

On Development of Metaverse and Digital Ecology Safety

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Abstract: The metaverse is not just an extension of physical life into the digital realm but a profound change in the new generation of the digital realm. The metaverse is the future integration of all elements, including the Internet, artificial intelligence, virtual reality, immersive experience, blockchain technology, Internet of Things, Internet of Body, cloud computing, and virtual twins. Several dimensions, such as object, subject, time, entity, and virtuality, can divide the metaverse into four primary forms: augmented reality, life log, virtual twin, and virtual reality. The metaverse means that more and more of our lives, labor, leisure, time, wealth, happiness, and relationships will be spent in virtual worlds. The problems in the cloud universe include the illegal collection of private data, violation of personal rights, digital human evil, data security, increased digital divide, robot evil, artificial intelligence discrimination, health issues, and the gamification of life. It is the direction to build the metaverse, keep the digital ecological environment pleasant, and promote the overall development of humanity.

Keywords: Metaverse; Virtual Reality; Augmented Reality; Virtual Twin; Digital Ecology; Cyber Security.

1. Introduction

The metaverse is a persistent, living digital world that provides individuals with a sense of substitution, social presence, awareness of shared spaces, and the ability to participate in a broad virtual economy with profound social implications. So far, few seem to be able to explain what the metaverse is or will be built, and some even wonder if it is too early to call this a period of metaverse development. However, the sense of smell of capital is always the most sensitive, and the development of the metaverse at home and abroad is in full swing. "In the intelligent society shaped by the metaverse, the highly developed digital intelligence technology and social life are mutually constructed, deeply rewriting the relationship between man and the world, man and society, man and information, and man and self." [1] There are four primary forms of metaverse: augmented reality, life log, mirror world, and virtual reality. The metaverse includes virtual reality, social media posting, live broadcasts, artificial intelligence, blockchain technology, computer vision, and other technologies. What the metaverse is has not yet been defined. Still, the development prospects of the metaverse have become apparent, as Marshall McLuhan said: "The U.S. Securities and Exchange Commission reports that in the first six months of 2022, the word metaverse appeared in regulatory filings more than 1,100 times. The previous year saw 260 mentions. The preceding two decades? Fewer than a dozen in total." [2]

2. The Background and Market Prospects of the Metaverse

Neal Stephenson coined the term "metaverse" in his 1992 science fiction novel *Avalanche*. In the novel, the "metaverse" refers to a virtual reality-based digital world in which real people use their digital avatars to escape into the virtual world and avoid the harsh real world. Now, as the concept evolves, that definition has become more nuanced. It has since been categorized as everything from the new Internet to virtual

societies, the fusion of virtual and physical realities, persistent virtual spaces, and the return of the virtual twin of our world.

The metaverse is a multi-user, real-time virtual realm where individuals worldwide can network, coexist, socialize, and exchange value. It is an extension of the Internet and an iterative upgrade of the Internet. The fourth era of computing and networking was the first phase from the 1950s to the 1970s; the second was the personal computer and the Internet from the 1980s to the mid-2000s; and the third was today's mobile and cloud era. Each generation has changed the elements of who, when, where, why, and how to access computing and network resources. These changes profoundly affect each stage.

Few have explained what the metaverse is or will be; some even wonder if it is too early to call it a period of metaverse development. However, the sense of smell of capital is always the most sensitive, and the development of the metaverse at home and abroad is in full swing. The SEC (U.S. Securities and Exchange Commission) reported that the term metaverse appeared more than 1,100 times in regulatory filings in the first six months of 2022, in contrast to 260 mentions in the previous year. Only a dozen was mentioned in the first two decades. [3]

The basic technology and talents of the metaverse have been preliminarily available, but over the years, countries worldwide have postponed their digital transformation plans for various reasons. However, when the COVID-19 epidemic ravaged the world, the world completed the integration of online and offline almost overnight. Visionary companies have discovered massive deposits buried in the digital data ecology and organized elite soldiers to dig them out day and night.

Facebook (Facebook) first changed its parent company's name to "Meta". The other six largest listed companies worldwide, Amazon, Apple, Google, Microsoft, Nvidia, and Tencent, are also busy recruiting talents, reorganizing their structures, and enhancing R&D capabilities, preparing to release dozens of billion-dollar metaverse products. Earlier this year, Microsoft announced the largest acquisition in Big

Tech history, buying gaming giant Activision Blizzard for \$75 billion. McKinsey & Company estimates that in the first five months of this year, corporations, private equity firms, and venture capitalists made a combined \$120 billion in metaverse-related investments. By 2024, the metaverse will provide a massive \$800 billion market.

“In addition to the major Internet companies deploying the metaverse, some cities have quietly started wrestling and contesting the metaverse, and the term “metaverse” has appeared in government work reports and industrial plans in many regions. For example, Shanghai has written the metaverse into “14th Five-Year Plan for National Economic and Social Development and the Outline Plan of the Long-Range Objectives Through the Year 2035”, a Metaverse Special Committee was established in Hangzhou, the NetEase Metaverse Industrial Base was settled in Sanya, and a Metaverse Innovation Laboratory in Shenzhen...” [4]

The metaverse is resilient against risk. When the global COVID-19 epidemic is raging, metaverse helps the health department to monitor the outbreak, helps many small businesses to tide over the difficulties, and also helps many users to order food, shop, study, hold meetings, live broadcast, exercise, and even participate in telemedicine through the Internet. Technology is people-oriented, and so is the metaverse. As endowed fast, low-carbon combines cutting-edge technology and humanistic care. The metaverse is on the cusp of capital pursuit.

The Internet has been integrated into life. The deeper the digital and physical realities integration, the more critical and valuable data will become. It is in this sense that data is far more valuable than oil. The digital ecology environment’s innovation and development are in full swing. On the one hand, it is nurturing and reshaping the world; on the other hand. It is necessary to see that the metaverse is complex, with good and evil, with many potential threats. It is essential to cultivate netizens’ correct digital ethics and moral literacy, improve the network’s technical safety standards, and strengthen the construction of laws and regulations.

3. Basic Concepts and Basic Forms of the Metaverse

The metaverse is the future integration of all elements, including the Internet, artificial intelligence, virtual reality, immersive experience, blockchain technology, Internet of Things (IoT), Internet of Body (IoB), cloud computing, and virtual twin. The six technical pillars BIGANT supporting the metaverse include blockchain technology, interactive technology, video game technology, artificial intelligence technology, intelligent network technology, and Internet of Things technology.

However, there is no clear definition of what the metaverse is. There are different opinions on the metaverse, with other cases using various combinations of augmented reality, virtual reality, NFT, and blockchain technologies, and all refer to the result as the “metaverse.” So, what exactly is the metaverse? It is interoperable and interconnective, but there is a lack of standard, concise, coherent definitions or accepted features or capabilities.

The metaverse is a world where computing seamlessly overlays the physical world around us. Virtual worlds will have three fundamental properties: social presence, network continuity, multi-person sharing, and interoperability. A large-scale and interoperable network of real-time rendering 3D

virtual worlds that can be simultaneously and continuously experienced by massive users, with continuity of data such as identities, histories, rights, objects, communications, and payments.

The metaverse cannot be described as wearable devices such as immersive virtual reality headsets or augmented reality glasses; it cannot simply be equated with online games or be confused with Web 3.0, NTF, and blockchain. All three are possibly an essential part of the metaverse. The connotations and boundaries of the metaverse are full of unknowns. Virtual devices, platforms, software, technologies, or principles are only a part of the metaverse. Arbitrarily defining the metaverse may be a blind man touching an elephant.

Microsoft believes the metaverse consists of virtual twins, simulated environments, and mixed reality. Augmented, virtual, and mixed reality are ever-changing thoughts, showing more streams of consciousness and growing in cyberspace. The mirror world is to replicate the appearance, content, and structure of the natural world in the metaverse. The mirror world seems to be the original appearance of the actual world. Still, the selection and processing of information are selective, and the mirror world cannot represent the entire natural world, such as the Baidu map and Gaode map. Map providers regularly update maps on time to ensure that virtual and objective reality are consistent.

Italian neuropsychologist Giacomo Rizzolatti found that mirror neurons significantly impact the body’s activity [5]. It is because of the role of mirror neurons that we can learn knowledge and skills by observing and imitating the behavior of others; when watching movies or reading novels, we will connect our own experiences to the experiences of the protagonists in the book and empathize with them, immerse ourselves in the protagonist’s touching stories, resonate, and gain aesthetic influence.

Virtual and augmented reality will help users narrow the gap between the digital and physical worlds. Both immersive technologies allow users to experience digitally rendered content in physical and virtual environments, changing the way and habits of socializing, playing, working, and collaborating. Of course, the two are not the only access points to the virtual world. It is necessary to understand the general classification of the metaverse:

- Augmented reality superimposes virtual images and things on reality or applies story logic to it to create a new world;
- Life logs share their records of life in various forms, such as text or images;
- The virtual twin is like a mirror, for it clones the real world, widens the boundaries of the natural world, and achieves more goals;
- Virtual reality comprises entirely new worlds that do not exist in the real world.

From the dimensions of an object, subject, time, entity, and virtuality, the metaverse can be classified into four primary forms: augmented reality, life log, virtual twin, and virtual reality (as shown in *Table 1*). Each basic form has at least three tenses, so the metaverse has 12 derivative forms. There can be multiple cross-combinations in specific applications, and each state has its application value.

The first globally known metaverse may be the online game *Second Life*, created by Linden Lab in 2003. According to the above classification, it mainly belongs to virtual reality. At its peak, there were about 1 million regular users and

nearly \$1 billion of annual virtual goods trading. It even created the world's first real-world millionaire by selling virtual real estate as its virtual asset.

Table 1. 12 Derivatives of the Metaverse

Time	Augmented Reality	Lifelog	Virtual Twin	Virtual Reality
History	Enhanced History	Historical Life	Historical Virtual Twin	Virtual History
Reality	Augmented Reality	Real Life	Reality Virtual Twin	Virtual Reality
Future	Augment The Future	Future Life	Future Virtual Twin	Virtual Future

A virtual world, whether augmented reality, virtual twin, or virtual reality, is akin to a new society. The rules involved in the virtual world, the embedded governance structure, and the virtual economy's establishment and operation will determine the virtual world's mode and its impact on users. The virtual world imitates the process of the whole human society. Only those with a scientific and systematic understanding of the natural world and who can abide by laws, morals, norms, and social ethics can build a metaverse.

4. The Application of the Metaverse in Various Fields

The metaverse paradigm is shifting. It is reshaping the world. The metaverse is not just an extension of physical life into the digital realm but a profound transformation of the new generation of digital domains, such as mixed reality offices, online conferences, online classroom education, live broadcasts, and live broadcast delivery. The companies that lead in the metaverse development will be more dominant than the leaders in today's digital economy. Initially, new technologies complement existing forms but gradually replace older ones. Traditional radio can only be heard on conventional radio. In the early days of the Internet, listening to radio programs on AM or FM radio stations and the Internet simultaneously was possible. Over time, many radio programs that can only be attended to on the Internet have evolved into podcasts. The development of other media is very similar to the development of broadcasting.

(1) Metaverse and life experience

The metaverse will fundamentally change our society; people everywhere will live, experience, and explore it. It will be integrated into people's clothing, food, housing, and transportation as naturally as the air they breathe. For example, during the 6.18 period of Taobao.com, Metaverse Shopping was launched, and users could initially realize virtual shopping on the terminal device without wearing external devices. Some experts predict that in 2040, the average person may have a highly complex and realistic 3D avatar with a few preset clothes and hundreds of dresses. If the customer cannot find the right fit, they can also make a tailored fit. Based on hyper-realistic twin digital human technology, Hanfei Technology, a company in the Heifei City of China, makes users try on clothes anytime and anywhere combined with fine 3D clothing modeling with cloud rendering technology.

The immersive 3D version significantly improves the brand experience, and even if the consumer decides not to buy the product, it is an opportunity to get to know the customer

and gain valuable advice. IKEA launched the Place app in 2017, an example of using augmented reality to provide customers with a unique experience while capturing additional user data streams for IKEA. The app takes full advantage of Apple's expanded reality framework ARKit, allowing users to try out furniture online to preview how a new sofa or table will look in a potential customer's home. In the future, virtual reality can also realize the sense of taste and smell. For example, in the future, "cloud dinners" will be more worthy of the name. Online sharing of virtual food can simulate the sense of taste and even allow astronauts to "enjoy" their favorite food on Earth in space.

(2) The metaverse and academic education

The COVID-19 pandemic has spawned metaverse innovations in education. ACAI, a world-renowned academic conference on artificial intelligence, put the 2020 seminar on Nintendo's open game "Animal Crossing: New Horizons." Before the start of the meeting, all the participants flew to the host's island in advance and entered the host's room to prepare for speeches. The assembly room has been pre-arranged with golden chairs, podiums, laptops, and an espresso machine. Some participants even wore masks as in reality.[6] Another example is at the Communication University of China, where some students rebuilt the campus in the sandbox game "Minecraft" and completed the graduation ceremony through virtual images. Nanjing University also held a unique cloud graduation event, sending warm blessings to teachers and students through the virtual world.[7]

Artificial intelligence (AI) has the potential to disrupt the education industry. By 2040, artificial intelligence could take over much of the education system. Students can access A.I. professors using virtual and augmented reality gadgets. A.I. teachers can provide students with tailor-made teaching guidance, evaluate teaching effects, and adjust to the best teaching method. "The immersive teaching of the metaverse can reconstruct the images, words, sounds, and other resources of the physical world into a three-dimensional virtual world, and users will get a new learning experience in the virtual world." [8] With the help of the virtual simulation lab, students can dissect frogs in virtual reality and even travel along the frog's circulatory system; they can also act as astronauts in virtual reality and explore Mars.

(3) Metaverse and cultural entertainment

Metaverse makes it convenient to manage the brand image in the whole chain and build deep and lasting loyalty and reputation for the brand. Disney has been a world leader in digital transformation. Due to the innate relationship between NFT and art, "Gallery" is currently the most popular business model in the metaverse, and most operators are artists or from related groups. Virtual idols are also a hot topic. At the end of 2021, a virtual idol named *Liu Yexi* became popular on the Internet, and his account gained nearly 8 million followers after only three videos were published. The overall market size driven by virtual idols is vast. The overall market size in 2021 was expected to exceed 100 billion.

The metaverse will enable the gamification of human life, and all entertainment in the metaverse will trigger a dopamine surge more than social media. The A.I. system learns about the user over time and tailors the metaverse experience to the user's preferences. By listening to social data to ensure that the character's speaking style perfectly matches the target audience, it can also adjust the interaction parameters and modes according to the player's personality characteristics,

providing an extraordinary immersive experience. In December 2021, Disney filed a patent for a “virtual world simulator” that brings theme parks into the virtual world, with the assistance of which users can get an immersive, personalized naked-eye 3D virtual experience. Metaverse technologies have injected vitality into brand innovation.

(4) Metaverse and digital medicine

Metaverse technologies such as augmented and virtual reality can change thought patterns or attitudes and help individuals achieve their goals faster to help patients regain muscle strength during recovery. Brain-computer interfaces (BCI) can stimulate the creation of new neurons around damaged areas of a patient’s brain, which is beneficial in restoring the ability to walk. On July 6th, 2022, brain-computer interface startup Synchron implanted the first U.S. patient with amyotrophic lateral sclerosis with an IoB device that helps him browse the web with his mind, send emails, and communicate by text. The Centers for Disease Control and Prevention estimates that as many as 6.1 million Americans have atrial fibrillation, which is expected to increase with aging populations. The Apple Watch is designed with a single-lead ECG test to assist wearers in screening for atrial fibrillation.

The BCI research began early in the 1970s at the University of California, initially focusing on restoring impaired vision, hearing, and movement. Now, the BCI can detect small changes in the energy radiated from the brain as humans think, thereby recognizing patterns in the brain. Magnetic resonance imaging (MRI) shows which parts of the brain light up when humans think about certain things. The user’s thoughts have no place to hide in front of the brain-computer interface. On July 6th, 2022, brain-computer interface startup Synchron implanted the first U.S. patient with amyotrophic lateral sclerosis with an IoB device that helps them browse the web with their minds, send emails, and communicate by text.

(5) Metaverse and enterprise operation

Metaverse offers a new way to conduct business, connect with clients, and collaborate with colleagues. Companies that value the metaverse continue to improve brand loyalty, optimize product design processes, and have a good development momentum. The metaverse can provide interfaces seamlessly connected to reality, with enhanced and complementary functions, and even create various virtual scenarios. The boundary between the real and virtual worlds is becoming increasingly blurred, and the two integrate closely. For example, the Tencent meeting application has become an online tool for communicating and coordinating in many enterprises and institutions during the COVID-19 epidemic. It can set A.I. meeting scenarios, online voice or video, and use whiteboards, group discussions, voting, and support for online collaboration and online documents in multiple formats, automotive screen recording, and other functions. The enormous potential of individual innovators and artists will have an even greater scope for talent. In the future, more people will settle in suburban areas far from the city center but can enjoy the same job opportunities as the urban center.

The industrial metaverse will cover the entire industrial production chain, including product design, process development, production testing, production line production, equipment debugging, production line inspection, remote operation and maintenance, operation management, personnel training, and marketing systems. [9] Affected by the epidemic, many factories have introduced robots and

become fully automated. The robot will not get sick, can work 24 hours daily, and does not require social distancing. In addition to fully automated factories, employees are facilitated by various technologies, including immersive technologies like V.R. or A.R., to an augmented workforce, a mix of human workers and technology that seamlessly collaborate for better outcomes. The full-scale humanoid bionic robot CyberOne, released by Xiaomi Technology in August 2022, is one of Xiaomi’s exploration achievements in creating a “connecting people and everything” technology ecosystem. It can recognize 85 kinds of ambient sounds and 45 kinds of human emotions in 6 categories.

5. Potential Dangers of the Metaverse

The metaverse is a digital living world that provides individuals with a sense of substitution, social presence, and shared space awareness. Users will have different virtual experiences in various virtual worlds. However, just like the real world, the metaverse may present dangers and ethical challenges, such as breaches of privacy data collection, online abuse and harassment, theft of sensitive information, security breaches, artificial intelligence, rampant bots, the digital knowledge gap, and physical and mental health issues.

(1) Privacy data and personal rights

In 2018, researchers found that a 20-minute VR game would collect 2 million data points, including body movements. Most headsets include eye tracking and face tracking. The data that can be collected has blink frequency and duration, eye movement, eye state, pupil characteristics, iris characteristics, and facial features. Micro-expressions can reveal the user’s personality characteristics, mental health, skills and abilities, sleepiness level, age, gender, origin, and cultural background. These data can be associated with the user’s Internet browsing content preferences, media type, duration, and other data to profile the users accurately. Obtaining these data requires the user’s informed consent, but not all businesses respect the user’s informed consent.

In the virtual world, the ugly phenomena in real life will also appear. Sexual harassment, abuse, and cyber violence may occur in virtual reality. The Internet is not a place outside the law; how to preserve the illegal evidence of the perpetrators and stop the violation of personal rights on the Internet. Metaverse service providers may obtain users’ private data beyond their authority and use it for product promotion or resell private data to insurance companies to avoid insurance for people with genetic diseases. Hackers may hack into the brain-computer interface, control the user’s brain and body, and even rewrite the user’s memory. This technology, which violates human autonomy and the right to life, needs to be strictly controlled by law.

In the virtual world, hackers attack organizations incredibly, trying to steal data from consumers and organizations. In the metaverse, the security levels and measures of the Internet, the Internet of Things, and the Internet of Things are not consistent, and each link may provide opportunities for hackers. Every critical company may be hacked to steal financial information, customer information, and intellectual property. Ordinary companies are not immune to hacker attacks. Data leakage, such as personal files, electronic medical records, and consumption records, may bring individuals material, monetary, or spiritual losses.

(2) Digital humans and black box discrimination

Creating digital humans is no longer exclusive to anime movies. Anyone can make any digital human they want with

the help of software similar to MetaHuman. Pick a suitable starting point from the library's many selections, select a few more sampled objects, and mix, adjust, and polish. "The focus of China's digital human research and development has shifted from 'digital visual human' to 'digital-physical human' and 'digital-physical human.' Undoubtedly, such digital humanoids will also have their digital avatars in the metaverse, and that is to say, they will also interact with real people and digital people in both virtual and real situations." [10] Some people may be reconstructed by people with ulterior motives, pretending to be their speech or doing something that damages their reputation or violates property rights.

Bad bots account for 20% of all internet traffic and continue growing and expanding. Thanks to available data collection, A.I. knows more about what the user wants than the user. The recommendations of these algorithms are based on collected data and often only provide advice that matches the user's profile, constantly reinforcing the user's attitudes and beliefs in an attempt to sell more products or keep users on hold for longer. For businesses that use evil bots, consumers are just some leeks to be slaughtered, whose fundamental rights of personality and privacy are not respected.

On the surface, computers are unselfish, but programmers and the managers behind them are biased due to the algorithmic black box. With big data, computers can make accurate predictions on various topics, such as earthquakes, tsunamis, tornadoes, epidemics, property markets, and financial turmoil. Still, ordinary people do not understand the reasoning behind them. The metaverse seems to expand the universe's boundaries, but revealing is obscuring, and the metaverse has data and A.I. elites that know it. Artificial intelligence's logic to exclude special groups of people can create black-box discrimination in many digital environments, including health insurance, educational opportunities, and recruiting practices. China has entered an elderly society. How can artificial intelligence truly consider elderly users and be reliable and worry-free?

(3) The digital divide and ethics

Big tech companies will become more powerful as they get to grips with the vast data generated in the virtual world. The ten wealthiest people have doubled their wealth during the COVID-19 pandemic, while 99% of human incomes have fallen. In the first two years of the pandemic, the billionaires' wealth increased by \$15,000 per second. [11] Nearly 2.9 billion people worldwide still have never surfed the Internet. Using the metaverse requires a good infrastructure of network equipment and basic Internet skills, and the purposes and effects of experiencing the metaverse are very different for the rich and the poor. The result of the metaverse development could further widen the digital divide.

Video games can be great entertainment and educational tools but can lead to many physical and mental health problems. Excessive video gaming can cause symptoms like drug addiction, severe brain or health problems, and sudden death. The consequences could be devastating, especially if people spend more time in virtual than physical reality. Minors immersed in a gaming environment for a long time may not be able to interact with others normally. Gaming is destroying and deteriorating mental health, is highly addictive to teens, and severely damages users' physical and psychological health. The same is true in other fields. The hardware equipment for the metaverse is not yet mature or humanized, and prolonged use can cause dizziness. Do we

need to rely on so many cumbersome facilities?

The BCI gives us a whole new way of interacting with computers, machines, and each other. However, this new form of communication can also pose serious problems. After all, human thinking is currently one of the last genuinely private domains, and the BCI could change that. The BCI was even used to download the consciousness of the entire brain and become a digital human immortalized in a virtual space. Would such a person take up too many digital resources? Will it interfere with the metabolism of the digital ecosystem? As for those operations that try to rewrite the brain's memory, extreme caution at the legal level is required. Both the starting point and destination of the metaverse are "people." What are the ethics and morals it should respect? What laws should it follow?

6. Guarantee the Ecological Security of the Metaverse

The ecological security of the metaverse involves aspects such as national sovereignty, information security, network security, and cultural security. If a corporation gains control of the metaverse, it will become more powerful than any government and become the god on earth. The metaverse bursts out with immense energy. If the negative energy is unrestrained, it will severely harm society.

(1) National sovereignty

"The A.I. industry is simultaneously challenging and reshaping the states' traditional role while also being used to shore up and expand older forms of geopolitical power. Algorithmic governance is both parts of and exceeds traditional state governance." [12] In the cyber age, the space for exercising national sovereignty includes territory, territorial waters, airspace, and cyberspace. Future national security will increasingly depend on "virtual territories"—the effective governance of the metaverse. With the network security level, the state implements critical protections for essential industries and fields such as public communication, information services, energy, transportation, water conservancy, finance, public services, and e-government. [13]

(2) Information security

Metaverse integrates blockchain, digital currency, encryption technology, and other information technologies, combined with virtual reality, augmented reality, virtual twin, and life logs, which has a strong attraction. Long-term immersion in digital scenes can easily lead to indifference to individuals' objective understanding of things, unthinkingly buying digital assets, and indulging in illusory satisfaction. Limiting the dangers of virtual worlds requires legislative bodies and regulatory agencies to formulate relevant laws and regulations in advance and strictly implement them. Relevant departments should strengthen the education of citizens' digital society ethics and legal system. Cybercrime is already wreaking havoc globally. As society moves into a multi-dimensional digital experience period, cybercrime is expected to grow to \$10.5 trillion by 2025, surpassing the combined GDPs of Germany, France, and the United Kingdom. [14]

(3) Network Security

Metaverse integrates blockchain, cryptocurrency, NTF, virtual reality, the Internet of Things, and other technologies. Cyber hackers' theft of information, data, and digital wealth will become crazier, and it is possible to forge contracts, digital collections, and digital people deeply—even control individuals or groups through the BCI. Faced with the new

situation and network security requirements in the new era, we will upgrade the network and computer security from laws and regulations to software and hardware and promote high-quality innovation and development of the network security industry. For example, the “Shanghai Action Plan for Building Cybersecurity Industry Innovation Highland (2021-2023),” released in December 2021, focuses on the digital transformation of urban economy, life, governance, industrial Internet, and digital new infrastructure, artificial intelligence, and data regulations and other innovative scenarios. It will promote opening at least 100 security requirements and deepen the creative application of network security technologies, products, and services.

(4) Cultural security

Built on distributed servers, blockchain technology, and encrypted virtual currency, the metaverse advocates decentralization. Everyone is the master of data and completely controls their data, privacy, and identity information. It is challenging to define and hard to put into practice. The technological theory ignores essential factors such as people and capital. It needs a considerable investment of human and capital resources, and individual people cannot escape the control of money. Individuals may be lost in dreams in the metaverse, forgetting their nation’s valuable culture, resulting in collective amnesia. The metaverse culture industry must focus on discovering excellent traditional culture, telling stories well, and defending cultural security.

The metaverse should not become a Leviathan-style monopoly platform in the business world, wantonly materializing and alienating the digital ecology, nor can the metaverse become the Godzilla behemoth that hegemonic countries dominate the world in the digital economy era. [15] The starting point of the metaverse is to benefit the healthy development of human beings, build a metaverse with a pleasant digital ecological environment, and promote the overall development of humanity.

7. Conclusion: The Future of the Metaverse can be Expected

The metaverse presents promising prospects and possibilities, opening the door to the future. Artificial intelligence, virtual reality, augmented reality, 5G, and Web 3.0 offer greater functionality and interoperability than any previously available service. It can be expected that the metaverse will play an increasingly important role over the next decade and beyond. The metaverse is not a myth; virtual reality and virtual twins cannot replace the real world, and the metaverse is not a paradise. There are still many hidden thefts, cyberbullying, deception, discrimination, and inequality, which need to be supervised and considered from aspects such as the legal system, morality, ethics, management, and technology.

The metaverse means that our lives, labor, leisure, time, wealth, happiness, and relationships are increasingly immersed in virtual worlds. The Internet will become as pervasive and essential as the air we breathe. The metaverse is changing how we perceive the world, but it is not everything, and humans cannot live without the natural world. No matter how perfect the metaverse is, it cannot replace the natural scenery and human relationships in real life. Perhaps the real happiness is to learn to return to the real world after studying and working, cast away the digital world’s distractions, and live with our real friends and family.

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