Journal of Statistics & Management Systems
ISSN 0972-0510 (Print), ISSN 2169-0014 (Online)
Vol. 29 (2026), No. 6, pp. 573–588
DOI : 10.47974/JSMS-1431

Metaverse unbound : A comprehensive exploration of beyond-the-hype realities, charting new frontiers in practice, investigation, and policymaking

Namrata Tapaswi
Department of Computer Science & Engineering (AI&ML)
Acropolis Institute of Technology and Research
Indore 453771
Madhya Pradesh
India

Abstract

The metaverse can extend the limits of reality by using augmented and virtual reality technology. It allows individuals to connect seamlessly in genuine and artificial environments by employing avatars and holographic pictures. Simulations and virtual reality games are considered precursors of the metaverse, offering insight into the potential social and economic implications of a fully realized and universally accessible metaverse. Differentiating between the exaggerated promotion of the "meta" redesign and the actual realities of the moment can be difficult due to the influential promotion by major technology companies. They present the metaverse as a significant catalyst that will benefit people's professional pursuits, leisure activities, and social connections. The emerging concept of a gradual merging of digital and physical realms could potentially have a transformative impact on various aspects of human activities, including work performance, communication with organizations and individuals, and the formation of collective memories. Although the necessary technology resources and infrastructure for creating new real-world worlds that human avatars can explore through gadgets are not yet available on a large scale, scholars are increasingly interested in the transformative potential of the metaverse. Normal social interaction parameters have far-reaching effects on many fields, including commerce, healthcare, academia, and society at large. Confidence, secrecy, prejudice, deceptive data, legal compliance, and mental health difficulties related to reliance and the impact on vulnerable populations are all factors to consider.

This research delves into several subjects related to the metaverse and its transformative impact by using an impartial narrative and a comprehensive approach that draws on the expertise of specialists from different disciplinary backgrounds. The report concludes by

ORCID-ID: 0000-0002-0440-2029

E-mail: namratastapaswi@outlook.com

proposing a comprehensive plan for further investigation that will be beneficial to scholars, practitioners, and decision-makers on a global scale.

Subject Classification: *00A72.*

Keywords: *Simulations, Virtual reality, Metaverse, Artificial environment, Blockchain, Meta platform.*

1. Introduction

The term "metaverse" is relatively new in the field of technology criticism and academia. The metaverse refers to a novel iteration of the internet that incorporates blockchain technology with virtual reality headgear. There have been online games available for a long time now that are realistic and captivating, enabling players to communicate socially while using virtual reality headsets [1,5]. Roblox and Fortnite, along with other 3D interactive platforms, have been recognized as pioneers of the metaverse because to its features that allow players to create avatars and engage with other gamers within a virtual environment. Despite their large worldwide user base and long existence from the early to mid-2000s, these platforms have limited functionality and lack platform independence within the metaverse.

The introduction of Horizon Worlds by Meta Platforms in 2021, along with the notion that the metaverse could revolutionize various aspects of our professional and social lives, has generated a significant amount of scholarly and professional interest regarding the extensive societal consequences for individuals globally. The term "metaverse" refers to a 3D virtual shared world where augmented and virtual reality services enable users to execute various activities. It is sometimes described as the layer that exists between individuals and reality.

Due to the swift advancement of virtual reality (VR) headsets, haptic gloves, augmented reality (AR), and extended reality (XR), users will soon be able to fully experience the interactive and immersive capabilities of the metaverse [2]. Organizations are now assessing the possibilities of the metaverse and exploring ways to integrate it into their existing business frameworks. The exploration of the design for representing and acting on behalf of individuals as their digital counterparts in metaverse contexts, together with the associated human rights, legal, and ethical concerns, is yet limited. The concept of assets and their ownership within the metaverse follows the same principle. Although the metaverse is currently in its early stages of development, platforms have successfully established ways to

generate income by capitalizing on users' willingness to spend money within this novel virtual realm. Firms that adapt their business models and operational capacities to function in the metaverse can have a profound impact on marketing, tourism, leisure and hospitality, citizen-government engagement, health, education, and social networks [3].

The metaverse offers a limitless array of possibilities for individuals who engage with it, as it seamlessly combines the physical and virtual realms and enhances our experiences and interactions across several modes. Some of these possibilities may surpass our current comprehension [4, 6]. Platform providers are striving to enhance the capacity of individuals and corporations to construct their virtual realms. However, there are various challenges from a sociotechnical and governance perspective. Research has identified several significant areas of concern, such as ethics, data security, legislation, safety, and potential adverse psychological impacts on society's most vulnerable members.

II. The Surroundings

The metaverse encompasses three types of environments: realistic, unreal, and blended. The merged environment exhibits specific illogical traits, which are derived from a real-life setting. The authentic metaverse precisely represents the vision of the designer and the interpretation of geographic and natural phenomena. Avatars cannot concurrently inhabit multiple places throughout the actual metaverse, and their mobility is constrained similarly to that of human beings [7]. This method provides the benefit of delivering thrilling experiences that closely mimic reality, like museum trips and library orientations. Although the aural and visual elements of the environment are exceptionally lifelike, the olfactory and tactile experiences are relatively less authentic. The user's perception is misled by the metaverse, a virtual reality that also surpasses the constraints of real-world time and space. The virtual metaverse provides the advantage of limitless engagement due to the lack of physical constraints, such as gravity. It provides the benefit of allowing users to innovatively create fantastical objects and partake in inaccessible encounters, for example, exploring Mars. In contrast, the unrealistic world is devoid of a robust sense of realism, necessitating a cohesive viewpoint and a properly designed environment.

The benefits of both strategies can be integrated into a singular plan. The metaverse comprises a hybrid environment that facilitates the construction of a novel cosmos based on the fundamentals of reality, while

simultaneously permitting the integration of virtual elements rooted in truth. It is crucial to demonstrate in the enhanced methodology the seamless integration of virtual and physical entities [8]. Despite its increased complexity, the virtual approach offers the advantage of facilitating user experiences that were previously unattainable with an impractical approach. Nevertheless, due to the inherent impossibility of reinterpreting rules and reconstructing the real world, the task of establishing a new cosmos is arduous and intricate.

III. Interface

There are three different methods for the interface: three-dimensional (2D), immersive, and tactile. While not an essential element of the metaverse, the term "3D virtual world" is commonly employed in its definitions. Most metaverse environments are constructed in three dimensions, although the degree of intricacy may differ. The utilization of the 3D technique has the advantage of augmenting realism, but it also presents the disadvantage of interrupting service continuity. There is a significant gap between 2D and 3D screen visualization, and this method calls for extremely powerful technology [8]. Immersion is crucial for the metaverse's coherence and for encouraging user participation. When a user›s actual visual perception is replaced by a physical tool, like virtual reality, the result is an immersive experience. Instead of composing a short «Happy Birthday» greeting to a distant acquaintance, the user is involved in a direct, personal dialogue with an avatar within the metaverse. But mental health issues like disconnection from reality can result from involvement to an unhealthy degree. In addition, societal issues like addiction and identity confusion might stem from unpleasant feelings and experiences experienced in the metaverse. Adding physical components, such as inertia, to the metaverse highlights its realistic nature. While it is admirable to try to make the interface more realistic by adding physical components, the state of the art just cannot keep up with the demands of modern gaming. The visual and tactile ways of depicting the elements of nature. Virtual reality goggles with tactile feedback and haptic suits are examples of direct stimulation that can improve physical sensations. Also, the rippling effect of the water looks more realistic when visual elements like a ball bouncing around are used. However, communicating it is challenging. Users can simulate physical interactions with virtual avatars, including hugs and handshakes [9]. It is not an easy undertaking to depict physical rules over a huge geographical region.

IV. Collaboration

Engagement in the metaverse consists of social networking, collaboration, and individual dialogue. Effectively defining and utilizing the social networking experience in the metaverse is a significant challenge. Furthermore, there is an increasing fascination with the collaborative generation of value that goes beyond individual virtual reality encounters. Persona dialogue maintains a casual conversation by imitating the characteristics of non-player characters (NPCs). Multiple studies have examined the importance of networks because user interaction is the foundation of the metaverse. It is argued by some that social networking sites (SNS) and the Internet come together to create a virtual environment. This network service facilitates the connection between individuals' interactions and serves as a valuable instrument for the expansion of the metaverse. The primary emphasis of most metaverses is on online user interactions [10]. However, it is equally crucial to contemplate the existence of an offline metaverse and an individual metaverse to safeguard privacy.

Collaboration and engagement are essential characteristics in the metaverse. User avatars have the power to communicate and disseminate information. They create innovative value through collaboration and reciprocal exchange. This partnership allows us to transcend the constraints of proximity and geographical distance, which cannot be achieved in the tangible world [11]. Moreover, it incentivizes users to participate in interpersonal relationships and guarantees the seamless functioning of the metaverse's ecosystem. Nonetheless, understanding or accurately evaluating concealed motives may be susceptible to inaccuracies due to the intrinsic constraints of communication, which depend on sensory information that is somewhat constrained relative to total reality. Engaging with metaverse non-player characters (NPCs) that exhibit unique personalities, encompassing interests and hobbies, is essential. The debate functions as a forum for the continuous articulation and enhancement of individuals' experiences inside the metaverse. It is necessary to evaluate both interactions between the user and non-player characters (NPCs) and interactions among users. The metaverse facilitates interaction not just with humanoid NPCs but also with inanimate objects and animals. Conversations within the metaverse frequently transcend the limits of rationality. The usage of angry language in user utterances necessitates an improved secure control mechanism.

V. Value to Society

To evaluate the metaverse's total importance, it is necessary to determine the ecosystem's intrinsic societal value. It is essential to incorporate ecological and transdisciplinary research into the metaverse to promote social goals and ensure its resilience. The metaverse places great emphasis on sustainability. The metaverse serves as both a means to enrich the physical world and as a distinct objective. Through the metaverse, users can exchange their distinct experiences and acquire fresh knowledge. Through this action, consumers enhance their financial wealth, generate novel products, and showcase an alternative facet of their identity [12]. These social activities have constraints on the platforms used, and it is important to maintain consistency, such as in terms of worldview.

Interdisciplinary study enables the metaverse to progress beyond its current state as a mere 3D environment and physical applications, allowing it to evolve as a community. The metaverse requires a variety of principles and innovative concepts that go beyond simple games and social networking. Gaining a new perspective is essential for comprehending the philosophy, psychology, sociology, culture, economy, and politics of the metaverse. It is crucial to adopt a sophisticated perspective rather than solely relying on formulas derived from the real world.

VI. The Taxonomy

The metaverse taxonomy consists of four fundamental components: environment, interface, interaction, and security, as depicted in Figure 1. Initially, it is crucial to comprehend the visual and auditory elements that constitute the world and to establish a setting capable of replicating them. The ability to identify and depict scenes and objects is crucial for the creation of a visual setting [13]. The ability to identify and combine sounds and voices is essential for constructing a soundscape. Moreover, it is imperative to incorporate motion rendering to ensure that non-player characters (NPCs) and avatars move in a lifelike manner. The physical interface enhances the user's engagement in the metaverse. Head-mounted displays (HMDs) and hand-based input devices are commonly used as standard equipment. Furthermore, input devices that do not rely on hand movements and instead use motion-based technology are evolving into input axes. Given that individuals in the metaverse do not consistently communicate using a single mode, the utilization of multimodal interaction is essential. Furthermore, multitasking is crucial as the avatar

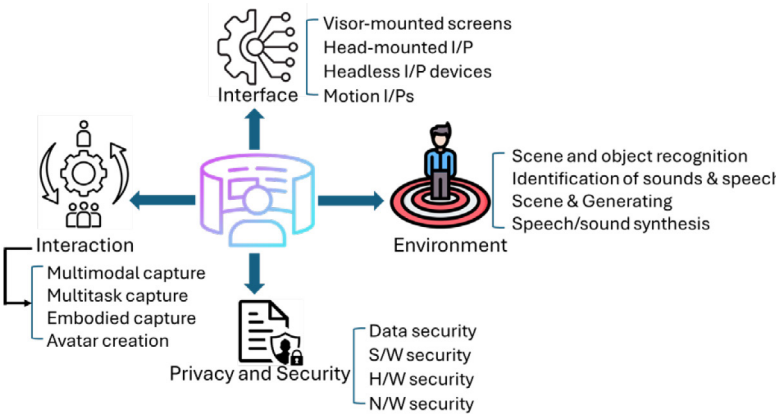

Figure 1

The environment, user interface, interaction, security, and privacy of the metaverse

simultaneously performs many tasks unrelated to the ongoing chat. The agent's behaviour can be influenced by interactive 3D engagement with the physical representation of the agent. The persona is a constituent that amplifies non-player character interactions and the metaverse. To ensure the provision of sustainable services, it is crucial to employ these components hierarchically to structure events and scenarios

VII. Uses

The increased prominence of the new metaverse can be attributed to its heightened social utility compared to its predecessor. The applications of the metaverse are classified into two categories: "use of metaverse" and "metaverse goal," as seen in Table 1 [14]. The term "utilization of the metaverse" pertains to employing the metaverse to tackle concerns and challenges in the tangible realm. The concept of "metaverse goal" refers to the ability of the metaverse to autonomously perform functions such as expanding its scope and generating revenue. Unlike the "utilization of metaverse," "metaverse goal" applications are independent and largely dependent on the virtual realm.

A. Use of the metaverse

The metaverse supplements the real world in various ways by undertaking demanding tasks, such as visiting remote areas, offering psychological support, and training recruits for battle zones. It replaces

well-known environments such as offices, social networking sites, in-person classes, and medical treatment, allowing for the execution of actions that would otherwise be challenging or unfeasible due to factors like expenses. The metaverse serves as a tool that simplifies complexity, particularly in fields like aircraft engineering, and enhances coherence by considering several modes of interaction. Businesses find the metaverse more suitable since it allows for more precise user experience analysis compared to survey analysis that relies on user views [15]. Individuals commonly assert that they consume a greater quantity of water in contrast to soda, nevertheless, the utilization of user logs kept in the metaverse can facilitate precise investigation. Moreover, the measurable data of the metaverse is utilized to replicate user actions shows in table 1.

Table 1

Applications of the metaverse and its objectives

Uses of the Metaverse	Workplace: Teamflow, FB, Gather
	Social life: VRChat, Social media, Zepeto
	Learning:360^{o} video experience, Quiver
	Medical care: Dehealth,3DMRI visualization
Metaverse Goals	Play: robolox, Pokemon go,Twitch
	Enterprises: BaaS, EBaaS,DeFi
	Act out: Dreams questers, Endeavor RX
	actual state: WWW, Earth2

B. Metaverse goal

The metaverse is the primary target of the attack. The metaverse was first utilized as a means of mirroring the tangible realm. Nevertheless, individuals have found worth and interpersonal engagement within the metaverse [16].

VIII. Key Concerns and Opportunities

A. *Sustainability*

Environmentally sustainable environment. To maintain sustainability, the metaverse's operating system requires a substantial user base, and it offers seamless services that can be accessed on even rudimentary mobile devices.

Long-term service in environmental design necessitates considering the scalability of the current constrained environment. Continuously developing open-source platforms that facilitate collaboration among multiple developers and a team of top experts is crucial for expanding the environment and leveraging its potential.

long-lasting interface. The viability of the metaverse hinges on the presence of an intuitive user interface. Holograms and ocular attachments are valuable enhancements to augmented reality and virtual reality. To provide the viewer with a detailed, real-time image, a more advanced approach is necessary, such as enhancing the rendering density for the specific area of interest [17]. In addition, Head-Mounted Displays (HMDs) evaluate and utilize user data by examining eye movement, focus, blinking, winking, and orientation. In addition, several user interfaces protect young users by dampening and suppressing unpleasant sounds from the surrounding environment. Most interfaces in the metaverse are comprised of visual elements along with additional audio components. The tactile, olfactory, and gustatory sensations are duly acknowledged, however, investigations on sensors are currently confined to the realm of experimentation. The commercialization of these numerous sensors could enable the creation of a more immersive and seamless reality. It is crucial to study end-to-end multimodal pre-trained models for processing various types of information, given the increasing interest in multimodal learning.

preserving the metaverse. Interactions can be classified into two categories: discussions between users and discussions with non-player characters (NPCs). Users commonly establish connections with one another in their native language as well as in English through social networking. Nonetheless, a metaverse necessitates a translation service that can accurately interpret and provide idiomatic terms for individuals who speak different languages.

It is crucial to bear in mind that the inclusion of persona, such as preferences or pastimes, as a contributing component to the enhancement of the metaverse, is a significant point to consider during conversations with non-player characters (NPCs). Engaging in continuous discourse with diverse individuals and ideologies is vital. Due to a simplistic non-player character (NPC) design that lacks multiple personalities, it becomes difficult to maintain the user's engagement. We need non-player characters (NPCs) that evolve in tandem with users and respond reliably to unexpected situations. Considering the user's behaviour as a lifelog, it should be possible to answer logically by considering the history of discussions, such as a chat that occurred a month ago [18]. Non-player

characters (NPCs) can be extended and employed to represent a wide range of living entities, including horses, dogs, and cats, as well as inanimate objects like desks and clocks, in addition to humans.

B. *Safety*

Privacy and security in the metaverse have been largely neglected, despite the considerable amount of research conducted on metaverse technologies. Metaverse users, especially those on social media, place a premium on privacy and security. Criminals can learn a user's identity by tracking their interactions in the metaverse, their purchases, and other activities, as well as by monitoring and collecting biometric data in real-time, such as facial movements and vocal intonations. When building the metaverse in a digital or cyber setting, it is crucial to think about privacy and cybersecurity issues so that services may be provided to customers safely and efficiently. Cybersecurity and confidentiality must offer a wide variety of methods, approaches, and solutions to protect users and systems from many possible dangers and vulnerabilities.

The virtual self (avatar) generates for the user a great deal of data in the metaverse, including sensitive information (such as private messages, voicemails, and videos), secrets of trade used in the workplace, and personal data necessary for the maintenance of services. Consequently, there will continue to be security vulnerabilities for this data. Private data and information stored in virtual environments, metaverse platforms, or service systems can be counterfeited and exposed. During platform usage, a user's avatar data, including voice and video recordings, may be vulnerable to compromise. Additionally, an attacker might exploit the situation by creating a fraudulent avatar and employing it for malevolent purposes. Nevertheless, due to the interconnected nature of advanced services in the metaverse, where personal information is constantly shared in real-time rather than at a specific moment, it becomes extremely difficult to determine the precise timing for effectively assessing the necessary security measures to maintain control over personal information [7]. Moreover, the existing system lacks adequate protective mechanisms and management restrictions to safeguard the virtual environment of the metaverse from its inherent characteristics. Anonymization of personal data, a data access control strategy that is both flexible and accurate, and improved authentication accuracy are all examples of such requirements. Furthermore, crucial data must be encrypted and stored securely to reduce the likelihood of unauthorized access.

The potential for metaverse technologies to gather far more personally identifiable information than conventional systems pose a serious risk to users' privacy. For instance, metaverse headsets with live sensors can record every discussion, and head-mounted displays (HMDs) with continuously active cameras can capture video in private spaces. In addition, devices that track the user's eyes can capture the direction in which they look. Strong safeguards must be put in place to preserve sensitive information to resolve privacy concerns, and improve data security. Implementing encryption, pseudonymization, dynamic access control, and fine-grained authentication is all part of these phases [12]. In addition, producers of metaverse platforms must adhere to privacy legislation and specify privacy standards when collecting data.

Enhancing the safety of the virtual world should be the top priority. In the same way that existing software systems can be compromised by vulnerabilities in the architecture of the system, unpatched computer programs, malware, and ransomware can also affect the metaverse. Teens and young adults may also come across explicit or sexual content. As an example of a representative metaverse, hackers breached Roblox. Hackers enacted ransomware to cripple the Roblox platform and demanded payment in Robux, the virtual currency used in the game. The hackers also forced fictional characters to act inappropriately, revealed sexually graphic photographs, and made racially disparaging comments.

In addition, bad actors have new openings to threaten lives and safety via the use of Augmented Reality (AR) in real-world settings like healthcare and business. Infectious programs have the potential to momentarily blur a user's eyesight. Use of metaverse platforms for sensitive business activities, such as high-security research, must be carefully considered.

Strict safety precautions have been implemented at the hardware level. Head-mounted displays (HMDs), virtual reality (VR) headsets, and Internet of Things (IoT) devices can be employed to authenticate users and control their access to certain media [19]. In the absence of a username and password, they could potentially allow users to bypass the required authentication and authorization procedure. Devices can also be linked to biometric data, such as movement monitoring. Hence, if malicious individuals manage to exploit the security vulnerabilities of metaverse devices, they can gain remote control over these connected devices, extract targeted device data (such as gaze information and activities within the metaverse), or compromise the central management server in metaverse systems by hijacking the user or administrator privileges of the devices. Therefore, it is imperative to protect every device used on the Metaverse

platform. The gadgets must be updated with patches and comply with robust security measures. Furthermore, it is recommended to utilize a distinct, fortified chip instead of relying on the device's software module when incorporating security measures on a device. This is due to the elevated CPU load and potential degradation of device performance.

Most Metaverse systems lack encryption for both Avatar-to-Avatar and user-to-platform connections. Consequently, assailants can employ sniffing or spoofing attacks on the metaverse platform to intercept messages or acquire confidential information. For optimal security in the metaverse, it is imperative to encrypt network connections using a robust and efficient encryption method that aligns with the specific data and conditions. Availability is a significant concern, as online asynchronous services are more vulnerable to network outages or security attacks, such as distributed denial of service (DDoS), compared to metaverse services. Having a business continuity and disaster recovery strategy is recommended when a system is crucial for corporate operations. An example of this is when a Distributed Denial of Service (DDoS) attack can cause unexpected consequences for a metaverse system.

IX. Difficulties and Prospects

Security and privacy must be mandatory in the metaverse. These factors are crucial and indispensable components that require constant monitoring throughout the entire service process in a metaverse environment. Throughout the entire lifespan of a system, encompassing its initial deployment to its eventual decommissioning, it is imperative to carefully assess and effectively handle security and privacy measures. To assure security and privacy, we might follow the "security by design" architecture. The concept of "security by design" refers to a cybersecurity approach that allows a company to systematically plan and implement security measures within its infrastructure. To achieve this goal, the company must include security in its IT management processes and automate data security measures. During the entire development and maintenance process, all products, whether they be software, hardware, networks, or content, must correctly maintain critical security attributes like privacy, accessibility, reliability, authentication, and confidentiality [20]. Data access control that is automated, customizable, and encrypted using artificial intelligence is one example of the sophisticated security solutions that are needed. It is not enough to merely use preexisting security solutions; rather, a unique privacy and safety strategy must be

developed to handle the metaverse's unique security and privacy challenges. In addition, a plan to safeguard the IP of metaverse-based works of art must be put in place immediately.

X. Studies Involving Multiple Disciplines

There are no nations, borders, or genders in the metaverse. We need a fresh viewpoint that goes beyond the current humanistic method. Many disciplines are part of the metaverse, including management, marketing, and strategic research. This section covers a wide range of topics, including a social lens on politics and economics, a collective perspective on sociology and cultural studies, an individual lens on philosophy and psychology, and a collective lens on sociology and psychology.

Based on the group or scenario, people adopt different personalities and use different ways of communicating. One way to represent oneself in virtual worlds is via an avatar. With each new version of the metaverse, the user becomes more immersed in their avatar and the virtual environment around them. But compulsive use of electronic media, such as video games or the internet, and prolonged exposure to it can cause mental confusion and a loss of interest in differentiating between real and imagined worlds. A person's connection with an avatar calls for deep philosophical contemplation [17]. Connecting with others on an emotional and psychological level is made easier in the metaverse. Instead of a succession of superficial encounters, conversations are driven by genuine interest. Considering the thoughts, feelings, attitudes, and memories of non-player characters (NPCs) is crucial for having meaningful interactions with them. The philosophy of mind, intrinsic motivation, and episodic memory are particularly notable traits. NPCs retain major events in their episodic memory and subsequently utilize this information during conversations. Sustaining uniformity over multiple contacts necessitates inherent drive, which is essential. The metaverse has the potential to address discrimination and societal imbalances, including those related to race, ethnicity, gender, and skin tone, within the realm of the humanities (social, cultural, etc.). Limited resources drive competition and result in adverse societal consequences. Within the metaverse, one can generate an infinite array of resources and commodities, such as concert tickets. Unlike the concept of opportunity cost in the real world, the metaverse promotes collaboration and reduces competition. It is necessary to consider several social impact variables, including bias, legality, and ethics [18]. To construct a metaverse civilization, it is important to engage in novel forms of study.

Culture is a social construct that evolves over a long period, characterized by its ethnic and geographic characteristics. Behaviour and discourse exemplify the expression of cultural features. The metaverse is not subject to the geographical and temporal limitations of the physical universe [12]. If an identical world were to be constructed, it would ultimately have a distinct form, akin to that of a parallel universe.

Aspects related to finances and politics: The modern metaverse is an interconnected economic structure modelled after the actual world. Physical currency is converted into digital assets within the metaverse, and any earnings are then reinvested within that virtual realm. The inclusion of high-end enterprises has showcased the metaverse's capacity as a profitable framework [20]. If a robust and sustainable economy is formed, further tangible goods will be incorporated into the metaverse. The metaverse market is poised to grow steadily, playing a crucial role in establishing a viable metaverse environment. Nevertheless, the metaverse's dependence on virtual goods results in significant fluctuations in asset volatility. There are no established systems in place to preserve one's social status. Politics in the contemporary world are founded on nation-states. The metaverse is not limited by geographical boundaries, organizational structures, or legal regulations. In the previous iteration of the metaverse, the service provider established the guidelines and supervised the operations. The decision-maker transitions from being a service provider to assuming the role of a group leader. Politics do not revolve around specific regions or countries; hence, a novel perspective on politics is necessary.

XI. Observations at the End

The emergence of the metaverse has prompted a surge in academic research and discussion over its benefits and potential to transform society. The advent of the metaverse introduces novel and stimulating degrees of engagement between the tangible and digital realms, generating fresh prospects and prospective commercial frameworks. Nevertheless, the extensive implementation of this technology also presents various obstacles with management, moral principles, safety and protection, appropriate conduct, confidentiality, and the possible marginalization of communities without the necessary means to enter the metaverse. This study takes a critical perspective and offers valuable insights into the benefits and challenges associated with the growing utilization of the metaverse, considering many perspectives and their impact on business

and society. Further academic research on the functioning of enterprises in the virtual world is necessary. However, it is essential to maintain a balance by also investigating the ethical, behavioural, and detrimental impacts on vulnerable users. The proposed research agenda presents numerous potential avenues for further scholarly exploration of the multifaceted aspects of the metaverse and its societal impacts.

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Received March, 2024