
AI translation · View original & related papers at
chinaxiv.org/items/chinaxiv-202310.00436

Research on the Metaverse Industry and Key Players: Postprint

Authors: Guo Quanzhong

Date: 2023-10-08T00:00:00+00:00

Abstract

The metaverse originated from gaming yet transcends it, and will in the future evolve through three developmental forms of cloud gaming, digital twin, and symbiosis of virtual and real, with the scale and number of applications expanding rapidly and the industry scale growing dramatically. Currently, the metaverse industry primarily focuses on VR/AR/MR hardware devices, gaming, NFTs, communications, and other fields, with main participants including Meta, Roblox, NVIDIA, Tencent, ByteDance, and other enterprises.

Full Text

Preamble

Research on the Metaverse Industry and Its Main Participants

(School of Journalism and Communication, Minzu University of China, Beijing 100081)

Abstract: The metaverse originated from gaming but transcends it. In the future, the metaverse will evolve through three developmental forms: cloud gaming, digital twins, and the integration of virtual and real worlds. The scale and number of applications will expand rapidly, and the industry will grow dramatically. Currently, the metaverse industry will focus primarily on VR/AR/MR hardware devices, gaming, NFTs, and communications, with key participants including Meta, Roblox, NVIDIA, Tencent, and ByteDance.

Keywords: Metaverse; integration of software and hardware; gaming; Meta; Tencent

Classification Code: G612

Document Code: A

Article Number: 1671-0134(2022)01-011-04

DOI: 10.19483/j.cnki.11-4653/n.2022.01.002

Citation Format: Guo Quanzhong. Research on the Metaverse Industry and Its Main Participants [J]. China Media Technology, 2022(01): 11-14.

Introduction: The Metaverse Industry Chain Takes Initial Shape

The metaverse, as an integration of internet, IoT, AR/VR, smart wearable devices, 3D graphics rendering, AI, high-performance computing, and cloud computing technologies, requires rapid development of related technologies while creating enormous opportunities for these industries. It will also generate new industrial opportunities by combining with user demands. Currently, due to rapid technological development and deepening applications, the metaverse industry chain has begun to take shape, primarily encompassing hardware, software, services, and application/content layers, with a development trend toward organic integration of software and hardware [?]. According to Jon Radoff, founder of Beamable, the metaverse industry chain can be specifically divided into seven layers.

1.1 Infrastructure Layer

This layer includes network facilities and chips, such as 5G base stations, WiFi6 devices, IoT, and cloud servers. The main participants include major telecom operators like China Mobile, China Telecom, and China Unicom, as well as chip manufacturers such as NVIDIA and AMD.

1.2 Human-Computer Interaction Layer

This layer includes consumer-grade and industrial-grade components, interactive devices, and VR output devices, primarily comprising smartphones, smart glasses, and VR/AR/MR equipment. Key participants include Google, Apple, Meta, Huawei, Tencent, ByteDance, Baidu, Alibaba, Xiaomi, Samsung, Nokia, and iFLYTEK.

1.3 Decentralization Layer

This layer includes edge computing, blockchain, and other technologies that help build distributed architectures for the ecosystem. The main participants include Microsoft, Amazon, Huawei, Apple, IBM, Wanxiang Group, Ant Group, Oracle, Baidu, SenseTime, Alibaba Cloud, Tencent Cloud, Amazon Web Services, Microsoft Azure, and Huawei Cloud.

1.4 Spatial Computing Layer

This includes the 3D layer, primarily comprising 3D engines, VR/AR/XR, and related technologies. The main participants in this field are Meta, NVIDIA, Tencent, Google, Huawei, ByteDance, Baidu, and Alibaba. From a macro perspective, the metaverse will evolve through three stages—cloud gaming, digital

twins, and the integration of virtual and real worlds—ultimately achieving organic integration of the physical and digital economies. In the short term, the metaverse industry will first achieve commercialization and industrial implementation in VR/AR/MR, gaming, NFT, and communications.

1.5 Creator Economy Layer

This layer helps creators produce content and monetize their work, primarily through design tools and monetization technologies. The main participants include Meta, Tencent, NVIDIA, Roblox, ByteDance, NetEase, Baidu, and Alibaba.

1.6 Discovery Layer

This layer encompasses the channels through which people learn about and access the experience layer, including various app stores. The main participants are Apple, Google, Microsoft, and Huawei.

1.7 Experience Layer

This includes the non-material experiences in which people actually participate, such as social interaction, gaming, and live music. It can be divided into B2B and B2C segments. B2B primarily covers real estate, education, healthcare, and engineering, while B2C focuses on social networking, live streaming, and gaming. This segment obviously represents the industry chain with the greatest potential, best prospects, and most participants. Key players include Tencent, Meta, NetEase, ByteDance, Roblox, Baidu, and Alibaba.

2. Analysis of Metaverse Sub-Industries

In the short term, metaverse sub-industries will concentrate primarily on gaming, NFTs, VR/AR/MR, and content industries. According to research from ARK Invest, metaverse revenue will grow at a compound annual growth rate of 17%, increasing from \$180 billion in 2021 to \$390 billion in 2025, with the gaming industry occupying an important position. Morgan Stanley's analysis suggests that in the long term, the metaverse could become a massive market worth \$8 trillion and will likely become the next generation of social media, streaming media, and gaming platforms.

2.1 Gaming Industry Continues to Develop and Rapidly Expands into Cloud Gaming

Gaming represents a typical scenario of digital life, and gamers are regarded as seed users of the metaverse. According to Newzoo's 2021 Global Games Market Report, the gaming market will reach \$175.8 billion in revenue in 2021, with nearly 3 billion players worldwide. By 2024, the global gaming market is projected to grow to \$218.7 billion annually, with the number of players

increasing to 3.3 billion. The mobile gaming market alone will reach \$90.7 billion, accounting for over 50% of total global gaming revenue. The VR gaming market is particularly recovering, with global VR gaming revenue reaching \$816 million in 2020 [?]. According to the “China Game Industry Report for January-June 2021,” China’s domestic gaming market achieved actual sales revenue of 150.493 billion yuan in the first half of 2021, a year-on-year increase of 7.89%; the number of Chinese gaming users reached 666.7 million, a year-on-year increase of 1.38%. Among these, domestic mobile gaming market revenue reached 114.772 billion yuan, up 9.65% year-on-year, accounting for 76.26% of the domestic market total [?].

In the future, for gamers, gaming will no longer be mere entertainment. In virtual worlds, they can also engage in gaming, experiences, social interaction, creation, entertainment, and shopping. “Gaming + Social” has become a new scenario and application in virtual worlds. For example, in April 2020, American rapper Travis Scott held an online immersive virtual concert in Epic Games’ *Fortnite*. The performance lasted only 10 minutes, but through holographic projection, Travis Scott appeared in *Fortnite* to interact with users up close. This new form of interaction attracted 12.3 million viewers, demonstrating that more players are willing to participate in virtual worlds. Roblox, the first metaverse-listed company, has created a complete closed-loop world featuring a “UGC gaming platform + immersive social attributes + independent economic system,” providing players with better experiences.

2.2 NFT Industry Holds Enormous Potential

As one of the important infrastructures of the metaverse, NFTs can solve identity authentication and rights confirmation issues while enabling value transfer between metaverses. They also serve as a bridge between the real world and the metaverse, accelerating its arrival and maturation.

The NFT industry has already begun to take shape. Relevant data shows that global USD transaction volume for NFTs increased from \$62.86 million in 2019 to \$250 million in 2020, nearly tripling. In 2021, NFTs experienced explosive growth. As a new representative of blockchain breaking into mainstream consciousness, NFTs achieved large-scale, wide-ranging commercialization. In March 2021, pioneering artist Beeple sold his NFT work *Everydays: The First 5000 Days* for \$69 million through Christie’s auction house, making him the third-wealthiest living artist. Subsequently, Twitter CEO Jack Dorsey sold his first tweet from 2006 for \$3 million. Since then, more creators, artists, celebrities, investors, brands, institutions, and even countries have entered the field. According to DappRadar data, global NFT market transaction volume was \$1.7 billion from 2020 to February 2021, while global NFT sales in the first half of 2021 alone reached \$2.5 billion. In the first week of August 2021, global NFT art transaction volume reached \$443 million, nearly triple the total for all of 2020 [?].

2.3 Interactive Devices and VR Content Have Already Begun to Take Shape

According to IDC's "Q2 2021 Augmented and Virtual Reality Market Tracker," global VR headset shipments are expected to reach 8.37 million units in 2021, with China's market expected to ship 1.43 million units. Over the next five years, China's VR shipment compound annual growth rate will be 69.4%, while AR headset growth will reach 109.9%. The China Academy of Information and Communications Technology projects that global virtual device shipments could reach 75 million units in 2024, including 33 million VR devices and 42 million AR devices, with AR devices eventually overtaking VR. According to Trendforce, AR/VR shipments will have a compound annual growth rate of 39% over the next five years. Huaxi Securities forecasts that China's AR/VR virtual terminal device market space will be 115 billion yuan in 2021, with VR devices accounting for approximately 65 billion yuan and AR devices about 50 billion yuan. By 2024, the AR/VR virtual terminal device market space will reach 480 billion yuan [?]. Additionally, according to iResearch data, China's VR content market size is expected to reach 27.9 billion yuan in 2021, with consumer-level and enterprise-level content combining for a 46% market share, making it the largest segment in the VR market.

2.4 Applications in Other Industries Begin Large-Scale Deployment

In the broad AI industry field, according to Huaxi Securities estimates, the 2021 AI industry space of approximately 740 billion yuan will nurture a metaverse business worth 40.7 billion yuan.

In healthcare scenarios, according to Huaxi Securities estimates, the global market space is expected to reach \$2.9 billion in 2021, approximately 12 billion yuan.

In industrial scenarios, according to Huaxi Securities estimates, China's industrial design industry market size is expected to exceed 230 billion yuan in 2021. If measured by a 5% AR/VR penetration rate, the corresponding market space would also exceed 10 billion yuan.

3. Main Participants in the Metaverse Industry

Internet giants began laying out their metaverse strategies several years ago, adopting approaches of self-development and investment mergers and acquisitions, exploring extensively from gaming and social businesses to VR, AR, MR, and XR industries, and from metaverse platforms to new products and services.

3.1 Facebook Fully Transitions to the Metaverse

As early as 2014, Facebook acquired VR manufacturer Oculus VR for \$2 billion, beginning its metaverse industry layout and subsequently achieving continuous breakthroughs. In March 2016, it released the Oculus Launch Pad and the

first-generation VR headset Oculus Rift; in December 2016, Oculus Touch was released, adding hand-tracking functionality and launching multiple games including *Robo Recall* and *The Climb*; in June 2017, *Lone Echo* and *Echo Arena* were released; in January 2018, Oculus Start was launched; in the same year, Oculus announced the renaming of Oculus Research to Facebook Reality Labs (FRL), effectively establishing a dedicated metaverse R&D department; in May 2019, Oculus Quest and Rift S were released, along with the popular game *Beat Saber*; in September 2020, *Assassin's Creed* and *Splinter Cell* were released on the Quest platform; in October 2020, Quest 2 was released with comprehensive upgrades, providing new content experiences and reducing content prices to popularize VR.

Facebook founder and CEO Mark Zuckerberg believes the metaverse will be the successor to mobile internet. At the end of June 2021, he stated that over the next five years or so, AR/VR and smart wearable devices are key to enabling users to continuously and stably access the metaverse and obtain immersive experiences, and are prerequisites for metaverse user and industry development [?]. In October 2021, at the Facebook Connect developer conference, Facebook co-founder and CEO Mark Zuckerberg officially announced that the company name would change to “Meta” and committed to investing \$10 billion in its VR division. After renaming to “Meta,” the company has indicated it will introduce NFTs as part of its ecosystem, enable advertising space in the metaverse, and aims to build a metaverse where users can conduct real transactions.

Overall, Facebook currently has the most comprehensive metaverse layout and the largest investment, including the Creator content creation community, VR/AR Oculus Quest, digital currency Diem and commerce, and Workplace virtual office space. The Creator App allows content creators to build communities around content and provides one-stop creation services, including video creation, editing, and publishing [?]. Specifically, it enables creators to: (1) receive messages and comments from Instagram, Messenger, and other apps; (2) share Facebook content to other platforms like Twitter and Instagram; and (3) help creators conduct statistical analysis and publish more popular videos. Additionally, Facebook launched Spark AR for Instagram, described as a platform where “anyone can create and publish AR effects on Instagram.”

3.2 Tencent’ s Comprehensive Metaverse Layout Through the “True Internet” Concept

As a company integrating gaming, social networking, and entertainment elements, and as the world’ s highest-grossing gaming company, Tencent naturally possesses metaverse genes and has laid out a comprehensive metaverse strategy starting from the gaming field. At the end of 2020, Ma Huateng wrote in the annual special issue *Three Views*: “After a decade of mobile internet development, we are about to welcome the next wave of upgrades, which we call the ‘True Internet.’ The door between the virtual world and the real world has already opened. Whether from virtual to real or from real to virtual, we are commit-

ted to helping users achieve more authentic experiences” [?]. This shows that the essence of True Internet is completely consistent with the metaverse, and Tencent is determined to win in True Internet.

First, Tencent actively invests in metaverse-related companies. As early as 2012, Tencent invested in Epic Games, a company focused on 3D content and AR/VR content development, becoming a major shareholder with 40% ownership. Epic Games’ Unreal Engine is considered the carrier for building the underlying digital space of the metaverse. In April 2021, Epic Games announced it had received \$1 billion in investment, primarily to build metaverse-related businesses. In May 2019, Tencent announced a partnership with metaverse representative company Roblox to establish its Chinese subsidiary, 代理 Roblox 中国版——“罗布乐思”. In February 2020, before Roblox went public, Tencent participated in Roblox’ s \$150 million Series G financing. In 2021, Roblox was listed on NASDAQ, becoming the first metaverse stock, with a market value of \$62.841 billion as of the close on November 9, 2021. According to Roblox’ s Q3 2021 financial report, revenue was \$509.3 million, a year-on-year increase of 102%, with 47.3 million daily active users added this quarter, up 31% year-on-year. In July 2021, *Luobulesi*, developed by Tencent and Roblox, was officially launched. Tencent has also invested in VR game company Vanimals, digital animation production company Soulgate, and VR film company Original Force.

Second, Tencent continuously explores and deploys metaverse initiatives internally. In 2020, Tencent Cloud launched the smart city underlying platform CityBase, seen as a landmark move into the True Internet era. Tencent’ s TiMi Studio Group leader Yao Xiaoguang will personally lead the development of a game targeting the virtual world “Oasis” depicted in the movie *Ready Player One*. Tencent also launched China’ s first NFT art trading app “Huanhe.” In August 2021, Tencent officially launched China’ s first NFT art trading app “Huanhe” and issued its first NFT artwork—the audio vinyl of *Thirteen Invitations* hosted by Xu Zhiyuan.

3.3 ByteDance’ s Active Metaverse Layout

As an emerging internet powerhouse, ByteDance has adopted an active entry approach into the metaverse with enormous development prospects, combining investment and self-research.

In April 2020, ByteDance made a strategic investment of 100 million yuan in “China’ s version of Roblox,” Code Qiankun, founded in 2018. The company’ s product is the youth creation and social UGC platform *Reworld*, similar to Roblox’ s metaverse vision. In August, ByteDance acquired Pico (Qingdao Xiaoniao Kankan) for 9 billion yuan, marking its formal entry into the VR track. Pico has leading technical capabilities, and its affiliated company and related entities have 758 published patent applications across 126 countries/regions. According to IDC data, Pico ranked first in China and third globally in market share in Q1 2021 [?]. Its Pico Developer Platform primarily provides developers

with world-leading VR technology integration and support services, including SDK access, technical support, data statistics, and payment systems. In June 2021, ByteDance's Volcano Engine jointly created an AR transparent waveguide glasses with Liangliang Shiye. Currently, ByteDance may be developing a metaverse social product called "Pixsoul" internally to create an immersive virtual social platform.

3.4 Microsoft's Focus on Enterprise Metaverse

In November 2021, at its annual technology conference Ignite 2021, Microsoft released Mesh for Microsoft Teams, an MR-based digital productivity platform for creating enterprise metaverses, with a test version expected in the first half of 2022. Teams will allow users to appear in video meetings as 3D cartoon avatars while supporting VR/AR devices and enabling users to share Office files and other functions, allowing them to experience immersive virtual workspaces. Microsoft will integrate the digital and physical worlds through a series of applications, with the Xbox platform joining in the future.

3.5 NVIDIA Releases Metaverse Platform Omniverse and Actively Expands Its Ecosystem

As the world's largest AI chip manufacturer, NVIDIA enhances its competitiveness by building a "three-chip" strategy of "GPU+CPU+DPU" to construct the underlying technology of the metaverse. NVIDIA released Omniverse, providing a basic virtual world simulation and collaboration platform for metaverse construction, and subsequently launched Omniverse Avatar and Omniverse Replicator. Among them, Omniverse Avatar is a technical platform for generating interactive AI avatars, while Omniverse Replicator is a synthetic data generation engine that can continuously generate training data based on existing data. The essence of Omniverse is a digital wormhole, and in the future, any computer can connect to Omniverse and link one Omniverse world to another.

3.6 Other Companies Also Actively Explore the Metaverse

First, foreign internet giants like Google and Apple are actively planning metaverse businesses. Google is deploying cloud gaming through Stadia and software/services through YouTube VR. Apple is expected to release a new VR device in 2022, with a price likely exceeding \$3,000.

Second, Alibaba, Baidu, NetEase, and others are taking various measures to deploy metaverse businesses. Alibaba has invested in AR unicorn Magic Leap and established a dedicated company for VR device hardware R&D. In June 2021, Alipay, combined with Dunhuang IP, limited the sale of two payment code skins, "Dunhuang Feitian" and "Dunhuang Nine-Color Deer," on the AntChain fan grain mini-program. Alibaba's Singapore holding company has applied for multiple trademarks including "Ali Metaverse," "Taobao Metaverse," and "DingTalk Metaverse." Baidu has Baidu AR Lab, VR Lab, VR interaction platforms, and has

invested in US holographic technology company Si, with Baidu Online Network Technology (Beijing) Co., Ltd. applying for the “metaapp” trademark. NetEase has invested in Avatar-Based social platform Imvu, with multiple NetEase affiliates including NetEase (Hangzhou) Network Co., Ltd. and Guangzhou NetEase Computer System Co., Ltd. applying for trademarks such as “NetEase Metaverse,” “Leihuo Metaverse,” and “Fuxi Metaverse.” In the case of iQIYI, the company released the VR hardware product Qiyu 3 in 2020 to build the world’s largest Chinese VR service, with Chongqing iQIYI Intelligent Technology Co., Ltd. applying for the “Qiyu Metaverse” trademark.

Additionally, MiHoYo has established the MiHoYo Research Center (Anti-Entropy Studio) with the goal of creating a virtual world as depicted in *Ready Player One*. China Mobile’s Migu Company has released the metaverse MIGU evolution roadmap and its first consumer-grade augmented reality glasses, Nreal Air. Hunan Radio and Television will explore building the Mango “Metaverse” platform based on the National Radio and Television Administration’s 5G Key Laboratory. Gaming-listed companies like Bestv, Zhongqingbao, and Immyshow have also launched metaverse-related products or concepts.

References

- [?] Huaxi Securities: Metaverse, the Next “Ecological-Level” Technology Mainline [EB/OL]. <https://new.qq.com/rain/a/20210911a09t2j00>, (2021-09-08) [2021-11-07].
- [?] Dianyu: 2021 Global Gaming Market Report: Will Exceed \$200 Billion [EB/OL]. <https://baijiahao.baidu.com/s?id=1704519212850973028&wfr=spider&for=pc>, (2021-07-06) [2021-11-10].
- [?] Report: China Gaming Market Sales Revenue Exceeded 150 Billion Yuan in First Half of 2021 [EB/OL]. <https://baijiahao.baidu.com/s?id=1706621692237802273&wfr=spider&for=pc>, (2021-07-29) [2021-11-10].
- [?] Lin Luo: *Thirteen Invitations* NFT Prices Skyrocket 10,000x on Xianyu, Does Blockchain Open New Imaginative Space for Culture and Entertainment? [EB/OL]. <https://xueqiu.com/7151715108/194058302>, (2021-08-12) [2021-08-18].
- [?] Sina Technology: Opening a New Chapter? Zuckerberg: Facebook Will Become a Metaverse Company Within Five Years [EB/OL]. <https://finance.sina.com.cn/tech/2021-07-26/doc-ikqciyzk7657029.shtml>, 2021-07-26/2021-08-21.
- [?] CITIC Securities: Metaverse: Humanity’s Digital Existence Enters the Initial Exploration Period [EB/OL]. <https://mp.weixin.qq.com/s/7GX9KJghpr9wn7ksnyAD2A>, (2021-07-26) [2021-08-21].
- [?] Li Xin: Competing for the New Frontier, Where Are the Giants’ “Metaverse” Efforts? [EB/OL]. <https://new.qq.com/omn/20211106/20211106A0B55R00.html>,

2021-11-06/2021-11-08.

Author Bio: Guo Quanzhong (1976-), male, from Linqun, Anhui, is a senior economist at the School of Journalism and Communication, Minzu University of China. Research interests: media economics and media management.

(Responsible Editor: Li Jing)

Note: Figure translations are in progress. See original paper for figures.

Source: ChinaXiv –Machine translation. Verify with original.