# Metaverse Economy and Real Economy: Integration and Development

**Yiming Deng**[1*]

[1]School of Information, Central University of Finance and Economics, China

*Corresponding Author: 2023212377@email.cufe.edu.cn

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## ABSTRACT

In recent years, the concept of the metaverse has captured widespread attention, emerging as a pivotal trajectory in the global digital economy. The metaverse, shaped by the convergence of diverse digital technologies such as artificial intelligence, blockchain, and smart contracts, represents an immersive interplay between the digital and real realms. It stands as a futuristic industry marked by the integration and innovation of new-generation information technologies, serving as an advanced manifestation of the intersection between digital and real economies. The metaverse economy, distinguished by features like the fusion of virtual and tangible elements and the concept of digital twinning, forms a novel research domain within the broader scope of digital economics. The development prospects of the metaverse economy can be dissected by applying fundamental economic principles and analytical methods. This article seeks to delve into the potential of integrated development between the metaverse economy and the realms of real and digital economies, emphasizing the latent synergies and opportunities arising from comprehensive development. Despite its promising outlook, the ongoing integration and development of these realms confront various challenges. Issues such as security and privacy concerns on the technological front and the absence of legal regulations at the governance level demand urgent attention. Overall, the evolution of the metaverse economy is poised to offer substantial opportunities for the advancement of the digital economy, propelling the development and progress of human society. As digital technologies continue to undergo iterative upgrades, the metaverse economy and digital economy are expected to unfold broader development horizons and limitless potential in the future.

**Keywords**: Metaverse economy, Real economy, Legal oversight, Ethics of technology

## 1. Introduction

With the rapid advancement of information technology and the Internet, there has been a remarkable enhancement in network infrastructure, fostering an increasingly vibrant online landscape. This, in turn, has accelerated the development of the virtual world, leading to the gradual emergence of the metaverse concept. The metaverse, constructed on the foundations of blockchain and virtual reality technologies, encompasses a diverse array of digital content and services, including virtual assets, digital identities, and virtual land. Its overarching objective is to establish an open and decentralized digital space that enables users to engage in virtual interactions, transactions, creative

endeavors, and immersive experiences[1]. Integrating multiple technologies from the digital economy domain, such as artificial intelligence, blockchain, virtual reality (VR), and augmented reality (AR), the metaverse economy strives to deliver more enriching and immersive virtual encounters, propelling the evolution of the digital economy and reshaping the dynamics of human interaction within the digital realm[2]. Functioning as an advanced manifestation of the digital economy, the metaverse economy has facilitated the convergence of the digital and physical worlds, emerging as a pivotal direction for the future progression of the digital economy. Its allure has captivated the attention of numerous enterprises and developers, spurring them to delve into the realm in search of novel explorations and innovations.

The interconnected nature of the metaverse economy and the digital economy is unmistakable. The foundational logic and technological underpinnings of the metaverse stem from Web 3.0, artificial intelligence, blockchain, and other related components. By amalgamating these cutting-edge technologies, the metaverse offers an efficient and decentralized online trading platform for the digital economy, fostering the fluid circulation and transaction of digital assets, while catalyzing the innovation and advancement of virtual commodities and services. This synthesis gives rise to the metaverse economy, thereby introducing novel business paradigms and growth impetus to the digital economy. Moreover, the metaverse economy enriches the digital economy by providing a more immersive and engaging consumer experience, expanding the horizons of digital commerce models and driving the transformation and elevation of digital business landscapes[3].

Based on the aforementioned context, it is evident that the metaverse economy holds the potential to emerge as the next focal point for economic growth. This prospect could offer a solution to current economic growth bottlenecks, fostering steady economic expansion in China, and carrying significant implications for advancing the high-quality development of the digital economy. Presently, research on the metaverse economy predominantly revolves around its definition, with limited attention devoted to the integrated development of the metaverse economy and the physical economy. Consequently, as a pivotal driver for the development of the physical economy, it becomes imperative to review the current progress in metaverse economy research and delve into the prospects of its integration with the physical economy.

This article will delve into the following aspects: Chapter Two elucidates the concept and value of the metaverse economy. Chapter Three examines the integration effects of the metaverse economy with the physical economy. Chapter Four discusses the challenges confronting the integration of the metaverse economy with the physical economy. Chapter Five provides an outlook on the prospects of the integrated development of the metaverse economy and the physical economy. Chapter Six concludes the article and presents future perspectives.

## 2. The Concept and Value of the Metaverse Economy

### 2.1 The Definition of the Metaverse Economy

The concept of the "Metaverse" first emerged in the science fiction novel "Snow Crash" by author Neal Stephenson. In the novel, the "Metaverse" depicts a parallel virtual world existing alongside reality. The significant increase in online activities, as a result of the impact of the COVID-19 pandemic, has driven a substantial shift of offline social activities to the online sphere, consequently accelerating the development of interactive virtual realms. The year 2021 marked the beginning of what was referred to as the "Metaverse Year," during which the Facebook company

rebranded itself as Meta. Subsequently, various technology giants, including Nvidia and ByteDance, made significant strides in the field of the "Metaverse," capturing widespread attention from diverse segments of society.

Presently, the academic community has not yet established a definitive and precise definition of the Metaverse. According to Zhao Guodong et al. (2021), the Metaverse economy encompasses the economic activities of producing, trading, and consuming digital products within the virtual world. This perspective confines the Metaverse economy within the realms of the virtual world, underscoring the detachment of all economic activities associated with the Metaverse economy from our physical reality[4]. Han Yonghui and Liu Yang (2023) propose that the Metaverse economy relies on the foundation of the actual economic system and is subject to the global economic governance structure, emphasizing the shared responsibility of nations in the governance of the Metaverse economy[5]. Through an analysis of the economic logic of the Metaverse, Zheng Lei and Zheng Yangyang (2022) suggest that the Metaverse economy fundamentally relies on the real economic and social spheres [6].

Taking into account scholars' understanding and viewpoints on the Metaverse, its economic attributes can be encapsulated as follows: the Metaverse constitutes a parallel and interactive virtual realm alongside the physical world, forged through the fusion of virtual and actual spaces facilitated by digital technologies. The Metaverse economy transcends mere circulation within the virtual domain, facilitating seamless communication between the virtual and tangible worlds while operating within the governance framework of the actual economic system.

### 2.2 The Economic Value of the Metaverse

The seamless integration of the digital economy and the metaverse economy has injected fresh vitality into the evolution of the digital economy. The symbiotic fusion of digital technologies, including big data, blockchain, and artificial intelligence, underpinning the digital economy, serves as the foundational technological support for the metaverse. These technologies not only provide robust backing for the construction of the metaverse, establishing a platform for metaverse economic activities but also bridge the gap between the virtual and physical realms. As an advanced iteration of the digital economy, the metaverse economy infuses a renewed vigor into the digital economy, offering a novel avenue for the exchange of digital and virtual assets, thus further expanding the horizons of the digital economy. Furthermore, leveraging blockchain and smart contract technologies, the metaverse economy fosters a secure and transparent environment[7], ensuring the reliable progression and sustained growth of the digital economy.

Simultaneously, the convergence of the metaverse economy and the digital economy heavily relies on the impetus and support derived from data[8]. The extensive collection, analysis, and organization of voluminous data form the foundational content for creating scenarios within the metaverse, offering vital support for generating diverse application scenarios and personalized experiences. This data-driven model not only propels ongoing innovation and upgrades within the digital economy but also fosters the refinement and maturation of the metaverse ecosystem.

## 3. The Integration Effect of Metaverse Economy and Real Economy

### 3.1 Promote the Digitalization of the Industry

The metaverse, through the creation of virtual settings, offers invaluable support for large enterprises and research institutions in establishing virtual digital factories or laboratory

environments, often referred to as digital twin applications. For large enterprises, the metaverse allows for the digital mapping of real-world factories into virtual spaces, paving the way for the development of digital factories that faithfully replicate the production processes of their physical counterparts. This holds significant advantages across various domains. In terms of production, enterprise engineers can utilize digital twinning technology to remotely and in real-time accomplish tasks such as solution design and technical guidance[9]. Moreover, in the realm of market research, the metaverse empowers research personnel to directly engage with consumers. By employing methods such as conversational interactions and observations, they gain profound insights into consumer behaviors and demands, which are instantly relayed to the research and development departments. This, in turn, aids enterprises in crafting products that align perfectly with consumer needs.

For research institutions, the utilization of virtual laboratory environments is a game-changer. It enables research professionals, situated across the globe, to actively participate in research and development processes in real time, thereby significantly enhancing research and development efficiency[10]. Furthermore, when confronted with high-risk procedures, virtual laboratories come to the rescue by offering an avenue for conducting experimental simulations, effectively minimizing potential risks[11]. Additionally, during the early stages of research and development, the deployment of digital twins and virtual reality enables research personnel to simulate physical production. This allows for the prompt detection of any design or production process flaws.

### 3.2 Innovative Business Models

In traditional economies, the long-tail theory has led most enterprises to focus primarily on the relatively small, yet more profitable customer base at the top, often leaving the diverse needs of customers at the tail end unaddressed. However, recognizing the demands of this long-tail customer segment could enable businesses to tap into a customer base with significant potential, even if the profits might be relatively modest[10]. Furthermore, this approach can help circumvent intense competition in the saturated market at the top [12].

With the advent of the digital economy era, user behavior and preferences are increasingly expressed in the form of data, empowering companies to extract insights into individualized user needs through data analysis, leading to the introduction of innovative business models. The metaverse, as a virtual world closely intertwined with reality, utilizes hardware devices such as VR and AR in conjunction with comprehensive real-world data to create an immersive virtual environment that caters closely to users' personalized and differentiated service requirements[2], thereby unleashing consumer demand. Supported by in-depth big data analysis, a multitude of consumer scenarios are seamlessly integrated with the metaverse, fostering the emergence of novel products and services, ultimately expanding the horizons of the physical economy.

Moreover, within the metaverse, the production, distribution, and trade of digital virtual goods occur with minimal reliance on real-world resources, other than electricity, effectively reducing production costs. This cost efficiency facilitates the accessibility of production entities to a broader user base [9], empowering users to function both as producers and consumers. As transactions within the metaverse economy rely on blockchain and smart contract technologies, users can engage in secondary creative processes based on existing commodities within the metaverse, earning a share of subsequent profits during product circulation[2]. This dynamic effectively positions each user as a creator of value, unlocking latent creativity and productivity, and driving the innovation of business

models.

### 3.3 Promote the Digitization of Social Governance

In the digital economy era, the daily functioning of society yields a substantial volume of data, underscoring the crucial significance of effectively harnessing this data to enhance governmental governance. Across various regions, numerous local governments have already established digital government service platforms, including platforms such as "Beijing Window" and "Yue Sheng Shi." These platforms seamlessly integrate with databases from multiple administrative departments, enabling streamlined processing for a diverse array of services. Leveraging the potential of the metaverse, governments can further bolster their service capabilities by constructing virtual government service halls and deploying virtual digital service personnel, thereby facilitating efficient handling of pertinent affairs and bolstering overall satisfaction levels among the populace [3].

An integral feature of the metaverse is its "virtual reality" dimension. Within the scope of social governance, the metaverse serves as a medium for offering realistic scenarios and facilitating the simulation and analysis of real-world predicaments [13]. Functioning as a virtual realm, the metaverse provides an avenue for policy experimentation, enabling observation of the behavior of other entities operating under the governance policy and assessing whether it aligns with anticipated outcomes, consequently enhancing the precision and efficacy of governmental decision-making. Moreover, through the fusion of "metaverse + AI," leveraging advanced technologies such as big data analysis, artificial intelligence, and the Internet of Things, intelligent monitoring and services can be implemented, fostering an elevated level of intelligence within the realm of social management. This approach serves to streamline social governance, making it more efficient, convenient, and precise.

In the domain of emergency preparedness, governments can leverage the metaverse to construct virtual scenarios, effectively simulating critical incidents like mine collapses or hazardous material explosions. Such applications facilitate the provision of simulation training for emergency response teams, ultimately fortifying the government's capabilities in managing unforeseen crises [14].

## 4. Challenges of Integrating the Metaverse Economy and the Real Economy

### 4.1 Technical Challenges: Technical Standards and Interoperability, Security, and Privacy Protection

The metaverse relies on a convergence of diverse digital technologies, making its development subject to the varying progress levels of these technologies, ultimately displaying a distinct "barrel effect" [9]. As the metaverse economy continues to evolve, the virtual landscapes become more diverse, and the range of digital products becomes increasingly extensive, thereby heightening the requisite demands on digital technologies. Presently, users still rely on virtual reality devices for accessing the metaverse, and the heightened capacity for rich virtual environments within the metaverse space to replicate experiences akin to the real world underscores the need for heightened hardware specifications in virtual reality devices. Yet, the absence of established hardware standards for current virtual reality devices results in significant disparities in users' perceptions of the authenticity of the metaverse environments. Moreover, limitations in device performance might also influence the suitability of digital goods, consequently impacting users' engagement in the metaverse economy and posing challenges to its sustainable development.

In terms of operability, the metaverse's current state, wherein the realization of its decentralized

concept remains incomplete, necessitates its construction and services to rely on major technology companies, each operating in isolated silos. This scenario implies that the current metaverse economic system is confined to limited circulation, with users' digital assets and virtual commodities restricted to specific metaverse spaces, thereby rendering the market size and activity incomparable to the real world. Moreover, the value of users' virtual assets is contingent on the survival of metaverse service providers[2], thereby introducing significant uncertainty. Thus, propelling the establishment of a unified metaverse world and the achievement of its "decentralization" objective requires technology companies to adopt an open approach, fostering increased cooperation and communication among themselves, and continually investing in research and development and iterative upgrades of digital technologies.

Concerning security and privacy protection, the substantial collection and analysis of personal information and transaction data within the metaverse pose significant risks, including data breaches and unauthorized access, thereby presenting formidable challenges to personal privacy [15]. Simultaneously, the escalation of metaverse users' participation in the production and design of digital goods will significantly amplify the supply and volume of digital commodities. Should users utilize virtual digital identities for transactions within the metaverse, it not only escalates the complexity of regulatory governance but also poses a challenging issue in effectively verifying the legitimacy of users' virtual identities to prevent theft or misuse.

### 4.2 Legal and Regulatory Challenges: Inadequate Laws and Regulations, and An Incomplete Regulatory System

In the digital economy era, people engage in online transactions involving goods and services, benefiting from the convenience and speed facilitated by digital technology in trading. Their goal is to acquire the right to use certain services or types of goods that fulfill their production and life needs, such as purchasing e-books, audiovisual platform memberships, image licenses, and more [16]. In this era, the focus lies on obtaining the right to use, while ownership remains with the suppliers of the goods or services.

In contrast, in the metaverse economy, people trade digital collections represented by Non-Fungible Tokens (NFTs). Due to the potential for secondary creation, individuals within the metaverse economy prioritize the copyrights and ownership of digital collections. NFT digital collections utilize blockchain technology and smart contracts to ensure that works are not counterfeited or tampered with during metaverse transactions. This not only helps bolster the credibility of digital collection transactions (preventing counterfeiting) but also aids in protecting and maintaining copyrights. While Chinese law has yet to introduce specialized laws and regulations for NFT digital collections to safeguard copyrights, there have been related cases of infringement disputes. Based on the study of relevant cases, Huang Yuye and Pan Bin (2022) suggest that through the use of blockchain technology, digital collections can establish a unique corresponding relationship with their originals, signifying that as duplicates, digital collections possess the attributes of property and tradability[17]. Feng Xiaoqing (2023) contends that the sale of unauthorized digital collections on NFT platforms constitutes an infringement of distribution rights[18], whereas Wang Qian (2023) argues that NFT trading does not constitute a distribution act[19]. It is clear that in the era of the digital economy, the forms of copyright infringement for digital works are different from the past, posing new challenges to legal and regulatory frameworks and intellectual property protection in the context of the metaverse economy.

### 4.3 Ethical Challenges: Guiding the Healthy Development of the Metaverse Economy

The ultimate aim of scientific and technological progress is to serve humanity. The values and ethical principles of science and technology emphasize the cultural concepts of technology for good, which must be adhered to in all technological activities [19]. The value of individuals in the metaverse is an extension of human values from the real world into the digital realm. Only when human values are placed at the core can the metaverse hold significance on the value level[21]. Currently, the establishment of ethical principles in the metaverse economy is still in its infancy. Forming an ethical consensus in the metaverse economy is essential for enhancing China's international status within the metaverse governance system.

Positive technological ethics propose that ethics shape technological behaviors, whereas negative technological ethics regard technology and ethics as mutually independent, with ethics serving merely as a checklist for technological examination [22]. Technology itself is neutral, but during its development and iteration, the subjective intentions of the designers are inevitably intertwined [5]. Therefore, the development of digital technologies related to the metaverse economy should promote a positive view of technological ethics during the development phase, ensuring that technological advancements align with the requirements of societal interests.

Furthermore, the operation of the metaverse economy should be based on the protection and respect of personal privacy, strictly prohibiting the illegal collection and dissemination of personal privacy data. Moreover, ethical standards and social equity within the metaverse world are also crucial issues to consider. The metaverse economy should respect the differences in various regions and cultures, avoiding discriminatory or unequal treatment of others caused by technological disparities.

## 5. Application Scenarios of the Integration Development of Metaverse Economy and Real Economy

### 5.1 Metaverse + Factory

In the metaverse economy, utilizing virtual space and digital twins, real-world manufacturing workshops and research laboratories are mirrored in the virtual realm. Within the virtual manufacturing workshop, technical experts can remotely provide guidance to resolve technical issues encountered during the production process. Similarly, supervisory personnel can monitor the performance of industrial robots, CNC machine tools, and other equipment, ensuring that product quality adheres to established standards. Through simulated research laboratories, researchers dispersed globally can engage in collaborative endeavors across temporal and spatial barriers, fostering efficient cooperation in product development. The metaverse offers a planning and simulation environment for the complete lifecycle of products, encompassing everything from factory site selection and design to the layout of production lines and equipment debugging. This method facilitates early analysis, evaluation, and validation of potential issues and deficiencies within the plan, enabling timely adjustments and optimizations, thus minimizing the need for subsequent production halts for modifications.

### 5.2 Metaverse + Healthcare

The scarcity of medical resources has persistently posed a significant challenge in the development of public welfare, with no immediate and effective solutions foreseen in the near term. Through the application of "metaverse + healthcare," avenues for remote consultations for doctors

can be established, facilitating the integration and development of online and offline healthcare services. In comparison to the current video-based remote consultations, "metaverse + healthcare" not only enables face-to-face consultations with doctors but also amalgamates offline medical monitoring devices to provide real-time transmission of patient health data to the doctor's office, thereby assisting in the diagnostic process.

For the overall society, the metaverse holds paramount significance for nationwide health research. In the era of the digital economy, we have already been able to upload human body data measured by various medical devices to the cloud. However, safeguarding personal privacy remains a significant challenge. In the era of the metaverse economy, the anonymity feature of the blockchain technology used in the metaverse allows for the transmission of measurement data from medical devices to the metaverse, ensuring the enhanced protection of public privacy information. Simultaneously, the integration of this anonymized data into various institutions such as hospitals, healthcare insurance companies, and biopharmaceutical companies promotes information sharing among different organizations, contributing to the collective enhancement of nationwide health and medical security services.

### 5.3 Metaverse + Tourism

As a vital pillar of the service industry, the cultural and tourism sector is deeply invested in enhancing consumer experiences. While virtual spaces can offer simulated experiences, they cannot entirely substitute real-world experiences. Conversely, by using simulated experiences in virtual spaces as an entry point, the industry can capture consumer attention and influence consumer behavior, encouraging them to seek out real-world experiences. Leveraging digital twinning, the metaverse can provide consumers with virtual spaces to explore specific destinations, engage in cultural interactive activities, and more, thereby stimulating consumer interest in planning actual trips[23]. Moreover, the metaverse can deliver personalized services to consumers, thus elevating service quality and consumer satisfaction. For instance, during the travel planning phase, the metaverse can offer consumers virtual environment experiences related to attractions, restaurants, and hotels. Service industry operators can utilize this feature to assess whether hardware facilities, service attitudes, and service processes meet customer demands, making prompt adjustments when necessary. This transition can further enrich consumer experiences by transforming the service industry's management model from the conventional "consumption-experience-feedback-adjustment" to "experience-feedback-adjustment-consumption".

## 6. Conclusion and Future Prospects

### 6.1 Conclusion

In the realm of the metaverse and its integration with the real economy, it is crucial to comprehend the vast potential and opportunities it presents. This amalgamation is set to bring about novel growth prospects and innovative momentum to the socio-economic landscape, expediting the digital evolution of traditional industries and fostering the advancement of the digital economy. Simultaneously, the advent of the metaverse will enrich the social and entertainment experiences of individuals, providing an even more convenient and diversified platform for commercial activities and social governance, catering to metaverse users with highly personalized and precise service encounters. Undoubtedly, this fusion is poised to serve as a new driving force for the expansion of

the digital economy, leaving a profound imprint on the global economic framework and societal structure.

However, it is equally imperative to acknowledge the challenges and issues that surface during the process of amalgamating the metaverse and the real economy. Safeguarding user privacy and data security, ensuring fair competition and regulatory compliance, as well as tackling concerns such as the digital divide and social disparities, represent critical areas demanding immediate attention. To this end, it is recommended to fortify the formulation and enforcement of relevant laws and regulations, foster technological innovation and security protocols, promote collaboration and information exchange across nations, establish an environment of transparency and openness in the market, and instill mechanisms for fair competition. Furthermore, there should be a focus on educating users and disseminating information, enhancing digital literacy and security awareness among the populace, guiding the rational engagement of the public in the construction and progression of the metaverse and the digital economy, collectively shaping a new order in the digital economy that is secure, trustworthy, equitable, and inclusive.

### 6.2 Future Prospects

In the future, the integration and permeation of the metaverse economy and the real economy into various industry sectors will continue to progress. Digital technologies will find broader applications in constructing and operating the metaverse, thereby propelling more traditional industries towards digitalization and virtualization. With continuous technological advancements and innovation, the metaverse economy and the digital economy will lead to the emergence of new technological applications and business models. Technologies such as artificial intelligence, blockchain, and virtual reality will be more deeply integrated, providing robust support for the development of the metaverse economy.

The metaverse will become one of the core platforms integrating social and business activities, enabling people to engage in social, entertainment, and commercial activities in virtual spaces. This will not only bring more possibilities for social interaction and business but also foster vibrant social exchanges and economic activities. With the development of the metaverse economy, cross-border exchanges and collaborations between different countries and regions will become more convenient. People will be able to conduct international exchanges, collaborations, and trade activities in virtual spaces, promoting economic exchanges and cooperation among different countries and regions.

The metaverse economy will offer users more personalized experiences and customized services. Individuals can customize their virtual world experiences and services based on their needs and preferences, obtaining more personalized and precise experiences and services. In terms of optimizing social governance and public services, the metaverse economy will provide more possibilities. Governments and institutions can use the metaverse to build a more intelligent and sophisticated social governance and public service system, enhancing the efficiency and quality of social governance and public services.

Overall, the integration and development of the metaverse economy and the real economy will bring more convenience and opportunities to human society, promoting the development and progress of the socio-economy. With technology continuously advancing and society persistently evolving, the metaverse economy and the digital economy will present broader development prospects and limitless potential in the future.

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