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Metaverse (Virtual World)

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ABSTRACT

The concept of parallel digital realities offering experiences that mirror or transcend the limitations of the physical world has a long history, predating the internet itself. However, advancements in recent decades, such as near-ubiquitous mobile phone adoption and high-speed internet proliferation, have brought the notion of a blended physical and digital reality closer to realization. The Metaverse refers to this convergence, facilitated by computing devices and immersive technologies like virtual reality (VR), augmented reality (AR) and mixed reality (MR). While this vision of a fully realized virtual world remains in its early stages, with its components still under development, the potential of the Metaverse to offer significant opportunities for humanity is clear. However, these opportunities are accompanied by ethical and legal challenges, prompting the critical question of who is responsible for regulating the Metaverse to ensure compliance with ethical and legal frameworks. Undoubtedly, the coming years will necessitate the development of some form of regulation and rule-making to govern human interactions within these digitally connected worlds.

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Introduction

The concept of the Metaverse, a virtual world transcending physical limitations, finds its roots in the term itself. “Meta” signifies “beyond” and “Verse” a shortened form of “Universe” combine to describe a “beyond-universe” or “transcendent universe” (1). This three-dimensional virtual realm, accessed via the internet, allows individuals to engage in activities mirroring their real-world experiences. It transforms into a substitute reality for a parallel existence, where digital avatars interact socially, attend virtual events and even participate in simulated economies. Notably, Persian literature offers a potential equivalent in “Jahaan Fara Majazi”, translating to “virtual world”.

The term “Metaverse” first appeared in Neal Stephenson's 1992 sci-fi novel “Snow Crash”, depicting a seamless integration of virtual space with the real world and the internet (2). Further popularized by Ernest Cline's “Ready Player One” (2011), later adapted into a film, the concept portrays a future where individuals escape into a virtual realm accessed through VR headsets and haptic feedback gloves. This haptic feedback technology is precisely one of the key building blocks envisioned for the Metaverse.

The Metaverse concept extends beyond fictional narratives, drawing upon technological advancements dating back to the 1960s. Its legacy intertwines with two prior hype cycles, largely forgotten: the early 2000s peak of Second Life and the 2010s disappointment of early consumer VR headsets (sources needed). However, these downturns fostered significant technological progress.

Crucially, the Metaverse distinguishes itself from existing virtual technologies. It envisions a fully interconnected virtual space, seamlessly navigable by users across diverse environments. Unlike isolated applications that define current virtual experiences, the Metaverse is a network, offering broader and more immersive experiences (3). Furthermore, the Metaverse is conceived as persistent, allowing a user's digital identity and avatar to exist across platforms and applications for continuous interaction (4). This contrasts with the limitations of current virtual technologies, where experiences are often confined to a single platform (5). In essence, the Metaverse aspires to a fully digital, three-dimensional world replicating or exceeding the possibilities of the real world.

1. Applications of the Metaverse

The Metaverse relies on four key technologies: Virtual Reality (VR), Augmented Reality (AR), Mixed Reality (MR) and Extended Reality (XR). VR immerses users in simulated environments, while AR overlays digital information in the real world. MR blends both and XR encompasses all immersive technologies. XR serves as the foundation for the Metaverse, enabling its convergence with various industries to create a novel social and industrial ecosystem (6).

Essentially, the Metaverse is an internet application built on AR, VR and AI (7). Kye et al. proposed a four-pillar model: AR, Life, Mirror World and Virtual World. This global platform fosters innovation, communication and knowledge sharing. These pillars work together as a roadmap for maximizing the educational applications of virtual technologies. AR enriches real-world information, while life experiences are captured, stored and shared. Mirror worlds reflect and provide external information about the real world, while virtual worlds create simulated environments (8).

The Metaverse offers a transformative platform for geographically dispersed researchers, enabling them to collaborate seamlessly in virtual workspaces as if co-located. Cutting-edge human-computer interaction (HCI) research explores the Metaverse's potential, focusing on intuitive user interfaces for interacting with virtual objects and users and creating immersive user experiences (9).

The rise of virtual and augmented reality technologies signifies progress in human experience. These technologies, particularly the Metaverse, play a fundamental role in the potential continuation and advancement of human life (10).

Despite its transformative potential across various disciplines, the Metaverse necessitates significant advancements in both technology and conceptual design. As VR and AR evolve, the Metaverse emerges as a tangible reality attracting considerable scientific interest. Notably, it offers the ability to connect and interact in a virtual realm, transcending the physical limitations of space and time.

2. Capabilities of the Metaverse

The Metaverse encompasses a vast array of capabilities including digital avatars, blockchain-powered operations, non-fungible tokens (NFTs), virtual reality (VR) and augmented reality (AR), artificial intelligence (AI) integration, decentralized autonomous organizations (DAOs) and Web 3 support. This vision posits a fully immersive and interconnected digital world where users seamlessly interact with one another and digital objects in real time. The Metaverse is anticipated to play a pivotal role in shaping the future of the web, drawing upon principles of enhanced user control and likely incorporating a range of advanced technologies like blockchain and AI.

3. Methods and Benefits of Utilizing the Metaverse

The Metaverse utilizes sensory systems like eye-tracking, touch and sound for natural user interaction within a virtual world. VR devices facilitate full immersion in a 3D virtual environment, while AR seamlessly integrates digital elements into the real world. Rapidly evolving graphics, VR/AR capabilities and AI

integration promise increasingly immersive experiences. Eye-tracking technology further enhances the visual aspects.

Key benefits of the Metaverse include:

- Collaboration and Interaction: Fosters connections and problem-solving in the virtual realm.

- Immersive Virtual Environments: Enables realistic experiences in virtual cities, landscapes and historical sites.

- Educational Opportunities: Enhances learning and comprehension through virtual experiences.

- Intensified Experiences: Amplifies the intensity and realism of experiences like attending virtual concerts.

Ethical concerns surround VR and emerging reality technologies, particularly the exposure of individual mental models. XR software monitoring eye movements and involuntary responses could potentially tap into subconscious thoughts, influencing decision-making and potentially being misused by corporations. Additionally, mental models could be exploited as training data.

Advanced technologies required for a more immersive Metaverse also present security and privacy challenges. Excessive use could lead to decreased focus and real-world social interaction.

Cybersecurity and privacy are major concerns. The lack of current metaverse-specific privacy regulations poses risks like:

- Misapplication of existing privacy laws.

- Invasive data collection.

- Data rights and ownership issues.

- Exploitation of minors.

- User-to-user privacy.

Businesses need proactive data privacy policies and collaboration for security and privacy safeguards. Consumers should understand the security and data privacy policies of businesses and platforms they interact with.

5. Metaverse Rights

In the age of rapid technological advancement, transformative phenomena emerge frequently, each potentially reshaping the world and its legal frameworks. The metaverse is one such example, driving a global revolution.

This surge in new technologies, including the metaverse and the accompanying public interest raises a critical question: is urgent regulation necessary to keep pace with such innovation? Should the law adapt to the evolving virtual world or should the virtual world conform to existing legal frameworks?

Historically, legal development follows the principle of learning from past experiences. Additionally, from a legal perspective, the metaverse may not be inherently disruptive. Virtual worlds and digital objects already exist and are likely to continue expanding, highlighting potential continuity with existing legal structures.

6. Ethical and Legal Challenges of the Metaverse

The contemporary digital landscape necessitates robust protections for users within virtual environments. Legal scholars contend that current regulations are inapplicable, incompatible or outpaced by technological advancements in the metaverse. This necessitates the development of a new legal framework to address the ethical and legal challenges posed by the metaverse.

6-1. Privacy Breaches

The potential benefits of the metaverse are accompanied by significant challenges. Building upon the privacy concerns of the internet, the metaverse presents heightened risks due to the collection of far more specific user data. Beyond traditional information like names and addresses, the metaverse can track biometric data such as eye movements, body language, vocal characteristics and even subtle expressions. This data can then be used to infer intimate details about users, including demographics, interests and even personal anxieties. As a result, casual engagement with the metaverse could inadvertently reveal a surprisingly personal profile.

6-2. Infringement of Intellectual Property Rights

The metaverse, a virtual world populated by user-controlled avatars, necessitates the application of intellectual property (IP) law to virtual items like clothing, vehicles and furniture. These items often

incorporate trademarks or copyrighted works, falling under the purview of IP law's “corpus mysticum” - the intangible essence of an object. Consequently, metaverse creators must respect the rights of inventors, designers and trademark holders similar to the real world. Right holders can legally pursue infringement of their IP rights within the metaverse, such as unauthorized use of a trademark on a virtual purse.

The Berne Convention, an international treaty for the protection of literary and artistic works, currently enjoys adoption by 181 countries. Article 2(1)(1) defines a “work” as any original creation expressed in a tangible medium. The convention mandates signatory nations to grant exclusive rights to authors for their works. Subsequent agreements like the WIPO Copyright Treaty (WCT) of 1996 update the Berne Convention for the digital age, explicitly recognizing the protection of digital works and establishing rules for their digitization. Article 1(4) of the WCT requires prior copyright holder authorization for storing a protected work in digital form, encompassing NFTs and metaverse content. This provision underscores the extension of copyright protection to metaverse works, including digital assets and immersive experiences.

Conclusion

The metaverse envisioned as a convergence of virtual and augmented reality, represents a significant leap forward in digital technology. It promises a broader, more interconnected and immersive space for user interaction and creation.

While still under development, the metaverse has the potential to reshape how we interact with each other and the world. It might lead to reduced physical interactions and introduce novel forms of engagement. Notably, virtual classrooms and learning environments could facilitate hands-on learning and simulations.

Essentially virtual worlds, metaverses can either mirror or diverge entirely from our physical reality. Users can virtually interact, trade goods, own and sell property, invest, attend work or participate in social events within these environments. This versatility positions metaverse technologies for application in diverse contexts.

On the positive side, the metaverse grants access to previously unimaginable realms, including outer space. Online social interactions offer the potential for increased richness. However, negative social media behavior may be amplified in the virtual world and metaverse addiction could become a concern for some users.

As technology advances, so too will the use cases for the metaverse in the coming years. While it presents opportunities, it also raises ethical and legal challenges. The crucial question of regulation remains - who is responsible for ensuring compliance within these digital worlds? Undoubtedly, some form of regulation will be necessary to govern interactions in these interconnected environments.

In conclusion, the metaverse holds immense potential to revolutionize research and communication. Its potential applications are vast and exciting, but careful consideration and ongoing evaluation are necessary to ensure its safe and effective implementation.

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Authorship

Mahmoud Abbasi: The conception and design of the study.

Mehrdad Teymouri: Data collection and analysis, manuscript writing and revisions.

Conflict of Interest Statement

The authors declares that there is no conflict of interest regarding the conduct of this research.

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