they can interact with others and share their experiences. The key element of decentralized Metaverses, on the other hand, is user ownership of digital assets. Nonfungible Tokens (NFTs) are tokens that represent ownership of virtual assets. In decentralized Metaverses, cryptocurrencies perform the same role that money does in the modern economy. For example, cryptocurrency is needed to buy NFTs like real estate as well as clothing and footwear for the avatar. Two examples of Metaverse platforms with their own cryptocurrencies are The Sandbox and Decentraland[19].

The Metaverse may be ready much sooner than we anticipated thanks to these blockchain-based platforms, which may even include a real "Real Estate" market.

The same is true of Decentraland, a developing decentralized virtual reality platform where users can create avatars, buy houses and clothes on the market, and take part in the activities of the thriving (and possibly

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[17] Welcome to Decentraland. https://decentraland.org/
[18] Spatial - About. https://www.spatial.io/about
[19] Kshetri, N. (2022). A typology of metaverses. *Computer*, *55*(12), 150-155

speciation) real estate market. An NFT that is precisely 16x16 meters in size and is located at a fixed coordinate serves as the representation for each individual lot. A native to Decentraland cryptocurrency (MANA) is used for the entirety of transactions in this virtual world, and NFTs are used to provide and certify proof of virtual ownership. In addition to being already prepared, many businesses have positioned themselves and conducted business by utilizing the capabilities of the new immersive worlds. For instance, the world's largest manufacturer of footwear and clothing, Nike, teamed up with the online gaming platform Roblox to introduce Nikeland in November, allowing fans to create avatars and play sports virtually[20].

1.4 The Avatar

The avatar, a digitally embodied depiction of the user in virtual worlds, is critical to the development of an online identity. Characteristics of avatars can be carefully customized to reflect users' freedom of expression; they can take on completely fantastical or human-like forms[21].

These Metaverse avatars can be created using a variety of applications. Each application offers features, such as the ability to create characters with their entire bodies, use incredibly lifelike replicas, and more.

Avatar allows the user to move around the Metaverse because the virtual world is based on user interaction. Think of it as a personal online presence. The avatar can be used by the user in a variety of virtual worlds. The ability to combine the Metaverse avatars with Non-Fungible Tokens (NFTs) is an interesting feature. Multiple clothing brands have decided to produce unique items specifically for the Metaverse. Nike and Adidas, for example, have launched various products in the Metaverse, such as wearing Nike shoes in the virtual world, which will be unique to the user. NFTs give the holder sole ownership as well as access to a variety of utilities[22].

[20] Maggi, L., Cavalloni, A., Flora, M., Giordano, M. T., Ricci, S., Vertua, V., & Vaciago, G. (2022). *Metaverso: La Guida Pratica: Manuale di sopravvivenza giuridica al Web3* (Vol. 2). 42 Law Firm (Pag. 14-16)
[21] Mystakidis, S. (2022). Metaverse. *Encyclopedia*, *2*(1), 486-497.
[22] P. (2022, December 8). Metaverse Avatar here is a quick guide for you. PlugXR. https://www.plugxr.com/augmented-reality/how-to-create-metaverse-avatar

Chapter 2

The Problem of Data Protection in the Metaverse

2.1 Data Protection: An Open Issue

In today's world dominated by social media, where the protection of personal data is a concern, the Metaverse[23] adds a dimension of great complexity in which a new level of data collection and use will be added, especially when users take advantage of all the new technologies made possible by virtual reality[24].

The Metaverse narrows the boundaries between the real and the virtual on an unprecedented scale by gathering a vast amount of personal data that will not only cover consumption patterns or political, religious, and sexual views, but also movements, heartbeat, brain waves, and, last but not least, the emotions experienced in various virtual life experiences. Avatars allow users to be defined as real entities that not only represent users but also their choices, preferences, and actions.

This mechanism enables the platforms of the Metaverse to gather enormous quantities of information. Multiple channels such as wearable sensors, microphones, cameras, and heart monitors will increasingly provide the Metaverse with this data to have the best experience.

The Metaverse does, however, share some issues with other forms of technology, such as: interoperability between services, allowing different businesses to collaborate without being obstructed by technological barriers; economic opportunities, to provide more options for consumers, promote competition, and keep a thriving digital economy; security and integrity, to keep users safe while providing them with the means to take action or seek assistance if they come across something they are not sure about; Fairness and accessibility, to guarantee that these technologies are created in an accessible and inclusive manner; Assuring the right to data protection, reducing the amount of data used, and giving people access to and control over their data[25].

The problematic profiles related to the Metaverse in terms of the upholding/enforcement of the right to personal data[26] protection, as well as the new issues that present themselves to the legislator at the regulatory level, are illustrated below in light of the aforementioned premises. On the merits, it is true that the coexistence of various

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[23] As described above, there are multiple Metaverses just waiting to be explored, but for the sake of clarity and precision in this chapter and the next the term will be used in the singular, the Metaverse.

[24] Maggi, L., Cavalloni, A., Flora, M., Giordano, M. T., Ricci, S., Vertua, V., & Vaciago, G. (2022). *Metaverso: La Guida Pratica: Manuale di sopravvivenza giuridica al Web3* (Vol. 2). 42 Law Firm (Pag. 39).

[25] Maggi, L., Cavalloni, A., Flora, M., Giordano, M. T., Ricci, S., Vertua, V., & Vaciago, G. (2022). *Metaverso: La Guida Pratica: Manuale di sopravvivenza giuridica al Web3* (Vol. 2). 42 Law Firm (Pag. 6).

[26] See Art. 4 (1), GDPR :" personal data' means any information relating to an identified or identifiable natural person ('data subject'); an identifiable natural person is one who can be identified, directly or indirectly, in particular by reference to an identifier such as a name, an identification number, location data, an online identifier or to one or more factors specific to the physical, physiological, genetic, mental, economic, cultural or social identity of that natural person".

laws governing the protection of personal data cannot be understated; their application in a unified virtual environment devoid of clear distinctions could result in significant protection challenges and uncertainties. Additionally, the lack of a particular discipline that establishes ad hoc definitions in relation to the unique components of the Metaverse results in the creation of a regulatory gap that can only be partially filled by the available tools.

In this regard, it is necessary to take into account how the issuance of data protection regulations has been particularly widespread, especially in recent years. Consider the GDPR in the European Union, the CCPA in California, the PIPEDA in Canada, the PDP in Argentina, the LGPD in Brazil, the Cyber Security Law in China, the Privacy Act 1988 in Australia, and a number of other regulations[27].

2.2 Personal Data Protection

To understand the potential problematic profiles involving the Metaverse and the guarantee of the right to personal data protection, it is necessary to dwell - briefly and without any claim to completeness - on the concept of this right, as the culmination of a long doctrinal and jurisprudential evolution. The development of information and telematic technologies, as well as the central role assumed by information—even of a personal nature—in the new economic and social context, are key factors in the emergence of the right to the protection of personal data. As a result, every person must be aware of the need to not only prevent the sharing of his own data but also of the risks to privacy rights. The primary issue on the data subject's protection front is ensuring that each individual has the ability to control and potentially limit the dissemination of personal data.

Based on these presumptions, it is possible to deduce how using the Metaverse, whose functionalities depend on the essential collection and interaction of data and information, may pose risks to the protection of this right, particularly in the absence of regulations requiring specific information and control mechanisms on the collection of users' personal data. The creation of a fully immersive experience requires the contextual use of physical and psychophysical data, as well as the analysis of avatars to understand the times and forms of reaction of each individual to specific stimuli, which makes it clear how the control and/or selection of the information to be collected could conflict with the enjoyment of the experience.

Therefore, there is a possibility that these developments would lead to the creation of a setting where the Metaverse platform operator not only would be able to watch over a person's life in all of its aspects without that person being genuinely aware of it or being able to prevent it in any way, and but for the first time at his disposal a vast amount of personal data that was spread across virtual environments[28].

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[27] Cassano, G., Scorza, G., & Mazzetti, A. (2023). Diritti degli utenti – piattaforme digitali – privacy – diritto d'autore – profili penali – blockchain e NFT. Pacini Giuridica. (Pag. 176).
[28] Cassano, G., Scorza, G., & Mazzetti, A. (2023). Diritti degli utenti – piattaforme digitali – privacy – diritto d'autore – profili penali – blockchain e NFT. Pacini Giuridica. (Pag. 176-177).

As previously stated, the Metaverse gathers a vast amount of personal data and related metadata, including information about identity and contacts, interests, consumption preferences, opinions, and activities carried out, as well as information about the corporeal and psychological realms (such as information about eye and body movements; emotional states and behavioral reactions).

This significant amount of data is processed using sophisticated tools that, with the help of artificial intelligence, enable analyses and predictions that are equally accurate and helpful as they are potentially having an impact on users' fundamental rights. In particular, the category of data pertaining to the physical and psychological sphere assumes central relevance in the context under discussion, under two particular aspects: (i) the possibility of unambiguously identifying the physical person beginning with the collection of psycho-physical data of the individual user, and (ii) the possibility of collecting "further" information related to the data subject. It is important to comprehend the potential implications of the highlighted aspects in such a context[29].

The protection of personal data as a fundamental right was first recognized at the European level, by Article 8 of the Charter of Fundamental Rights[30].

The protection of personal data is in fact of utmost importance in maintaining the individual's centrality in power dynamics with private and public actors given the vast amount of personal data circulating in the Metaverse. Never before has a single virtual space been created where the total actions of each person can be gathered with such continuity, in contexts and situations that can closely resemble reality, from school to work, passing through the dimension of leisure and free time[31].

2.3 What data is collected in the Metaverse and how is it classified?

The Metaverse is a virtual world that is rapidly gaining popularity, and it is becoming increasingly important to be aware of the data being collected in this digital space. The data obtained in this virtual world can cause issues if it is not properly classified and protected, even though the Metaverse offers countless opportunities for entertainment and socialization. One of the main problems with data collected in the Metaverse is that it can be difficult to classify. The amount of data generated in this virtual space is staggering, and it can be difficult to determine which data is relevant and which is not. Additionally, sensitive data is frequently included in data collected in the Metaverse. To ensure that it is protected, this information needs to be properly classified.

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[29] Cassano, G., Scorza, G., & Mazzetti, A. (2023). Diritti degli utenti – piattaforme digitali – privacy – diritto d'autore – profili penali – blockchain e NFT. Pacini Giuridica. (Pag. 182).

[30] See Art. 8 of the Charter of Fundamental Rights: "1. Everyone has the right to the protection of personal data concerning him or her. 2. Such data must be processed fairly for specified purposes and on the basis of the consent of the person concerned or some other legitimate basis laid down by law. Everyone has the right of access to data which has been collected concerning him or her, and the right to have it rectified. 3. Compliance with these rules shall be subject to control by an independent authority".

[31] Cassano, G., Scorza, G., & Mazzetti, A. (2023). Diritti degli utenti – piattaforme digitali – privacy – diritto d'autore – profili penali – blockchain e NFT. Pacini Giuridica. (Pag. 174-175).

The information that is gathered within the Metaverse may vary depending on the platforms used and the purposes for which it is used, but generally speaking, it may include: User profile data, including name, age, interests, avatars, and other personal information; Location and movement data, which keeps track of the user's avatar's movements and location within the virtual environment; User activity data, such as user behavior within the virtual environment, interactions with other users and digital objects, shopping activities, and game preferences; information on platform usages, such as the number of users actively using it, the amount of time they spend there, and their most popular activities; Data from analytics enables us to assess platform performance and enhance user experience.

The problem with this data is that it can be used to identify individuals and their personal information.

There are various perspectives on how to categorize the data collected in the Metaverse: One method is to use "traditional" methods, while the other is more motivated by purpose.

The question here is whether psychophysical data should be classified as biometric data[32].

In the Metaverse, users are represented by avatars, which are digital representations of themselves. These avatars can be customized to look like you, or they can be completely different. As users interact with the Metaverse, they leave behind a trail of data that can be analyzed and used to improve their experience. One of the main concerns is that the user's psychophysical data is classified as biometric data. The answer to this concern is not simple. Biometric data is any physical or behavioral characteristic that can be used to identify a person. Examples of biometric data are fingerprints, facial recognition, and iris scans. In the context of the Metaverse, the user's psychophysical data may include body movements, facial expressions, and vocal patterns. Psychophysical data can be collected in a variety of ways, including monitoring eye movements, facial expressions, and heart rate. The user experience can be tailored using this data, and environments that are more immersive and engaging can be produced. However, there are issues regarding who has access to this data and how it is used. Since psychophysical data are specific to an individual and can be used to identify them, some experts contend that they should be categorized as biometric data.

Others contend that, even if such personal information could be used to specifically identify a data subject, it might not be appropriate to refer to biometric data as long as this possibility is only an unstated possibility[33].

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[32] See Art. 4 (13), GDPR : " 'biometric data' means personal data resulting from specific technical processing relating to the physical, physiological or behavioural characteristics of a natural person, which allow or confirm the unique identification of that natural person, such as facial images or dactyloscopic data".

[33] Cassano, G., Scorza, G., & Mazzetti, A. (2023). Diritti degli utenti – piattaforme digitali – privacy – diritto d'autore – profili penali – blockchain e NFT. Pacini Giuridica. (Pag.185).

Another category of data that needs to be considered is inferred data[34].

The information about the user that is inferred or hypothesized through the examination of his or her online behavior and interaction data is referred to as this data. These inferred data can be categorized as follows based on their nature and purposes:

- Behavioral data refers to the user's Metaverse behavioral patterns, such as his activities, social interactions, and game preferences. This information can be used to create a user profile and present the user with customized gaming recommendations or advertisements;
- Personality information relates to the inferred personality traits of the user from his or her interactions and Metaverse behavior. On the basis of their actions while playing, the person might be classified as either an aggressive or cooperative player;
- Mental health data refers to information inferred about the user's mental health based on his or her Metaverse behavior and interaction patterns. This information can be used to identify any mental health problems and promptly provide guidance and support. Emotion data is information about an individual's emotional state that is inferred from their behavior and facial expressions in the Metaverse. Real-time emotional support and game customization are both achievable because of this data[35].

Another category of data should be discussed, the category of neurodata.

As more individuals spend time in the Metaverse, questions have been raised about the gathering and use of neurodata as well as the advancement of neurotechnology in this virtual environment.The term "neurodata" refers to data that is gathered from the brain, including measurements of neural activity, brain waves, and other physiological indicators. Neurodata may be gathered in the Metaverse using a variety of techniques, including brain-computer interfaces (BCIs) and other wearable technology. The user's behavior and emotions could then be tracked, their experiences could be made more distinctive, and even their thoughts and actions could be influenced using this information. The advancement of neurotechnology in the Metaverse raises ethical concerns as well. Some researchers and developers, for example, are investigating the use of BCIs to allow users to control their avatars in the virtual world using only their thoughts. Although people with disabilities or limited mobility may benefit from this technology, it also raises concerns about consent and privacy. Concerns about abuse are also raised by the use of neurotechnology to influence users' emotions and behavior in the Metaverse. For instance, advertisers or other organizations might use neurotechnology to influence users' purchasing decisions or political opinions, which could result in manipulation and exploitation. In general, it will be crucial to carefully consider the ethical ramifications of gathering and using neurodata as well as the

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[34] See Art. 9, GDPR.

[35] Cassano, G., Scorza, G., & Mazzetti, A. (2023). Diritti degli utenti – piattaforme digitali – privacy – diritto d'autore – profili penali – blockchain e NFT. Pacini Giuridica. (Pag.186).

development of neurotechnology within this virtual world as the Metaverse continues to develop and grow. To guarantee that users' privacy and autonomy are protected and that the use of neurotechnology is carried out in an ethical and responsible manner, it will be essential to establish clear standards and guidelines[36] [37].

In this discussion of sensors, where in addition to the VR headset, there will also be gloves, this implies that one really has a cast of the physical user. The behavior here is sensed at the biological level. While we can take all of this data, let's discuss the purpose and use. Is it possible at this point that meta use this data to create a bald/uncast of the user, for the purpose of behavioral economics?

Never as in this case of extended reality we were able to collect data of this kind, so as to be able to have a cast of the user. So, we get into the area of behavioral economics.

To better explain this sensorization of extended reality activities in the Metaverse, let us take as an example the Meta commercial, in which there is Zuckerberg where he is playing fencing against an avatar, fact that he does more lunges and less defense, and how he does the lunge by extending his forearm or not, is information that represents behaviors or behavioral types. The study of how psychological, social, and emotional aspects influence economic decision-making is known as behavioral economics. Behavioral economics acknowledges that human behavior is more complex and impacted by a variety of factors, including cognitive biases, emotions, social conventions, and context. Traditional economics makes the assumption that people are rational and make decisions that maximize their own interests. To better understand how people make decisions in a variety of circumstances, including markets, financial systems, healthcare, and public policy, behavioral economists employ experiments and observations. In order to more accurately predict and understand economic behavior, they also create theories and models that include findings from the social sciences and psychology. Marketing, consumer behavior, finance, and public policy are some of the domains where behavioral economics is used in the real world. Organizations can create interventions and policies that encourage people to make decisions that are in their best interests by understanding how people make decisions. The study of and research into the connection between behavioral economics and the Metaverse is still in its early stages. However, the potential Metaverse applications of behavioral economics may have an impact on user behavior and judgment. Using tailored experiences is one way that behavioral economics could be used in the Metaverse. Users engage in virtual world interaction and produce data on their preferences, actions, and behaviors. This information may be utilized to develop tailored experiences that influence users' decisions or actions. A virtual store in the Metaverse, for instance, might use information about a user's prior purchases and browsing habits to suggest goods that they are more likely to buy. The store could persuade the customer to buy something by making

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[36] Rainey, S., McGillivray, K., Akintoye, S., Fothergill, T., Bublitz, C., & Stahl, B. (2020). Is the European Data Protection Regulation sufficient to deal with emerging data concerns relating to neurotechnology?. *Journal of Law and the Biosciences*, *7*(1), lsaa051.
[37] Ienca, M., Fins, J. J., Jox, R. J., Jotterand, F., Voeneky, S., Andorno, R., ... & Kellmeyer, P. (2022). Towards a governance framework for brain data. *Neuroethics*, *15*(2), 20.

these recommendations interesting and employing persuasion strategies like social proof. The usage of virtual currencies and economies is one more way that behavioral economics might be applied in the Metaverse. Understanding how users choose to spend and save virtual currency as well as how they value virtual products and services can be done with the aid of behavioral economics. This information can be used to create virtual economies that promote positive behaviors like saving and investing or dissuade negative ones like fraud and exploitation. Behavioral economics has several possible applications that could affect user behavior and decision-making in virtual settings, however, the relationship between behavioral economics and the Metaverse is still being investigated[38].

As mentioned earlier, another way to classify data is by purpose.

Companies today are interested in any information about consumers, including their health conditions, family and financial situations, sports preferences, friendships, and other factors besides just their purchasing preferences or habits. Regarding the processing of customer data, there is a significant conflict between privacy issues and the interests of businesses.

Personal data could also be categorized first by its "relationship" with the data subject and reality, and then by purpose. In today's economy, personal data is subject to conflicting interests. Data are regarded as both a type of personal property owned by individuals and an intangible asset of the information industries. Personal data are seen as a key component of the data-driven economy and a strong tool of consumer power in the marketplace, in addition to being seen as a particular area of human personality. Understanding which data truly "belongs" to the consumer and which to the company is important when discussing data ownership. In other words, the ownership issue—who can assert ownership or quasi-ownership of personal data over whom—is essential to resolving the conflict-of-interest problem. We must recognize the categories of data that are automatically the property of data subjects and those that belong to businesses in order to arrive at a fair solution.

The distinction between business data and other personal data is outdated because the information industry is interested in any information about consumers. Indeed, all of these data are regarded as critical for accurate consumer profiling, even in the context of specific lines of business. The rules, interests, and rights involved must be balanced in order to determine whether the interests of people outweigh those of companies. The only way to find a balance would be to examine each individual category of data to determine when general economic interests should take priority over data protection[39].

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[38] Wilkinson, N., & Klaes, M. (2017). *An introduction to behavioral economics*. Bloomsbury Publishing. (Pag. 4-14)

[39] Malgieri, G. (2016). Property and (Intellectual) ownership of consumers' information: a new taxonomy for personal data. *Privacy in Germany-PinG*, (4), 133.

Overall, the problem of data collection in the Metaverse is a complex issue that requires careful consideration and regulation. Using traditional classifications such as GDPR and innovative approaches, it can be ensured that data collected in the Metaverse are used responsibly and ethically.

2.4 The use of synthetic data in the Metaverse

Artificially created data that resembles actual data is known as synthetic data. It can be used to replicate the properties of real-world data without disclosing sensitive or personally identifying information because it was developed using algorithms and statistical models.

In the Metaverse, synthetic data can be applied in a number of different contexts. Businesses and organizations might, for example, employ synthetic data to create virtual users with realistic qualities and behaviors to test and enhance their products and services without collecting personally identifying information from actual customers. Synthetic data may also be used to simulate real-world circumstances and assess the effects of various decisions in a virtual setting, for example, to simulate the effects of a new advertising campaign or pricing strategy in a virtual store. By creating synthetic data that represent a range of ethnicities and cultures, the Metaverse might be made more inclusive and welcoming to all users.

On the other hand, there are issues with the Metaverse's usage of artificial data. Synthetic data may not adequately reflect the complexity and variety of actual data, which could result in findings that are incomplete or skewed. Furthermore, if synthetic data is used to manipulate or take advantage of users or if it is not properly disclosed, there might be ethical issues with it. In order to preserve users' rights and privacy, it is crucial to weigh the advantages and disadvantages of using synthetic data in the Metaverse and to put in place the necessary safeguards and restrictions.

By taking real data to train on behavioral models, machine learning algorithms create synthetic data by simulating fake data while retaining the statistical characteristics of the original dataset. These data can mimic real conditions and, unlike typical anonymized datasets, are not subject to the same errors as authentic data. Humans need new capabilities to interact naturally with the digital world as advances in AR/VR and the Metaverse move toward more accurate digital environments. This involves the development of a robust 3D digital overlay on the physical environment.

A 3D model must be trained using a lot of data related to the face and body, hand, etc.

Companies can produce customizable data using synthetic data that can help projects proceed more smoothly because it can be easily shared among creative teams without having to worry about compliance with privacy regulations. By giving developers more freedom, they can work more effectively and focus on revenue-generating projects.

The use of synthetic data generated from simulations accelerates the creation of AR/VR applications by enabling continuous development, integration and testing procedures. This data can also help train AIs for various near-field sensors that are invisible to human vision, as well as improve tracking accuracy of position sensors when built from the digital twin of the real environment.

Great care must be taken to protect these individual data elements. Effective data governance, security and consent management rules are needed for organizations. To scale effectiveness in the Metaverse and produce accountable data for training, storage, and distribution of models in production, it is critical to ensure ethics in AI[40] [41].

2.5 The issues with profiling

The profiling of avatar behavior has a direct impact on the privacy risk of the Metaverse. Users in the Metaverse represent themselves through avatars that move, interact, and purchase items in a virtual world in addition to interacting with a digital platform. These avatars are treated as actual Metaverse residents rather than just being users' representations.
The Metaverse platform gathers a vast amount of information about users' behavior, preferences, and interests as they engage with the Metaverse through their avatars. This information is then used to create a detailed profile of the user and their avatar's online activity.
The profiling of avatars in the Metaverse presents several privacy risks. For example, this data can be used to target users with personalized advertising, potentially revealing sensitive personal information. It can also be used to create detailed profiles of individuals that could be used for nefarious purposes, such as identity theft or cyberstalking. Additionally, as the Metaverse grows in popularity and more people spend time interacting with it, the amount of personal data being collected will only increase.

One must consider whether and how Article 22 of the GDPR[42] can still be considered as applicable in this situation if one envisions the Metaverse as a virtual space based on automated decision-making processes, in which the experiences offered are created based on users' preferences. In other words, it's important to consider whether it's possible to avoid being subjected to a decision in this virtual setting that is solely based on

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[40] Goodin, R., & Goodin, R. (2022, November 13). Synthetic data can unlock the Metaverse - Synthesis AI. *Synthesis AI - The data generation platform for computer vision*. https://synthesis.ai/2022/09/21/synthetic-data-can-unlock-the-metaverse/
[41] Dey, V. (2022, October 4). Why the metaverse needs synthetic data. *VentureBeat*. https://venturebeat.com/ai/deep-dive-how-synthetic-data-can-enhance-ar-vr-and-the-metaverse/
[42] See Art. 22, GDPR.

automated processing, including profiling, when those effects have legal repercussions that the data subject experience or will experience significantly.

On the basis of a preliminary analysis, it appears possible to conclude that such a right is not currently likely to be exercisable by individuals. In fact, an immersive reality like the Metaverse, which aims to give users a virtual experience that enhances the interactions of physical reality, urges for a level of analysis, prediction, and personalization of the "user" that has never been seen before. It is therefore possible to see how automated decision-making processes that are essential to the Metaverse's operation will eventually be regarded as processing that is "strictly necessary" to the enjoyment of the service itself, even just in light of these characteristics.

That being said, it is necessary to clarify the true scope of Article 22 of the GDPR, which does not outright prohibit automated decisions but simply limits their use when human intervention cannot be guaranteed.

As a result, while it may be difficult to ensure the right to human intervention in any automated decision-making process in the context of the Metaverse, the data controller may be able to rely on the exception provided by Article 22(2)(a) of the GDPR[43] because processing said data is required for the conclusion or performance of a contract. It could even be argued that without such a condition, using the service would not be feasible.

This solution, however, seems to be insufficient. In reality, such an interpretation undermines the real guarantee of the right to the protection of users' personal data because, if applied, it would force the user to choose between forgoing the service or consenting to the extensive collection of their data, which would present obvious difficulties in balancing various fundamental rights.

In conclusion, the limitations of legislation designed to regulate an essentially two-dimensional digital world emerge once more, failing to effectively regulate dynamics unrelated to its formation, such as those of the Metaverse. In light of this, it seems all the more important to emphasize the importance of developing legislation to regulate such an ad hoc virtual world in its complexity and unity[44].

2.6 How to manage personal data in the Metaverse?

As the Metaverse is still a developing concept, the management of personal data is not yet fully defined or regulated. Described below are some of the legal aspects that developers must and should focus on dealing with data protection issues, and will also be points of reflection for future chapters:

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[43] See Art. 22 (2)(a): "Paragraph 1 shall not apply if the decision: is necessary for entering into, or performance of, a contract between the data subject and a data controller."

[44] Cassano, G., Scorza, G., & Mazzetti, A. (2023). *Diritti degli utenti – piattaforme digitali – privacy – diritto d'autore – profili penali – blockchain e NFT*. Pacini Giuridica. (Pag. 188- 189).

Consent and disclosure

 In a Metaverse, consent and disclosure are crucial to ensuring that users are aware of the guidelines and requirements they must follow while inside the virtual world. Consent refers to the users' acceptance of the Metaverse's terms of service. Generally, this consent is required before the user can access the virtual environment. The terms of service may include rules and guidelines for Metaverse user behavior and information on how user data is managed and used. When a user accepts the terms of use, he or she typically does so by clicking on a button or a checkbox indicating that they have read and agree to the terms. Disclosure, instead, focuses on the Metaverse's data management practices. This may include information on collecting, processing, and sharing user data within the Metaverse. Users should have easy access to and comprehension of the disclosure so they can know and understand how their data will be managed and used by inside the virtual environment. In general, consent and disclosure are crucial to ensuring that users of the Metaverse are aware of the policies and procedures pertaining to their experience in the virtual world. By doing so, issues like data misuse, privacy violations, and inappropriate user behavior may be avoided.

Data Protection Impact Assessment and Legitimate Interest Assessment

Companies operating in the Metaverse must enforce strict self-regulation in accordance with the accountability principle by conducting thorough analyses to find any potential threats to the rights and freedoms of data subjects (Data Protection Impact Assessment). To properly assess the type of technology used in the Metaverse, teams with both legal and technological expertise are required. Additionally, it will frequently be necessary to evaluate the data controller's legitimate interest in carrying out processing without consent (Legitimate Interest Assessment). Again, the data controller must carefully preserve the documentation generated at the conclusion of the analysis in case the Data Protection Authority makes a request for it[45].

Managing Users' Rights

The management of data subjects' rights within the Metaverse will certainly be one of the most important aspects of data protection management.

These rights are:

- Art. 15 GDPR[46] - Right of access by the data subject
- Art. 16 GDPR[47] - Right to rectification

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[45] Maggi, L., Cavalloni, A., Flora, M., Giordano, M. T., Ricci, S., Vertua, V., & Vaciago, G. (2022). *Metaverso: La Guida Pratica: Manuale di sopravvivenza giuridica al Web3* (Vol. 2). 42 Law Firm (Pag. 40-44)
[46] See Art. 15, GDPR.
[47] See Art. 16, GDPR.

- Art. 17 GDPR[48] - Right to erasure ('right to be forgotten')
- Art. 18 GDPR[49] - Right to restriction of processing
- Art. 20 GDPR[50] - Right to data portability

All requests must receive an adequate and reasoned response within 30 days, which can be extended up to a maximum of 90 days. Consider a user who has been using the Metaverse for years asking to have their data removed. A complete and permanent deletion of the data cannot be ensured easily. The number of requests in the context of the Metaverse may also rise as a result of the initiatives that have emerged over the past year to help users exercise their rights[51].

2.7 The next steps

The Metaverse presents a unique set of data protection challenges. With millions of users interacting in the virtual world, ensuring data privacy can be a very difficult task, even more so if there are so many "opinions" on how to define the data collected, categorize it, etc. A clear legal framework is required for data protection in the Metaverse. In the next chapter, a walkthrough in the Metaverse will be described, an activity within the Metaverse such as to challenge/test what is the tightness of confidentiality, provide a report of what has been the experience (in data protection) in that environment and possibly suggest as a conclusion some technical and legal expedients. The technical expedients of confidentiality are to understand how the platform retains the data of users/avatars, audio recordings of places then rooms, etc. One of the questions that will be answered and one of the main questions of this thesis is the following: How is the data handled in the Metaverse? This may not be specified.

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[48] See Art. 17, GDPR.
[49] See Art. 18, GDPR.
[50] See Art. 20, GDPR.
[51] Ibidem note 42.

CHAPTER 3

Inside the Metaverse

3.1 Research Hypothesis

As has already been mentioned, privacy and data protection concerns will continue to grow as the Metaverse grows and its user base increases. Strong privacy and data protection methods must be developed and put into place to ensure users' trust and safety in the Metaverse. Its widespread adoption, however, may be delayed by major privacy and security vulnerabilities in the Metaverse (inherited from underlying technologies or appearing in the new digital environment). Due to the Metaverse's inherent characteristics, such as immersive realism, security in the Metaverse may also encounter a number of important obstacles (such as scalability and interoperability). The expansion of digital experiences accessed through immersive headsets and related technologies raises questions regarding the data collected on the device and how it is saved. Customers might not be aware of or understand the types of data that are gathered when utilizing extended reality devices. For instance, XR devices with hand tracking might measure the user's hand size and track their movements. Users that spend more time in the Metaverse will produce enormous amounts of data, including personal data, and engage in activities that call for privacy and security precautions to protect the user. If privacy and data security measures are insufficient, users may be exposed to threats like identity theft, fraud, and data breaches. As a result, the Metaverse might become less compelling, which would ultimately constrain its adoption and growth. The Metaverse must create and put into place effective privacy and data protection processes if users are to feel secure and trusted. Many of the potential applications of the Metaverse are based on presence and persistence: the user, through the creation of the Avatar in that platform, will feel physically immersed in the virtual space around him or her and more connected to the digital assets and properties that the Avatar owns in that space. To evaluate the hypothesis, research can be done on the current state of privacy and data protection policies in the Metaverse and potential threats and issues.

3.2 Research Question

Based on the literature described above, one could analyze a game, virtual room, or other chats with which one has other experiences and check and analyze the technical-legal aspects of privacy: from the moment of account creation, one goes to study the policy that allows one to open the account, so from the client/user design point of view first one reads a policy well and understands several things. After analyzing the legal aspect of creating the account, begin to consider how data is used and potential profiling. The technicalities of confidentiality are to be understood, how do platforms store user/avatar data, audio recordings of locations then rooms, interactions with

other users, if there is a tracking of movements, and how is user data processed? Or rather, is the purpose of the use of this data explained in a way that justifies the potential profiling, not only of movements but also of personal and sensitive data? This may not be specified in the privacy terms.

3.3 Methodology

A journey into the Metaverse will be explained, as well as an activity within the Metaverse such as challenging/testing the tightness of confidentiality. A description of the data protection experience in that setting will be given, and perhaps some technological and legal solutions will be recommended as a conclusion. Understanding how the platform handles user/avatar data (such as audio recordings of locations, rooms, etc.) is part of the technical agreement on privacy.

The platforms Decentraland and Horizon Worlds Meta platform case studies will be considered.

To stay on the topic of video games, since many have described these two platforms in this way, a walkthrough will be drafted. The experience (one direct and the other indirect) of these platforms will be reported, and terms and conditions, privacy rights, protection, and security will also be analyzed.

3.4 Walkthrough

In general, a walkthrough is a guide designed to assist players in getting better at a specific game, whether it's the whole game or just a specific section. Walkthroughs can be viewed as directions on enhancing players' experiences, assisting them in completing game objectives, or just operating as a kind of social interaction. What is proposed in the next section is just an easy and understandable way how to navigate two of the many platforms in the Metaverse.

What is being proposed is a framework for documenting experience across many platforms, with descriptions of each associated activity at each stage:

Table 1: Platform Experience

Activity	Description
Platform	Description of the platform (how to enter the platform, graphics, interface, etc.)
Account Registration	It will ask the user for personal information such as their name, e-mail address, and password.
Create Avatar	After registering an account, the avatar, or virtual character in the Metaverse, must be created. The majority of Metaverse platforms let users to create their avatars by selecting their gender, physical traits, clothes, and other attributes.

Explore the Platform	After creating the avatar, the user will be ready to explore the Metaverse. He/she can visit the various areas of the Metaverse, meet other users, participate in events and activities, and much more.
Read the Terms and Conditions	Before registering a Metaverse account, the terms and conditions should be read.
Configure Privacy Settings	Verify the Metaverse platform's privacy settings.
Interactions with other Avatars	Experience of interactions with other users in the platforms.

The "possible" key points to keep in mind as analyze the information:

Table 2: Data Protection

Key elements	Description
Data Collection and Use	The majority of Metaverse platforms get information about users' identities, actions, and interactions through avatars. Specify which data is collected.
Consent	Informed, explicit, and clear consent is required.
Security	Metaverse platforms must ensure that user data is secured from misuse, disclosure, and unauthorized access.
Pseudonyms and Anonymity	Some Metaverse systems allow users to create anonymous or fictitious identities. Even if a user uses a pseudonym, the platform must ensure that their privacy is maintained.
Privacy Rights	User rights must be specified.

The 1st Case: Decentraland

The first scenario to be analyzed is that of Decentraland. This platform is defined as a "**decentralized virtual reality platform powered by the Ethereum blockchain. Within the Decentraland platform, users can create, experience, and monetize their content and applications[52]**".

Decentraland is a three-dimensional virtual reality game. The open-world Metaverse is a user-owned, 3-D, Ethereum-based virtual reality world platform that combines virtual reality, augmented reality, and the internet. Users can interact in a shared digital environment by playing games, trading collectibles, buying, and selling wearables for avatars, socializing, and engaging with one another. Decentraland is a component of the growing Metaverse movement, which has led to the creation of meta-related currency. Using the DAO, or decentralized autonomous organization, users have control over a completely immersive virtual reality world they have created. With Decentraland, users can directly vote on the game and the organization's regulations, setting it apart from other virtual reality games in that it gives players some power over their surroundings.[53]

In the description of this experience, DAO will not be described.

Table 3: Platform Experience (Decentraland)

Activity	Description
Platform	With the exception of the ability to socialize, it resembles a video game. Avatars are just users with access to a computer from anywhere in the world and with whom one may socialize, engage, play together, share feelings, communicate, etc.
Account Registration	It will ask if the user want to sign in with a wallet or play as a guest. In order to sign in with the wallet, it is needed to create a domain name that's going to act as the username.
Create Avatar	Setting up the avatar is the first thing the user should do when using Decentraland. The body, face, hair, and clothing can all be changed.
Explore the Platform	Many have compared it to SecondLife, but how is it different from the latter? First, in Decentraland, every space, and every square is an NFT, called a LAND, so users can buy these spaces and build on them. If the user is interested in a particular parcel, they can jump into that particular spot on the map to see what it looks like before purchasing it. The other key feature of Decentraland is MANA, the cryptocurrency used to buy items. Some squares are assets or otherwise have been built by individuals or companies who have purchased the spaces. Coming into the virtual space, the avatar first lands in the Genesis Plaza and this will display the events, crowds, and classifies. It is one of the first spaces to look around. It does take a little time to get used to.

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[52] *Introduction*. (2023, May 5). Decentraland Documentation. https://docs.decentraland.org/player/general/introduction/
[53] Lodge, M. (2023). What Is Decentraland? *Investopedia.https://www.investopedia.com/what-is-decentraland-6827259*

	The user can jump into the events that are currently on. At Decentraland, the user can assist to various events, for example, the fashion week: one of this year's big names is Adidas, which organized a fashion show. Many businesses have started making wearables to give people more freedom to express their individuality. There is a visitable marketplace in Decentraland where users may buy or sell their virtual goods utilizing MANA to make buying wearables easier. Major clothing companies have also come to understand that NFTs' advantages extend beyond the Metaverse. Not only fashion houses have become interested in this platform, but also auction houses, like Sotheby's, which created an art gallery where the user can look at digital art.
Read the Terms and Conditions	Terms of Service and Privacy Policy are displayed.
Configure Privacy Settings	General settings are displayed. The voice chat will immediately connect when the user joins the world. When a user notices this UI (User Interface) in the taskbar, it can check whether a voice chat connection is present. They can send audio messages to nearby users who are also using the Voice Chat by holding down the microphone button. Nearby users can be muted or unmuted by the user. Keep in mind that during your subsequent sessions in Decentraland, the mute state of each user will be retained. The user can also leave the chat at any time[54].
Interactions with other Avatars	Being a decentralized experience, so unlike Secondlife where it is the company that decides how to evolve the game, in this experience it is the user. Those who have the cryptocurrency of this experience can decide through surveys new policies, what to change, etc., so it is the user who decide. As mentioned before, the user can interact with others using the voice chat or just the chat to socialize. As a mode for interacting with other users, it is very static.

Table 4: Data Protection (Decentraland)

Key elements	Description
Data Collection and Use	The following privacy policy provides key information about how user data is collected, used, and disclosed on the site and through the tools. Following are the general types of personal information that may be collected from user: network transaction information, such as the type of device the user uses, access times, hardware model, operating system and version, and other unique device identifiers; information about any plugins may be using, such as those for managing bitcoin assets and any data they may offer, but not limited to those; both your Ether address and email; Through Segment.io, Google is able to keep track of interactions with the Site. **The Use of Personal Information:** Transparency into transactions is provided by public blockchains, and the Foundation is not responsible for obstructing or regulating information broadcast on a blockchain. The servers, like nearly every other exchange on the World Wide Web, can

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[54] *Voice Chat*. (2023, May 5). Decentraland Documentation.https://docs.decentraland.org/player/general/in-world-features/voice-chat/

	collect information by virtue of the user interaction with them, including but not limited to IP Addresses. **How the data is used:** To assess usage patterns for the Site and Tools; to improve the Site and Tools; and to assist in tailoring users' experiences with the Site and Tools and If the user provides contact information, he or she may receive technical notices, support, security alerts, confirmations, and updates; information may be shared with third parties who need access to it in order to work on projects related to the Site and the Tools; these third parties only access and use the information as needed to perform their functions. **Information Not Collected:** Farther personally identifying information about the user will not be gathered unless the user voluntarily provides it to the Foundation[55].
Consent	The processing of personal information will take place in compliance with this Privacy Policy, and as a result, the user will have little or no control over how the information is used[56].
Security	The Foundation has put in place the necessary security measures to safeguard personal information, but neither it nor any other organization can guarantee the security of information processed online. For instance, the submitted personal information is kept on computers with restricted access, encryption, or both.[57]
Pseudonyms and Anonymity	Information may be used to build aggregates and anonymizations that do not specifically identify the user. The Site and the DCL Client may use or share those aggregations and anonymizations for a variety of purposes.[58]
Privacy Rights	The user have the right to (i) obtain a copy of personal information as well as details about its collection and use; (ii) have inaccurate personal information corrected (including the right to have incomplete personal information completed); and (iii) have your personal information erased (in certain circumstances, when it is no longer required for the purposes for which it was collected or processed);(iv) to limit the processing of personal data in the following situations: (a) the personal data's accuracy is disputed; (b) the processing is unlawful, but you object to its deletion; (c) no longer need the personal data, but it is still necessary for the establishment, exercise, or defense of a legal claim; (vi) to stop from sending direct marketing; (v) to contest processing that have been justified on the basis of a legitimate interest; (vii) to object to decisions that are solely based on automated processing or profiling; (viii) to withdraw the consent from the processing of personal information; (ix) in addition to the aforementioned rights, have the right to lodge a complaint with the supervisory authority[59].

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[55] *Welcome to Decentraland*. Decentraland. https://decentraland.org/privacy
[56] Ibidem note 55.
[57] Ibidem note 55.
[58] Ibidem note 55.
[59] Ibidem note 55.

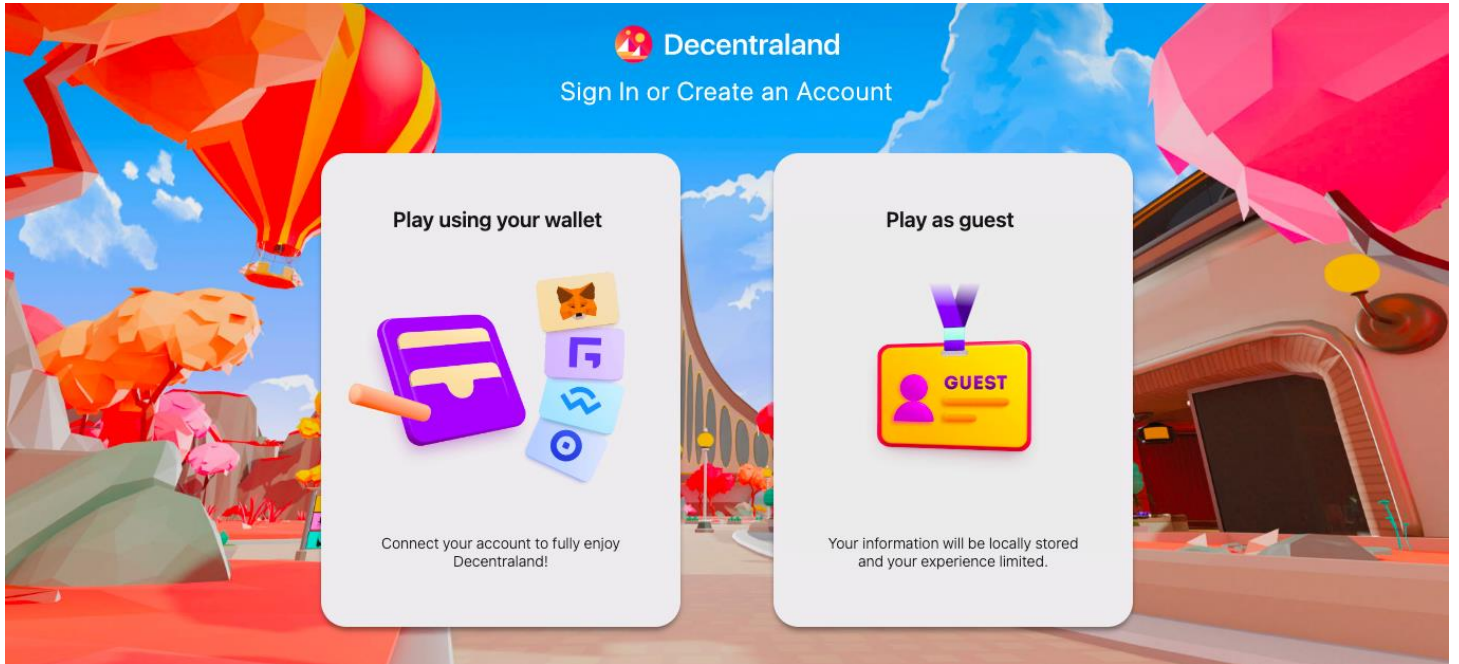# Interface screenshots provided by Decentraland
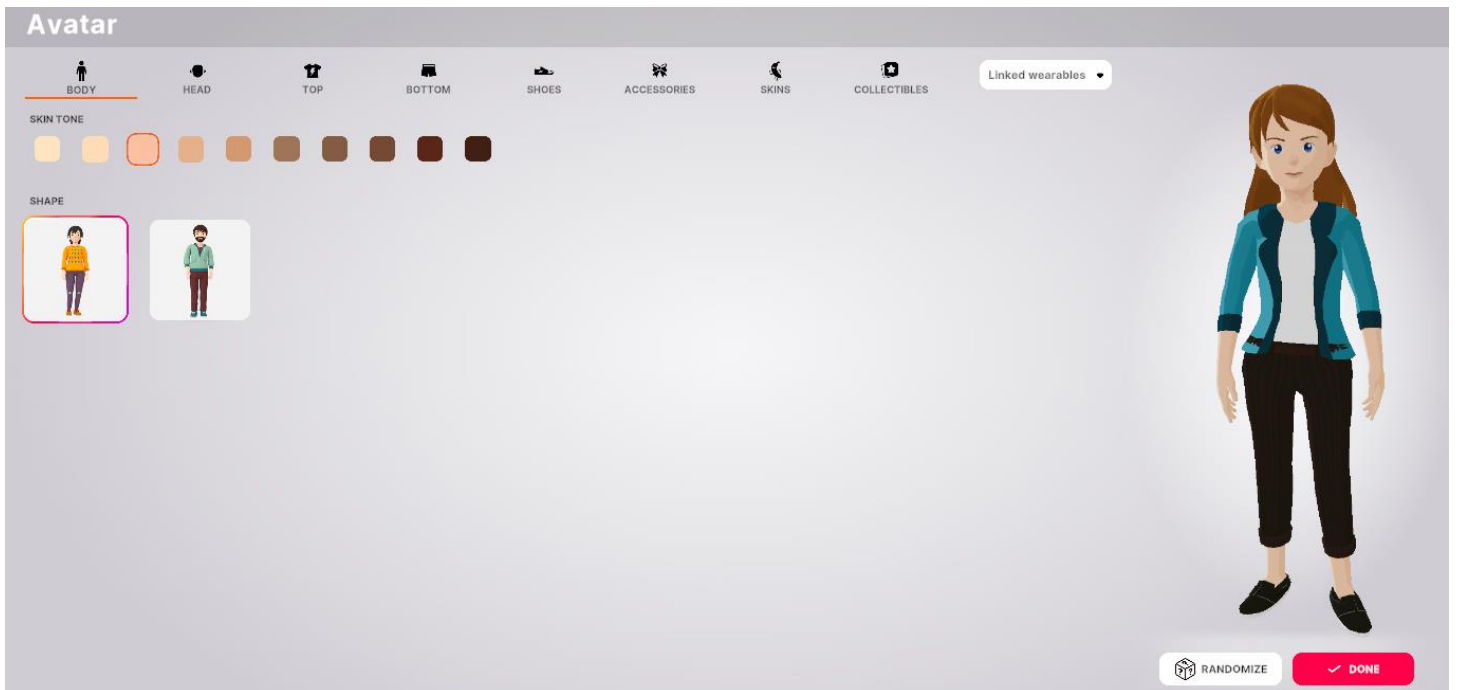

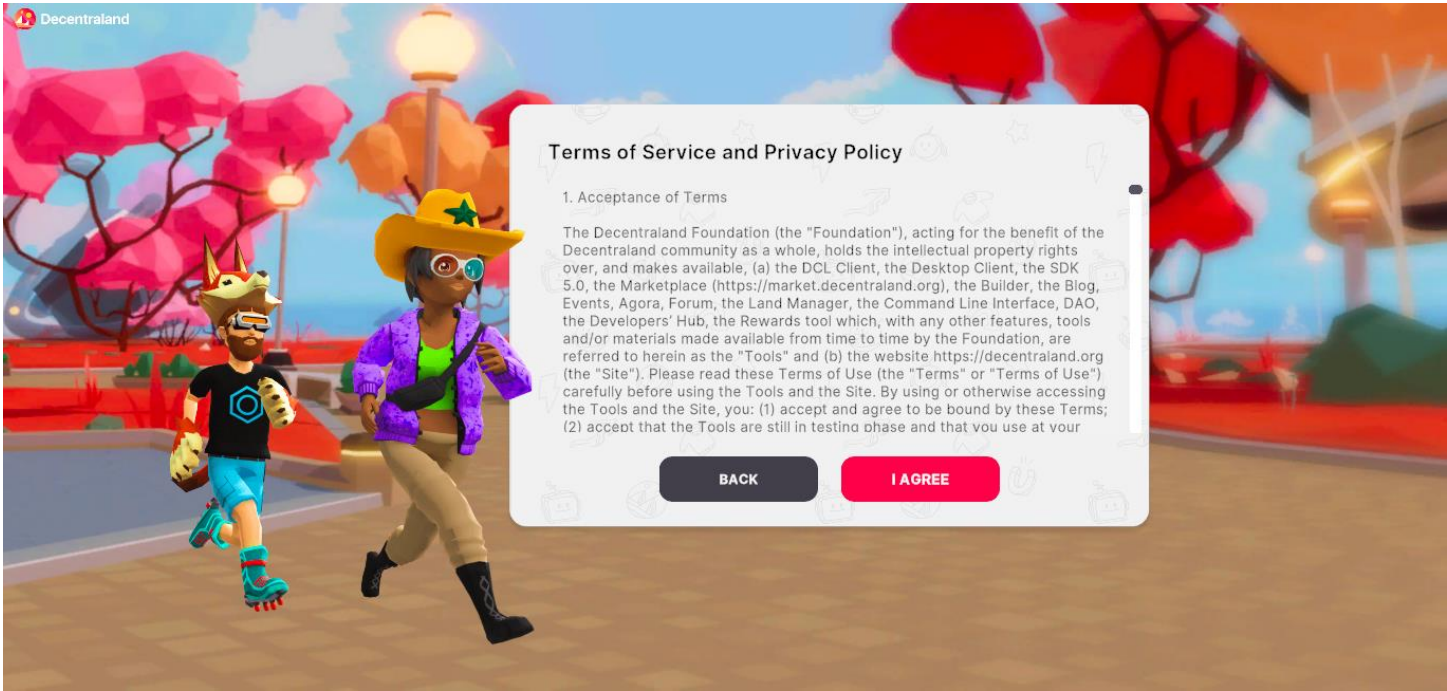Figure 2: Account Creation

Figure 3: Avatar Creation

Figure 4: Terms and Privacy Policy

Figure 4: Explore the Platform

The 2nd Case: Horizon Worlds Meta

The second scenario that is going to be analyzed is that of Horizon Worlds. This platform is defined as **"a social experience that allows you to explore, play, and create worlds[60]"**.

The Metaverse, according to Mark Zuckerberg, CEO of Meta, is the "holy grail of online social experiences" and the "future of the Internet." For him, it is a complete way of life, not just an addition to Facebook or another social networking platform. Zuckerberg made his idea public and demonstrated his dedication by renaming his business from Facebook to Meta. During the company's annual Connect conference in October 2021, the Metaverse announcement was made. It is a combination of several of Meta's services, as well as 3D and VR experiences made possible via the company's Meta Quest 2 and Quest Pro headsets. In the founder's letter, Zuckerberg discussed the potential for holographic "teleportation" to various areas as well as the hosting of cryptocurrencies and NFT projects within the virtual realm, highlighting the fact that the Metaverse is now Meta's primary priority as opposed to Facebook. A VR platform called Horizon Worlds, which was launched in late 2021 and allows users to communicate with one another in virtual environments, is the hub of the Metaverse. Due to low retention rates, Meta initially expected Horizon Worlds to draw 500,000 monthly active users, but it has only attracted 200,000, a number that has been gradually falling. Along with the low population of the world itself, a lack of engaging material and world deters people. The lack of legs and poor graphic quality of avatars have led to widespread mockery of their design. As Meta had planned, the VR headsets themselves have not been as successful[61].

Table 5: Platform Experience (Horizon Worlds)

Activity	Description
Platform	Choosing the best virtual reality headset is the first step in entering Horizon Worlds. The best way to use Horizon Worlds is usually thought to be the Oculus Quest. This is primarily because Oculus Quest and Horizon Worlds are both made by Meta. The Oculus models up for purchase are Meta Quest Pro and Meta Quest 2, formerly known as Oculus Quest 2.
Account Registration	First the creation of a Meta account, and then the creation of a Meta Horizon profile — social profile in VR.
Create Avatar	Setting up the avatar is the first thing the user should do when using Horizon Worlds. The body, face, hair, and clothing can all be changed. The user has the choice to change the avatar at a later time after saving the changes.
Explore the Platform	**First step:** After the user create the avatar and reads some additional info like Headset Recording and some Warning, a voice guides the user and gives some instructions/tour. A key feature is the Wearable, located on

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[60] *Centro assistenza del Meta Store*. Meta – Shop VR headsets and smart glasses.https://www.meta.com/it-it/help/quest/articles/horizon/explore-horizon-worlds/

[61] Pamula, P., & Writer, G. Meta Faces Trouble at the Horizon. https://weddingtonwitness.com/2484/news/meta-faces-trouble-at-the-horizon/

	the wrist of the user, and just look at it the user can find a variety tool that help to explore, create, and connect with other users in Horizon. An interesting feature is the Safe Zone, where the user can create a private space at any moment, and when it is created the other users cannot interact with him/her. Also, the voice that guide the user through the intro remined that every avatar the user meets are real people and asks to be respectful. **Games:** There are variety games that the user can play, and it looks like to be part of the game. **Horizon Workrooms for Oculus Quest 2:** Is a VR app and to use it the user need an Oculus Quest 2 headset, the idea is that the user put this on, and he/she is "transported" in a workspace with other people in it, moving around, talking and sitting at the desks. A feature that is really interesting, is that the user can actually bring his/her computer and his/her desk: The user need to scan his/her desk as part of the experience, Oculus has this tool built into the Quest 2 to bring desk and even some keyboards into VR to type and work on. Workroom pulls off another trick, it casts the user computer screen into the VR experienced and what it feels like, it displays a hovering screen in front the desk (like a disembodied monitor). Between the monitor and the keyboard which it can see as floating in front of the avatar, it feels like having a computer that the user can actually work on. The user can actually draw on a whiteboard through the controller. Regarding the room, the table that the Avatar is sitting at can change configurations, i.e. All the avatars can be sitting at a multi-faceted circular table that look like all the avatars are in the same space. The room can reconfigure into a different type of conference room table or even rows like a classroom to look at the whiteboard. Something that was really interesting is that the user can actually "gesticulate". A user describes as if his hands didn't always move the way he wanted them to move. Remember that there is hand tracking which happens via the oculus quest 2 front cameras so the user can move their hands around, point people or wave. Remember, the user is a cartoon avatar that because in VR there is no camera that-s looking at what the user really are looking like in the real world /during call conference for example there is the possibility to see ourselves and actual faces, VR flips that, so the user is able to move around but can't see his/her avatar).
Read the Terms and Conditions	After the creation of the Avatar, it is displayed that the headset records some of the avatar experience.
Configure Privacy Settings	The user can go to the Settings tab in VR, chooses Device, and turn the head tracking option to make it available. This will enable hand tracking, eye tracking, natural face expression, fit adjustment, and other features as well. Hand tracking can be turned off at any moment by switching the feature off in Settings.
Interactions with other Avatars	When the user decides which world wants to enter, it is easier to meet people. The user can actually interact with them with voice chat and

	can decide to be mute his/herself or speak. Most users describe the feelings of being in the Metaverse "immersive" and the fact that there are other users in that please it can be felt to be with them "physically". Most users didn't like the aspect that the avatar is not fully capture, in fact when the user enters in different world the user see other's avatar from their head to their waist.

Table 6: Data Protection (Horizon Worlds)

Key elements	Description
Data Collection and Use	**Following categories of information collected by the platform:** **Not all categories of data will be explained, only those related to the possibility of user profiling.** **BASIC INFORMATION:** **Meta account :**(Password, Contact information, Date of Birth); **Meta Horizon Profile** (Profile photo and name, Avatar, Username, Interactions with games and apps, List of followers, status when the user is online or offline when interacting with the program). **MOVEMENT DATA:** **Physical characteristics and movements**, how the headset and controllers are positioned and oriented to determine body pose and enhance the realism of the avatar's motions; the headset's location, the controller's movement speed, and changes in the user orientation to offer a realistic and immersive virtual experience; audio data to animate the lip and face movements of the avatar when the microphone options are enabled. **Hand tracking,** the platform gathers technical data, including estimated hand size and hand position information, if the user chooses to enable the hand tracking feature. The functionality of the feature requires this data. **Eye tracking,** the monitoring of the eyes. If the user chooses to enable eye tracking in Meta Quest Pro, the program will use abstracted gaze data to improve the quality of the image in relation to where the user is looking in VR, animate avatar eye contact and facial expressions, and/or allow the user to interact with virtual content. The device saves the raw image data from the eyeballs. To provide the feature and ensure that it works properly, it also gathers and retains particular data about eye tracking interactions (such as the time it takes to identify your eyes and tracking accuracy). **Fit adjustment,** if customers activate fit adjustment in Meta Quest Pro, the platform will process abstracted fit adjustment data to assess whether the headset is positioned appropriately and provide headset adjustment

suggestions. The tool stores the device's raw image data for the lower face and the eyes.

To provide the feature and ensure that it works properly, it collects and stores data about the user interactions with fit adjustment (such as how long the setup procedure took or whether or not a user completed the setup).

Fitness information, when users allow fitness-related experiences on MPT Products such as Meta Quest Move, the process collects data on the users' physical activity such as the number of calories burned. The amount of time the user has been physically active; fitness objectives and achievements. This makes it possible for the user to monitor their fitness progress and enhances those features.

Natural facial expression, facial expression that is natural. When Natural Facial Expressions is activated in Meta Quest Pro, the platform uses abstracted facial expression data to provide avatar expressions in virtual reality with a more genuine appearance.

The device stores a raw image of the face.

To provide functionality and ensure that it works properly, it collects and stores data on interactions with Natural Facial Expressions (such as the amount of time it takes to detect and identify expressions).

Camera and audio information, camera data, including images and videos. For instance, the sensors on the Meta Quest headset process the raw photos of the environment while also allowing the headset to process your movement and assist you in finding your way about the allocated virtual reality spaces. The device processes the raw photos of the environment; Audio content, to safeguard and help our community, we record audio and other conversations in Horizon worlds. We also provide users the option to report unsafe situations. User-created audio or video content, together with details about it like the time and date it was made. The devices also keep track of recent audio and other interactions between the user and other users (via a rolling buffer handled locally on-device). The user can use this to report abuse, stop unacceptable conduct, and defend and help our community.

Voice interactions, voice interactions include any background noise produced while a user utilizes voice services, as well as any orders and dictations they give verbally. This definition also includes accidental invocations of voice services. The platforms processes the following when a user utilizes the voice services: audio recordings, transcripts, related information concerning voice interactions, such as the device's hardware version and the length of the interaction-related audio.

DEVICE:

Product activity, the platform gathers data on product usage, including user engagement in virtual reality. The following information is also included: payment information, attendance at virtual reality events, purchases, downloads of apps, and the timing, frequency, and length of

activity. For instance, we gather data on usage, including interactions with suggested WebVR experiences.

How is data used?
It is also necessary to: (v) assist users in determining which communities or content may be most relevant to them in order to: (i) provide measurement, analytics, and other promotional services (including advertisements and commercial content); (ii) advance safety, security, and integrity; (iii) communicate with users; and (iv) conduct research and innovate for social good[62].

With the limited movement data collected, Meta takes precautions. Once this information is no longer required to operate the device, it is retained in the systems and assigned a special ID that is distinct from the user account ID.

This information is utilized to help mirror the user's movements in VR and reflect them in the avatar. The gathering of headset and controller movement data is necessary to create a realistic VR experience that is safe, comfortable, and seamless between apps. These data inputs assist the platform in giving the consumer a more immersive and interesting VR experience.

Is user-owned Oculus device data used to target advertisements?
No. Users who use Oculus and other Facebook products and technologies do not see advertisements based on information that is only locally kept on their headsets.

Software on the Meta Quest Pro headset analyzes infrared images of the eyes/face (referred to as "raw image data") to produce an estimate of where the eyes/face are looking in VR when the user chooses to enable eye tracking, hand tracking, fit adjustment, or natural facial expression on the headset or in a particular app.

The raw visual data is processed in real time on the headset if the user enables features like eye tracking and is then erased once processing is finished. The eye tracking feature's raw image data is not gathered or saved on Meta servers. Using hand tracking, the same justification[63].

Consent	In compliance with the Privacy Policy, personal information will be handled, and as a result, the user will have little to no control over how that information is used.
Security	Under Meta Guidelines.
Pseudonyms and Anonymity	Horizon Worlds does offer some degree of anonymity and pseudonymity.

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[62] *Supplemental Meta Platforms Technologies Privacy Policy | Meta Quest*. Meta – Shop VR headsets and smart glasses. https://www.meta.com/it/en/legal/quest/privacy-policy/?utm_source=www.meta.com&utm_medium=organicsearch
[63] *Privacy information and settings*. (s.d.). Meta – Shop VR headsets and smart glasses. https://www.meta.com/en-gb/help/quest/articles/accounts/privacy-information-and-settings/

Privacy Rights	Under the GDPR, users have the right to object to some processing of information gathered through Meta, as well as access, erase, port, and rectify information. The user can also restrict some data processing and object to others. This includes the right to object to how the platform handles data for direct marketing, as well as the right to object when data is processed to further one's own or a third party's legitimate interests, or to carry out a duty in the public interest[64].

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[64] Ibedem Note 60.

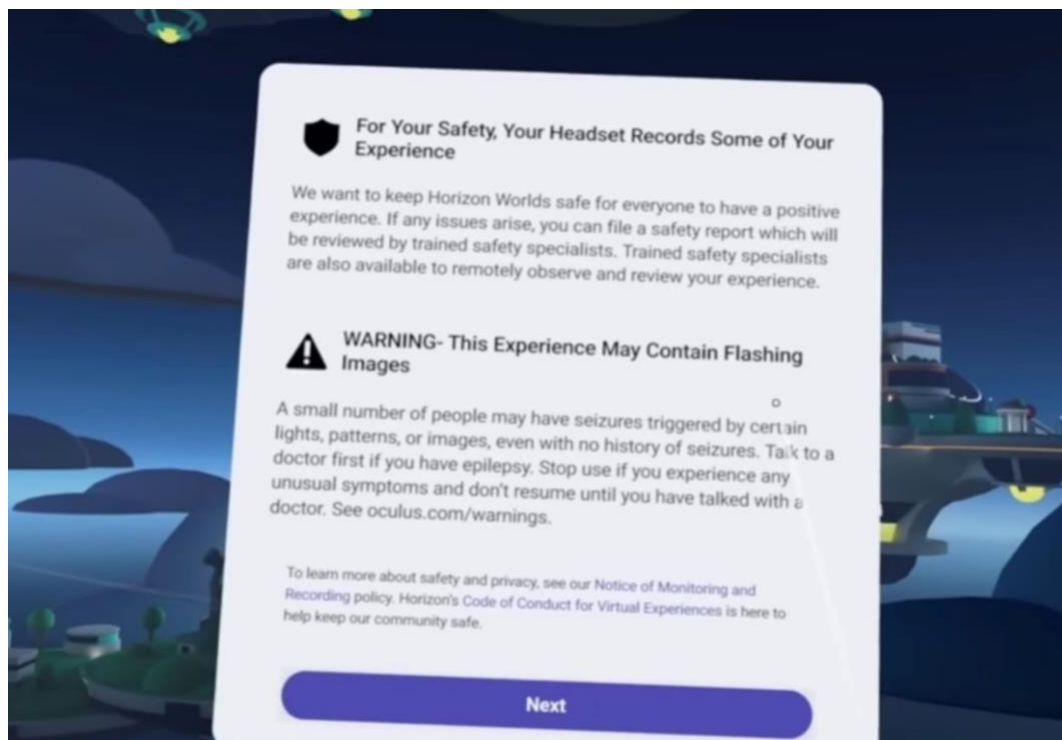**Interface screenshots provided by Meta**

Figure 5: Avatar Creation [65]

Figure 6: Safety Conditions

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[65] Baker, H. (2023). How To Make Quest Avatars - Edit, Create & Change A Meta Avatar On Quest 2. https://www.uploadvr.com/how-to-make-quest-avatars/
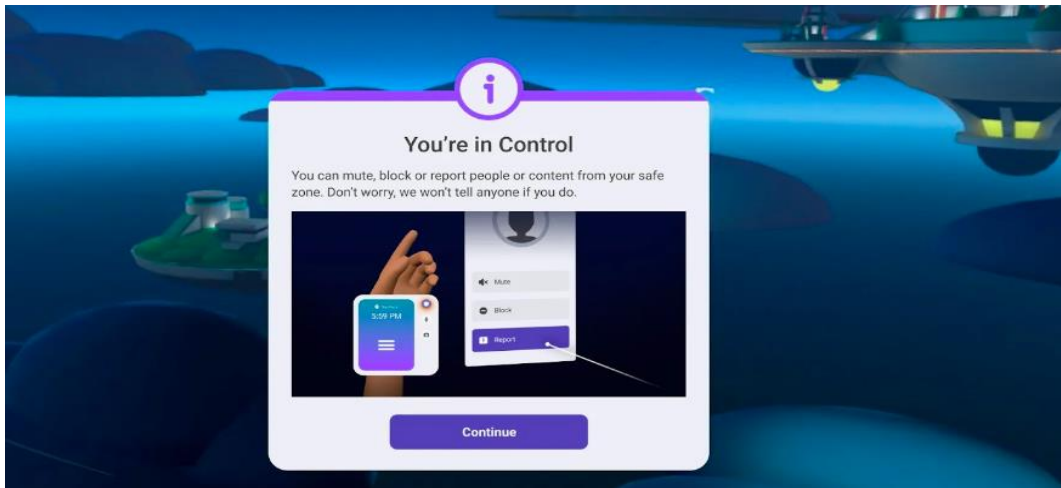
Figure 6: Safety Conditions
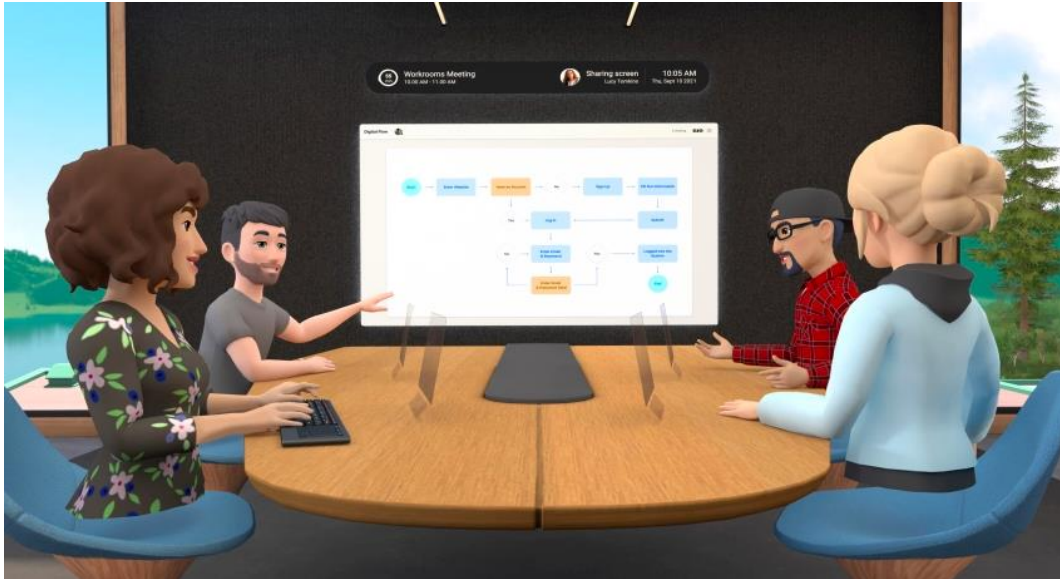

Figure 7: Safe Zone
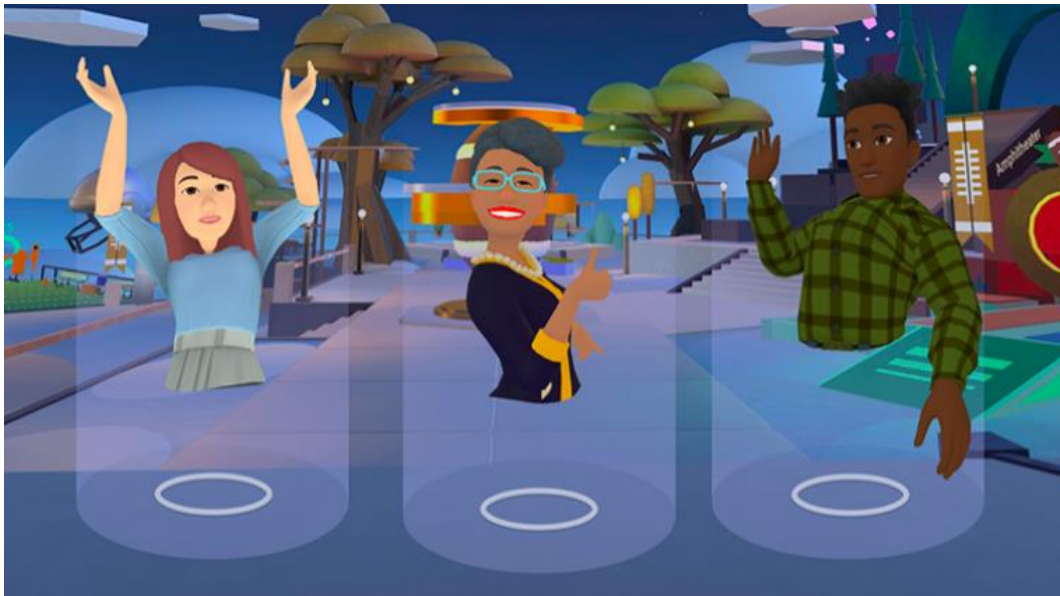
Figure 8: Workroom

Figure 9: Interaction with other users

3.5 Discussion

Taking up on the opening remark of this thesis, an issue was posed, "how do platforms store user/avatar data, audio recordings of locations and rooms, interactions with other users, whether there is movement tracking, and how is user data processed? Or rather, is the purpose of the use of this data explained in a way that justifies the potential profiling, not only of movements but also of personal and sensitive data? This may not be specified in the privacy conditions." Through the description, or rather walkthroughs of the two scenarios of Decentraland and Horizon Worlds, an answer was sought by analyzing the results of the two proposed cases. It is also reminded that these are case studies, and each Metaverse has its own characteristics, as described above, but they have some common elements: interaction with the platform and other users and the use of the collected data.

The first scenario was Decentraland, a virtual world built on the Blockchain that is now well-known for its decentralized nature and enables users to really own their own digital assets, such as virtual real estate and NFTs. Dynamic three-dimensional content can be created using the platform's development environment. The user can design items, alter their textures, control their dynamics, make payments, and play music. In order to engage users, businesses will be able to sponsor their goods, services, or events on digital billboards. In order to promote buying and selling on the platform, there is also a lot of interest in luring users to develop digital collectibles linked to tokens.

Free options for physical appearance and clothing are used to create avatars, but for utmost customizability, things made for this purpose can be purchased[66].

Decentraland must understand how to manage and safeguard user data, much as any Metaverse-related platform. Due to the platform's singularity, a number of particular challenges regarding data management and profiling must be taken into account.

When it comes to user profiling specifically, the platform not only gathers information like passwords and avatar names, but also activities with the site itself, such as "to help personalize users' experience with the site and tools, and if the user provides their contact information, they may receive technical alerts, updates, confirmations, security alerts, and support." Regarding consent[67], however, one of the key elements of this discussion, where it is reminded that the consent must be explicit and obtain without constriction. What is reported is that "the processing of personal information will take place in compliance with privacy policy, and

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[66] Bellacicca, A. (2022, September 13). *Decentraland: ecco il mondo virtuale che fa monetizzare*. Blockchain 4innovation. https://www.blockchain4innovation.it/mercati/media-entertainment/decentraland-ecco-il-mondo-virtuale-che-fa-monetizzare/
[67] See Art.7, GDPR.

as a result, the user will have little or no control over how the information is used," so it implies that the user despite being able to exercise their privacy rights, has little say of their data as they interact with the platform and this makes it difficult to tell if user profiling is taking place and with what data.

The Metaverse of Meta, or Horizon Worlds, was the second scenario.

Many commentators referred to this "project" as Zuckerberg's actual dream, and as a result, he changed the name of his business to Meta, which alludes to the idea of the Metaverse. Others, on the other hand, have described it as a chance for a true new business model, in addition to social, professional, and recreational interaction. However, just as was the case with Decentraland, managing and safeguarding user data is a challenge for Horizon Worlds as well. The service Horizon Worlds appears to be the ideal illustration of a new technology-based service that processes personal data yet poses a significant risk to rights and freedoms due to its nature, object, context, and aim[68] [69].

But how could Meta monitor users' actions?

The first is consent to record audio if you want to talk to other players:

In Horizon Worlds, the users who want to communicate with one another must agree to the audio being recorded; if they refuse, they are unable to do so. The audio actually stays local if there are no reports from other players; Meta only has access to recordings if a user is flagged as abusive, inappropriate, etc. However, speaking with other players requires accepting a recording that enables Meta to listen to it later to confirm whether or not reports of forbidden behavior are accurate. As a result, numerous talks between people are implemented and recorded[70].

The second is the use of the VR headset:

The oculus uses inward-facing cameras to capture a user's eye movements and facial expressions. This enables an avatar to mirror the user's expressions in real time, such as smiling, winking, or raising an eyebrow.

"When we communicate, our nonverbal expressions and gestures are often even more important than what we say, and the way we connect virtually needs to reflect that as well," said Zuckerberg. The internal cameras plus those on the controllers, according to Meta's CEO, will enable the creation of photorealistic avatars that resemble actual people more closely than cartoon characters.

Despite the absence of evidence that the technique works, companies such as Amazon and numerous research initiatives have already employed traditional pictures of faces to try to anticipate a person's emotional state. A

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[68] See Art. 35, GDPR.
[69] Lang, B. (2020, August 28). *Facebook Horizon Can Invisibly Observe Users to Spot Rule Violations*. Road to VR. https://www.roadtovr.com/facebook-horizon-privacy-monitoring-moderation/
[70] Fulco, D., & Fulco, D. (2022). Horizon Worlds e il caleidoscopio di problemi di privacy nel metaverso: il reportage. *Agenda Digitale*. https://www.agendadigitale.eu/sicurezza/privacy/horizon-worlds-e-il-caleidoscopio-di-problemi-di-privacy-nel-metaverso-il-reportage/

new method to deduce someone's interests or responses to content may be possible using information from Meta's earpiece.

The headset stores the raw photographs and images that are utilized for these functions, processes them locally, and then deletes the results. Although the raw images are deleted, the information gleaned from those images may be processed and stored on Meta's servers, according to privacy notes on eye tracking and facial expressions published by the company[71].

In conclusion, privacy and data security are major issues in the Metaverse. Users will produce an increasing amount of data in virtual worlds as they develop and become more immersive, opening up new chances for abuse and exploitation. The developers of the Metaverse must take precautions to protect users' private information and guarantee that they have choice over how their data is gathered, utilized, and shared. This entails strong security safeguards, clear data processing guidelines, and user-friendly interfaces that make it simple for users to control their privacy settings. We can make sure that the Metaverse continues to be a secure place for everyone to explore and enjoy by putting a high priority on data protection and privacy.

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[71] Johnson, K. (2022, October 13). Meta's VR Headset Harvests Personal Data Right Off Your Face. *WIRED*.
https://www.wired.com/story/metas-vr-headset-quest-pro-personal-data-face/

Conclusion

In the face of technological development, it is difficult to question the current state of technological development that gains new futuristic aspects every day, in which it is difficult to identify what the real situation is today and its protection for the future. In the face of this development, it is fair to ask, reading the latest news regarding its current state, whether the Metaverse, the subject of our thesis, is going through a crisis or not? We can point out that the major players in this field already are even separating themselves from the Metaverse in terms of investments and communication strategies, after the extraordinary hype experienced at the turn of 2021 and 2022. But can we actually speak of a crisis in the Metaverse? A question still unanswered.

So, the exodus from the Metaverse that we are witnessing reflects a negative situation affecting many sectors of the technology business internationally and pushing big tech to rationalize investments. Each year, Gartner publishes a report on the hype cycle of emerging technologies to clarify in plain language the ideas that define the path of public acceptance and affirmation of emerging technologies. Following the contents of the report, we point out that in the initial phase a real escalation is expected, followed by an abrupt contraction caused by a general sense of disillusionment, often accompanied by a decline in investor confidence. The Metaverse, first mentioned by Gartner in the 2022 hype cycle, is currently destined--the report states--to experience this sudden decline. As we have said, the development of what is the real Metaverse that needs to be referred to today, consisting of practical applications in industries that have been investing in it relentlessly for years, is proceeding. This development is taking place at the slow pace that characterizes sound implementation in processes. If we thus highlight a current crisis in which we can thus describe a path of strong recession, which has not, however, halted the development of the Metaverse, while prudently scaling back its ambitions. 3D virtual worlds and immersive technologies have certainly not ceased to exist; on the contrary, their development proceeds unceasingly, finding feedback and applications in many business sectors[72].

Faced with the technological innovations we are experiencing that have the potential to affect how we live; many jurists have defined two attitudes. First is to overestimate the technological component, and second, is to raise issues by speculating from the outset about how the novelty might alter the world. Information technology itself, electronic commerce and, more recently, artificial intelligence, have shown this to be the case. Especially in the case of the Metaverse, the initial and intermediate points of the phenomenon will determine much of its final outcome[73].

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[72] La Trofa, F. (2023). In fuga dal metaverso: è vera crisi? *Tech4Future* https://tech4future.info/fuga-dal-metaverso/

[73] Fulco, D., & Fulco, D. (2022). Horizon Worlds e il caleidoscopio di problemi di privacy nel metaverso: il reportage. *Agenda Digitale*.https://www.agendadigitale.eu/sicurezza/privacy/horizon-worlds-e-il-caleidoscopio-di-problemi-di-privacy-nel-metaverso-il-reportage/

Moving to the level of public debate, the popularity of the Metaverse may seem inappropriate given that many of these technologies are not only not yet accessible to everyone but are expected to be in the next five to ten years. Considering that many of the technologies underlying the Metaverse are still under development, is it not premature to place so much emphasis on it now? In the face of this picture, even if it is early, the Metaverse is going through a crucial phase that will determine its fate as the possible benefits, opportunities and criticalities of using these technologies are carefully considered.

Talking about the Metaverse now also gives us time to design the best frameworks to take advantage of its potential and reduce the risks involved in this technology. As described earlier, immersive Metaverse technologies are clearly among the most disruptive technologies, so it is critical to consider how to regulate them in advance to ensure healthy growth of the ecosystem. We now have the opportunity to examine the prospects and difficulties presented by the Web 3.0 digital revolution virtually.

In the face of this framework of uncertain development, the best standards and norms need to be established to improve various experiences while preserving people's fundamental rights, there is also a need for in-depth debate among public policy makers, regulators, businesses and experts.

Therefore, the qualitative and quantitative importance of data flows will require a rethinking of the consent collection system and guarantees of transparency in disclosure requirements.

Returning to the concept of data processing, according to the concept of privacy by design[74], both the planning and execution of the processing itself must keep in mind the implementation of appropriate technical and organizational safeguards in order to protect the rights and freedoms of data subjects. Rapid technological progress, as we pointed out in our study, has led to a large number of products and services based on advanced technologies. However, we could see that new technologies can have a disruptive impact, forcing fundamental changes in people's lifestyles, economies and social behaviors.

Although technology is often described as neutral, it is up to humans to decide whether to use this new technological opportunity for good or evil. In this regard, a clear regulatory environment is considered essential for the growth of technology and autonomous market systems that enable the smooth introduction of goods and services. Many analysts fear that intrusive and premature regulation will hinder scientific progress, undo the benefits it may have or, worse yet, lead to other problems such as economic inefficiency. It is also recognized, somewhat ironically, that the absence of a reliable and secure legal framework may also hinder technical progress. Such a challenging situation can undoubtedly threaten legal certainty and lead individuals to engage in

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[74] See Art. 25, GDPR.

a gray area where rights and obligations cannot be known in advance. Faced with this picture comes the need for the legislature to intervene to regulate the introduction of certain high-tech products or services (think drones, for example), a problem that is often highlighted when discussing the relationship between technology and regulation. Technological innovation is much faster than the regulator. Not only do new and developing technologies create legal problems, but also when current technologies undergo significant changes. In this situation, it becomes necessary to change the existing regulatory framework to keep in mind the rapid speed of technological development. The law must adopt the conflicting goals of safeguarding consumers and end users in general from negative impacts while encouraging innovation. Therefore, the optimal regulatory framework in this area must integrate a range of tools, including laws, technology standards, codes of conduct, and best practices. It would be prudent to address and solve any problems from the outset, per the principle of privacy by design in the specific area of privacy, to at least partially overcome these challenges[75].

Ultimately, the user must be the focal point of the data protection system, requiring the data controller to provide effective protection from a substantive and not just a formal point of view. In other words, it is not enough for the design of a system to comply with the standard if the user is not also protected.
Therefore, all new systems, procedures, or services that handle the processing of personal data must keep data protection and privacy issues in mind during the design phase. This includes security precautions such as encryption, pseudonymization, and data minimization[76] [77].

The Metaverse may find a solution in using synthetic data, which has a number of advantages over actual data. It is anticipated that the Metaverse, a virtual world that is being created as a parallel reality that people can explore and engage with, will produce and handle a vast amount of data. It is crucial to be able to generate synthetic data fast and efficiently since the Metaverse will need a tremendous volume of data to be produced in real-time. Synthetic data can also be utilized to safeguard users' privacy in the Metaverse.
Synthetic data can aid in ensuring privacy and security by producing data that resembles actual data but does not include any personally identifiable information. In order to promote inclusivity in the Metaverse, synthetic data can also be used to build a broad variety of varied avatars and landscapes that represent the diversity of the actual world. The Metaverse will primarily rely on AI to administer and regulate the virtual environment,

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[75] Iaselli, M. (2018, April 6). Privacy by design. *Altalex.* https://www.altalex.com/documents/altalexpedia/2018/04/04/privacy-by-design

[76] Saetta, B. (2018, March 25). *Privacy by design e by default*. Protezione Dati Personali. https://protezionedatipersonali.it/privacy-by-design-e-by-default

[77] Article 25 makes it clear that the GDPR takes a risk-based approach to compliance and that businesses must evaluate the risk associated with their activities in addition to other requirements (such as reporting to national data protection authorities). Prior to the start of processing, this risk assessment must be completed during system design. The procedure must be modified over time to account for the current state of technology.

therefore using synthetic data to train AI models that will be employed there is crucial. Synthetic data can enable effective data collection, safeguard privacy and security, support diversity and inclusivity, and train AI models, among other useful Metaverse solutions[78].

In the face of all that we have read and written, we can point out that The Metaverse presents opportunities with new forms of social interaction, enhanced immersive experiences, and innovative business models. However, there are also significant risks associated with development, such as privacy and security risks, challenges to inclusivity and accessibility, ethical concerns, and risks to addiction and mental health.

Overall, the Metaverse has the potential for innovation and development, but to ensure that it is built in a way that maximizes benefits for all users, it is critical to carefully analyze and manage potential problems that may arise at the same time that the user should always be the focal point of the entire data protection system.

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[78] Dey, V. (2022, October 4). Why the metaverse needs synthetic data. *VentureBeat*. https://venturebeat.com/ai/deep-dive-how-synthetic-data-can-enhance-ar-vr-and-the-metaverse/

Glossary of terms

Augmented Reality (AR): A technological advancement that superimposes digital data on the physical world.

Avatar: A digital avatar is a user's or a person's representation in the Metaverse.

Blockchain: A secure, decentralized digital ledger that keeps track of transactions across numerous computers.

Digital native: Refers to those who were exposed to digital technologies at a young age and have lived through the digital age.

Digital twins: Relate to digital representations or replicas of objects, systems, or procedures)

digital natives.

Mixed Reality (MR): An interactive environment where digital and actual objects can coexist. MR combines virtual and augmented reality.

NFT: A non-fungible token (NFT) is a special digital asset that can only exist once and is confirmed on a blockchain.

Virtual Reality (VR): An artificially created simulation of a three-dimensional environment that can be interacted with in a manner that makes it seem real.

Web 2: The Internet as it is now, is a read/write environment where users can easily send data across borders and interact with the Web.

Web 3: A network that is open and, in theory, unfettered by a central authority is at the heart of Web 3.0, which is considered to be the next generation of the Internet.

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Summary

Introduction

The Metaverse is an immersive virtual environment where people gather to socialize, play games, and work. Mark Zuckerberg, the founder of Facebook, announced the new business name (today Meta) and his pledge to create the Metaverse in October 2021, sparking public attention.

Presence and Persistence are crucial elements in the Metaverse, but both require meticulous large-scale data collection. This new wave of information will likely allow developers and advertisers to personalize a user's Metaverse experience. Many commentators are concerned about the collection of new and even richer data sets combined in the Metaverse, requiring additional safeguards under data protection laws. The thesis proposes the following outline: the first chapter will outline the phenomenon of the Metaverse and point out that there is not just one platform, but multiple. Access to the Metaverse varies from platform to platform, and data protection issues will be discussed in the second chapter. The Metaverse is a major concern due to the amount of personal data that will be collected and processed. This data can be valuable to companies trying to improve their products and services, but it can also be used to get a cast of the user. To verify this, documentation of the experience in the platform, and the study of data protection, is proposed. The platforms chosen are Decentraland and Horizon Worlds. The qualitative, empirical methodology is used to explore points such as if there is a crisis relating to the Metaverse, why privacy by design is important in this matter, and opportunities and risks related to it.

Chapter 1

The Metaverse is a concept that has been the subject of much discussion in recent years. It allows users to "walk" through the two intertwined worlds using glasses or headphones connected to a computer, enabling them to create or take part in any desired universe in the virtual world. The term "Metaverse" refers less to a specific technology than to the evolving relationship we have with it that allows the virtual and physical worlds to coexist. The Metaverse is an advancement in social technologies that enable avatars, or digital representations of people, to interact in different environments. It provides a space for endless interconnected virtual communities to use smartphone apps, augmented reality (AR) glasses, virtual reality (VR) headsets, or other devices, whether at work, attending concerts or sporting events, or even trying on clothes. It is important to understand the Metaverse's development and characteristics before explaining its properties on a technical level to better comprehend its complexity. The Metaverse is a collection of three technologies, encompassing virtual reality, augmented reality, and mixed reality. Augmented reality enables the addition or removal of elements from the real-world view, while Mixed Reality combines Virtual and Augmented Reality by allowing the real and virtual world. The Metaverse is the next evolution of connectivity, where NFT, decentralization, and cryptocurrencies

all come together in a seamless universe. This is known as Web 3.0, which is the next generation of the Internet. Web 2.0, or the Internet as it is now, is a read/write environment where users can easily send data across borders and interact with the Web. If successful, the Web 3.0 paradigm would be successful in destroying the data "silos" of centralized service providers and returning ownership of users' data, identities, and representations to them. The main component of the Metaverse is the "Extended Reality" collection of three technologies, encompassing virtual reality, augmented reality, and mixed reality. The view of the physical world is replaced by a scene created digitally in virtual reality, which can be a replica of the real world or a location in an entirely fictitious universe. The four fundamental pillars of the Metaverse are realism, ubiquity, interoperability, and scalability. Realism is sought to aid a user's psychological and emotional engagement with the environment, while ubiquity provides a setting for interpersonal communication that is psychologically engaging for the user. Interoperability allows disparate heterogeneous networks and subnetworks to exchange or transport avatars, behaviors, and objects in the virtual world while also enabling transparent communication between them. The most difficult virtual world feature to implement is scalability, which is why growing the platform's user base is crucial. How access to new digital ecosystems will be made possible will be a key factor in the growth of Metaverses. Virtual reality (VR) and augmented reality (AR) devices are essential to achieving the goal of delivering increasingly immersive experiences. Brain-computer interface (BCI) technologies that rely on an infrastructure that simulates physical life should guarantee a persistent immersive environment. It is crucial to navigate the different Metaverses that already exist, as there is a race between different companies or brands to create the most beautiful and immersive Metaverse. This mapping divides digital worlds into two categories: the technology used to access the Metaverse (browser/app or virtual reality/VR tools) and the operating technology of the Metaverse's internal economy (blockchain or not). The avatar is a digitally embodied depiction of the user in virtual worlds, which can be customized to reflect users' freedom of expression. Avatars can be created using a variety of applications, such as the ability to create characters with their entire bodies, use incredibly lifelike replicas, and more.

Chapter 2

The Metaverse is a dimension of great complexity in which a new level of data collection and use will be added, especially when users take advantage of the new technologies made possible by virtual reality. The Metaverse narrows the boundaries between the real and the virtual on an unprecedented scale by gathering a vast amount of personal data that will cover consumption patterns, political, religious, and sexual views, as well as movements, heartbeat, brain waves, and emotions experienced in various virtual life experiences. Avatars allow users to be defined as real entities that not only represent users but also their choices, preferences, and actions. The Metaverse does, however, share some issues with other forms of technology, such as interoperability between services, economic opportunities, security and integrity, fairness and accessibility, and assuring the

right to data protection. The problematic profiles related to the Metaverse in terms of the upholding/enforcement of the right to personal data protection, as well as the new issues that present themselves to the legislator at the regulatory level, are illustrated below. The coexistence of various laws governing the protection of personal data can lead to significant protection challenges and uncertainties. Additionally, the lack of a particular discipline that establishes ad hoc definitions in relation to the unique components of the Metaverse results in the creation of a regulatory gap that can only be partially filled by the available tools. The Metaverse is a virtual space that gathers personal data and related metadata, including information about identity and contacts, interests, consumption preferences, opinions, and activities carried out, as well as information about the corporeal and psychological realms. This data is processed using sophisticated tools that, with the help of artificial intelligence, enable analyses and predictions that are potentially having an impact on users' fundamental rights. The protection of personal data as a fundamental right was first recognized at the European level, by Article 8 of the Charter of Fundamental Rights. The Metaverse is a virtual space where the total actions of each person can be gathered with such continuity, in contexts and situations that can closely resemble reality. One of the main problems with data collected in the Metaverse is that it can be difficult to classify. It can include user profile data, location and movement data, user activity data, platform usage data, and data from analytics. To ensure that it is protected, this information needs to be properly classified and protected. The information gathered in the Metaverse may vary depending on the platforms used and the purposes for which it is used. The problem with this data is that it can be used to identify individuals and their personal information. There are various perspectives on how to categorize the data collected in the Metaverse, with one method being traditional and the other more motivated by purpose.

The question of whether psychophysical data should be classified as biometric data in the Metaverse is not simple. Biometric data is any physical or behavioral characteristic that can be used to identify a person, such as fingerprints, facial recognition, and iris scans. In the context of the Metaverse, the user's psychophysical data may include body movements, facial expressions, and vocal patterns. Psychophysical data can be collected in a variety of ways, such as monitoring eye movements, facial expressions, and heart rate. However, there are issues regarding who has access to this data and how it is used. Experts contend that psychophysical data should be categorized as biometric data, while others contend that it might not be appropriate to refer to biometric data as long as this possibility is only an unstated possibility. Inferred data is the information about the user that is inferred or hypothesized through the examination of his or her online behavior and interaction data. These inferred data can be categorized based on their nature and purposes: Behavioral data, Personality information, and Mental health data. Neurodata is data that is gathered from the brain, such as measurements of neural activity, brain waves, and other physiological indicators. It can be gathered in the Metaverse using a variety of techniques, such as brain-computer interfaces (BCIs) and other wearable technology. However, it raises ethical concerns such as the use of neurotechnology to influence users' emotions and behavior. To ensure that users'

privacy and autonomy are protected, it is essential to establish clear standards and guidelines. Sensors, such as VR headsets and gloves, can be used to create a bald/uncast of the user, for the purpose of behavioral economics. The study of how psychological, social, and emotional aspects influence economic decision-making is known as behavioral economics. It acknowledges that human behavior is more complex and impacted by a variety of factors, including cognitive biases, emotions, social conventions, and context. To better understand how people make decisions in a variety of circumstances, behavioral economists employ experiments and observations. Organizations can create interventions and policies that encourage people to make decisions that are in their best interests by understanding how people make decisions. Behavioral economics has several potential applications that could affect user behavior and decision-making in virtual settings, but the relationship between behavioral economics and the Metaverse is still being investigated.

Data collection in the Metaverse is a complex issue that requires careful consideration and regulation. Companies are interested in any information about consumers. In today's economy, personal data is subject to conflicting interests. Understanding which data truly belongs to the consumer and which to the company is important when discussing data ownership. The distinction between business data and other personal data is outdated because the information industry is interested in any information about consumers. The rules, interests, and rights involved must be balanced in order to determine whether the interests of people outweigh those of companies. Using traditional classifications such as GDPR and innovative approaches, it can be ensured that data collected in the Metaverse are used responsibly and ethically. Synthetic data is artificially created data that resembles actual data. It can be used to replicate the properties of real-world data without disclosing sensitive or personally identifying information. However, there are issues with the Metaverse's usage of synthetic data, such as not adequately reflecting the complexity and variety of actual data, and if it is used to manipulate or take advantage of users. It is important to weigh the advantages and disadvantages of using synthetic data and to put in place the necessary safeguards and restrictions. The profiling of avatar behavior in the Metaverse has a direct impact on the privacy risk of the Metaverse. Users in the Metaverse represent themselves through avatars that move, interact, and purchase items in a virtual world. This information is then used to create a detailed profile of the user and their avatar's online activity. This data can be used to target users with personalized advertising and create detailed profiles of individuals that could be used for nefarious purposes. Additionally, as the Metaverse grows in popularity, the amount of personal data being collected will only increase. Article 22 of the GDPR does not outright prohibit automated decisions but limits their use when human intervention cannot be guaranteed. The data controller may be able to rely on the exception provided by Article 22(2)(a) of the GDPR, but this interpretation undermines the real guarantee of the right to the protection of users' personal data. It is important to develop legislation to regulate such an ad hoc virtual world. The Metaverse is still a developing concept, but developers must and should focus on dealing with data protection issues. Consent and disclosure are essential for ensuring that users are aware of the guidelines and requirements they must follow while inside

the virtual world. Data Protection Impact Assessment and Legitimate Interest Assessment Companies operating in the Metaverse must enforce strict self-regulation in accordance with the accountability principle by conducting thorough analyses to find any potential threats to the rights and freedoms of data subjects. Additionally, it will often be necessary to evaluate the data controller's legitimate interest in carrying out processing without consent. The management of data subjects' rights within the Metaverse is one of the most important aspects of data protection management. These rights include the right of access by the data subject, the right to rectification, the right to erasure, the right to restriction of processing, the right to data portability, and the right to data portability. All requests must receive an adequate and reasoned response within 30 days, which can be extended up to a maximum of 90 days. The Metaverse presents a unique set of data protection challenges, with millions of users interacting in the virtual world. A clear legal framework is required for data protection in the Metaverse. In the next chapter, a walkthrough in the Metaverse will be described, an activity within the Metaverse such as to challenge/test what is the tightness of confidentiality, provide a report of what has been the experience (in data protection) in that environment, and possibly suggest some technical and legal expedients.

Chapter 3

The Metaverse is growing, and its user base is increasing, leading to increased privacy and data protection concerns. To ensure users' trust and safety, strong privacy and data protection methods must be developed and put into place. To evaluate the hypothesis, research can be done on the current state of privacy and data protection policies in the Metaverse and potential threats and issues. The platforms Decentraland and Horizon Worlds Meta platform case studies will be considered, and a walkthrough will be drafted: a framework for documenting experience across many platforms will be proposed, with descriptions of each associated activity at each stage.

Table 1: Platform Experience

Activity	Description
Platform	Description of the platform (how to enter the platform, graphics, interface, etc.)
Account Registration	It will ask the user for personal information such as their name, e-mail address, and password.
Create Avatar	After registering an account, the avatar, or virtual character in the Metaverse, must be created. The majority of Metaverse platforms let users to create their avatars by selecting their gender, physical traits, clothes, and other attributes.
Explore the Platform	After creating the avatar, the user will be ready to explore the Metaverse. He/she can visit the various areas of the Metaverse, meet other users, participate in events and activities, and much more.

Read the Terms and Conditions	Before registering a Metaverse account, the terms and conditions should be read.
Configure Privacy Settings	Verify the Metaverse platform's privacy settings.
Interactions with other Avatars	Experience of interactions with other users in the platforms.

Table 2: Data Protection

Key elements	Description
Data Collection and Use	The majority of Metaverse platforms get information about users' identities, actions, and interactions through avatars. Specify which data is collected.
Consent	Informed, explicit, and clear consent is required.
Security	Metaverse platforms must ensure that user data is secured from misuse, disclosure, and unauthorized access.
Pseudonyms and Anonymity	Some Metaverse systems allow users to create anonymous or fictitious identities. Even if a user uses a pseudonym, the platform must ensure that their privacy is maintained.
Privacy Rights	User rights must be specified.

Decentraland

Decentraland is a virtual world that resembles a video game with the exception of the ability to socialize. Account registration is needed to sign in with a wallet or play as a guest.

The following privacy policy provides key information about how user data is collected, used, and disclosed on the site and through the tools. The general types of personal information that may be collected from users include network transaction information, plugins, Ether address and email, and Segment.io. The use of personal information is provided by public blockchains, and the Foundation is not responsible for obstructing or regulating information broadcast on a blockchain. The data is used to assess usage patterns, improve the Site and Tools, and tailor users' experiences with the Site and Tools. If the user provides contact information, they may receive technical notices, support, security alerts, confirmations, and updates, and information may be shared with third parties who need access to it in order to work on projects related to the Site and the Tools. Farther personally identifying information about the user will not be gathered unless the user voluntarily provides it to the Foundation. The Foundation has put in place the necessary security measures to safeguard personal information, but neither it nor any other organization can guarantee the security of information processed online. Pseudonyms and anonymizations may be used to build aggregates and anonymizations that do not specifically identify the user. The user has the right to obtain a copy of personal information, have inaccurate personal information corrected, have their personal information erased, limit the processing of

personal data, contest processing that has been justified on the basis of legitimate interest, object to decisions that are solely based on automated processing or profiling, withdraw consent from the processing of personal information, and lodge a complaint with the supervisory authority.

Horizon world

Horizon Worlds is a virtual reality game that allows users to explore, create, and connect with other users in a virtual world. The best way to use Horizon Worlds is the Oculus Quest, which is made by Meta. The Meta Quest Pro platform collects data related to user profiling, such as Meta account, Meta Horizon Profile, Movement Data, Hand Tracking, Eye Tracking, and Fit Adjustment. The platform also gathers technical data, such as estimated hand size and hand position information, if the user chooses to enable the hand tracking feature. The Meta Quest Platform collects data on physical activity, natural facial expressions, camera and audio information, audio content, voice interactions, product usage, payment information, attendance at virtual reality events, purchases, downloads of apps, and the timing, frequency, and length of activity. Fitness information includes the number of calories burned, the amount of time the user has been physically active, fitness objectives and achievements, camera and audio information, audio content, voice interactions, product usage, payment information, attendance at virtual reality events, purchases, downloads of apps, and the timing, frequency, and length of activity.

Voice interactions include background noise produced while a user utilizes voice services, orders and dictations they give verbally, and accidental invocations of voice services. Product activity includes payment information, attendance at virtual reality events, purchases, downloads of apps, and the timing, frequency, and length of activity. Data is used to assist users in determining which communities or content may be most relevant to them, provide measurement, analytics, and other promotional services, advance safety, security, and integrity, communicate with users, and conduct research and innovate for social good. Movement data is retained in the systems and assigned a special ID to help mirror the user's movements in VR and reflect them in the avatar. Raw image data is processed in real-time on the headset and erased once processing is finished. Horizon Worlds offers some degree of anonymity and pseudonymity, and users have the right to object to some processing of information gathered through Meta, as well as access, erase, port, and rectify the information.

Discussion

This thesis examines how platforms store user/avatar data, audio recordings of locations and rooms, interactions with other users, movement tracking, and how is user data processed. Two scenarios of Decentraland and Horizon Worlds were used to answer this question. Decentraland is a virtual world built on the Blockchain that enables users to own their own digital assets, such as virtual real estate and NFTs. Dynamic three-dimensional content can be created using the platform's development environment, and businesses can sponsor their goods,

services, or events on digital billboards. Decentraland is a Metaverse-related platform that is focused on luring users to develop digital collectibles linked to tokens. To do this, the platform must understand how to manage and safeguard user data, such as passwords and avatar names, activities with the site itself, and consent. Consent must be explicit and obtained without constriction, and the processing of personal information will take place in compliance with the privacy policy, with the user having little or no control over how the information is used. This makes it difficult to tell if user profiling is taking place and with what data.

The Metaverse of Meta, or Horizon Worlds, was the second scenario proposed by Zuckerberg. It is a new technology-based service that processes personal data yet poses a significant risk to rights and freedoms due to its nature, object, context, and aim. To monitor users' actions, Meta requires consent to record audio if they want to talk to other players. This audio stays local if there are no reports from other players, and Meta only has access to recordings if a user is flagged as abusive, inappropriate, etc. However, speaking with other players requires accepting a recording that enables Meta to listen to it later to confirm whether or not reports of forbidden behavior are accurate. The Oculus VR headset uses inward-facing cameras to capture a user's eye movements and facial expressions. This enables an avatar to mirror the user's expressions in real time, such as smiling, winking, or raising an eyebrow. Companies such as Amazon and research initiatives have already employed traditional pictures of faces to try to anticipate a person's emotional state. A new method to deduce someone's interests or responses to content may be possible using information from Meta's earpiece. Privacy and data security are major issues in the Metaverse, and developers must take precautions to protect users' private information and guarantee that they have a choice over how their data is gathered, utilized, and shared. This entails strong security safeguards, clear data processing guidelines, and user-friendly interfaces that make it simple for users to control their privacy settings.

Conclusion

The Metaverse is going through a crucial phase that will determine its fate. It is important to design the best frameworks to take advantage of its potential and reduce the risks involved. We now have the opportunity to examine the prospects and difficulties presented by the Web 3.0 digital revolution, and there is a need for in-depth debate among public policy makers, regulators, businesses and experts. Data flows will require a rethinking of consent collection and transparency in disclosure requirements. The concept of privacy by design states that data processing must take into account the implementation of appropriate technical and organizational safeguards to protect the rights and freedoms of data subjects. Rapid technological progress has led to a large number of products and services based on advanced technologies, but new technologies can have a disruptive impact on people's lifestyles, economies, and social behaviors. A clear regulatory environment is essential for the growth of technology and autonomous market systems. However, the absence of a reliable and secure legal framework may also hinder technical progress. To address this challenge, the optimal regulatory

framework must integrate a range of tools, including laws, technology standards, codes of conduct, and best practices. The most important details in this text are that the user must be the focal point of the data protection system and that all new systems, procedures, or services that handle the processing of personal data must keep data protection and privacy issues in mind during the design phase. The Metaverse may find a solution by using synthetic data, which has a number of advantages over actual data. Synthetic data can also be utilized to safeguard users' privacy by producing data that resembles actual data but does not include any personally identifiable information. The Metaverse presents opportunities for new forms of social interaction, immersive experiences, and innovative business models, but there are also risks associated with development. To ensure that the Metaverse is built in a way that maximizes benefits for all users, it is critical to carefully analyze and manage potential problems while the user is the focal point of the entire data protection system.