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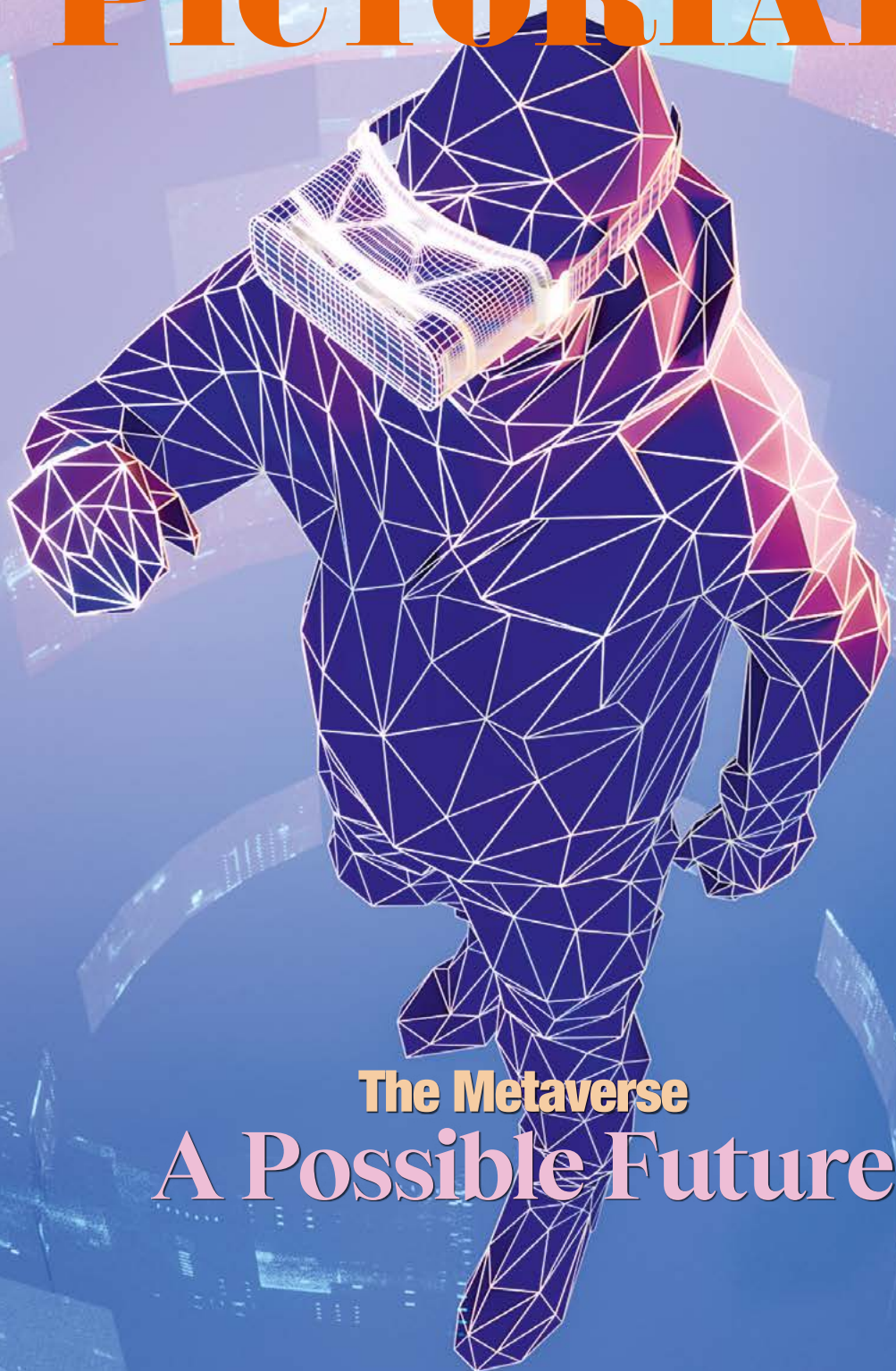
CHINA PICTORIAL

Vol. 893 April 2023



The Metaverse
A Possible Future

国内零售价：10元
USA $5.10 UK £3.20
Australia $9.10 Europe €5.20
Canada $7.80 Turkey TL.10.00

ISSN 0009-4420

邮发代号2-903 CN11-1429/Z

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April 2023

Administrative Agency: 主管单位：中国外文出版发行事业局（中国国际传播集团）
China International Communications Group

Publisher: China Pictorial Publications　主办、出版单位：人民画报社

Address: 社址：
33 Chegongzhuang Xilu　北京市海淀区车公庄西路33号
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Telephone of the Distribution Department: 订刊电话：
86-10-68412660　86-10-68412660

Legal Adviser: Yue Cheng　法律顾问：岳　成

Printing: Toppan Leefung Changcheng Printing (Beijing) Co., Ltd.　印刷：北京利丰雅高长城印刷有限公司

Overseas Distribution:
China International Book Trading Corporation (Guoji Shudian),
35 Chegongzhuang Xilu,
P.o. Box 399, Beijing 100044, China
Telephone: 86-10-68413849
Fax: 86-10-68412166
China Book Trading (Canada) Inc.
Telephone: 1-416-497-8096

出版日期 每月1日
国内零售价：10元
国内刊号：CN11-1429/Z
国际刊号：ISSN0009-4420
京海工商广字第0121号

In China, subscriptions are available at any post office.

Subscription and distribution agency in Hong Kong, Macao, and Taiwan:
Hong Kong Peace Book Company, Ltd.
17/F., Paramount Building, 12 Ka Yip Street, Chai Wan, Hong Kong

Visit *China Pictorial* on the Internet:
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China Pictorial is an official media partner of the Boao Forum for Asia Annual Conference.

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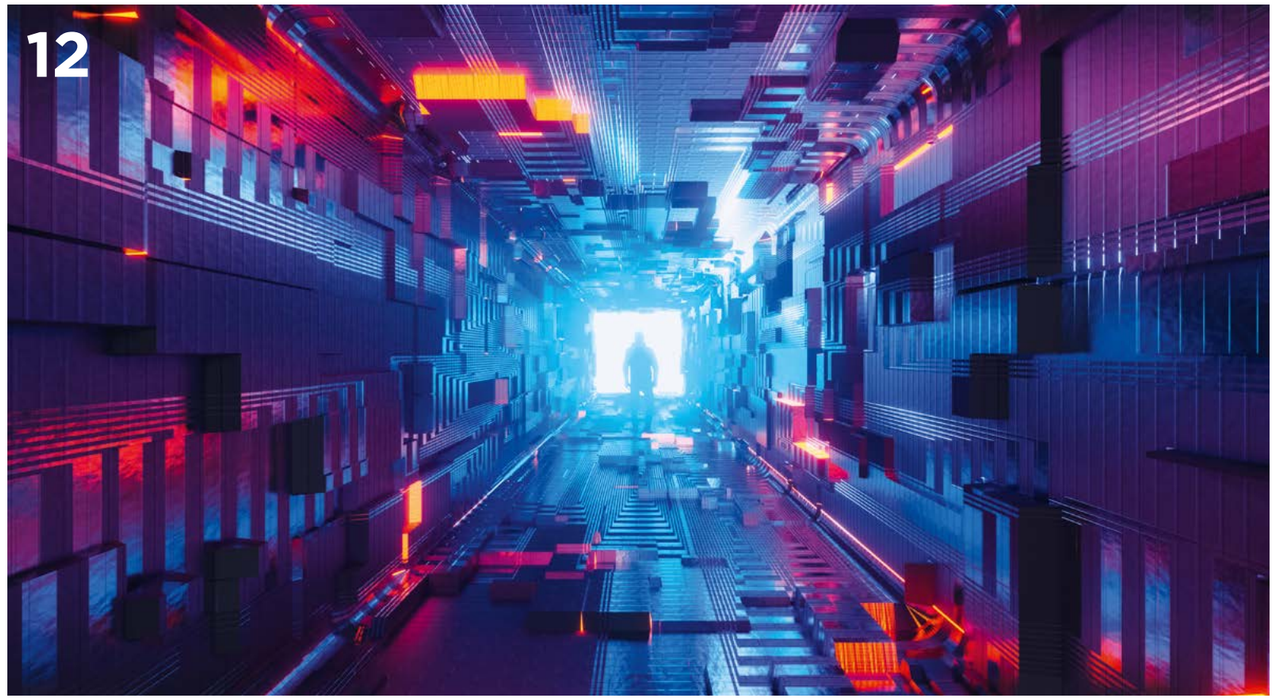


Panorama

Central

Mosaic

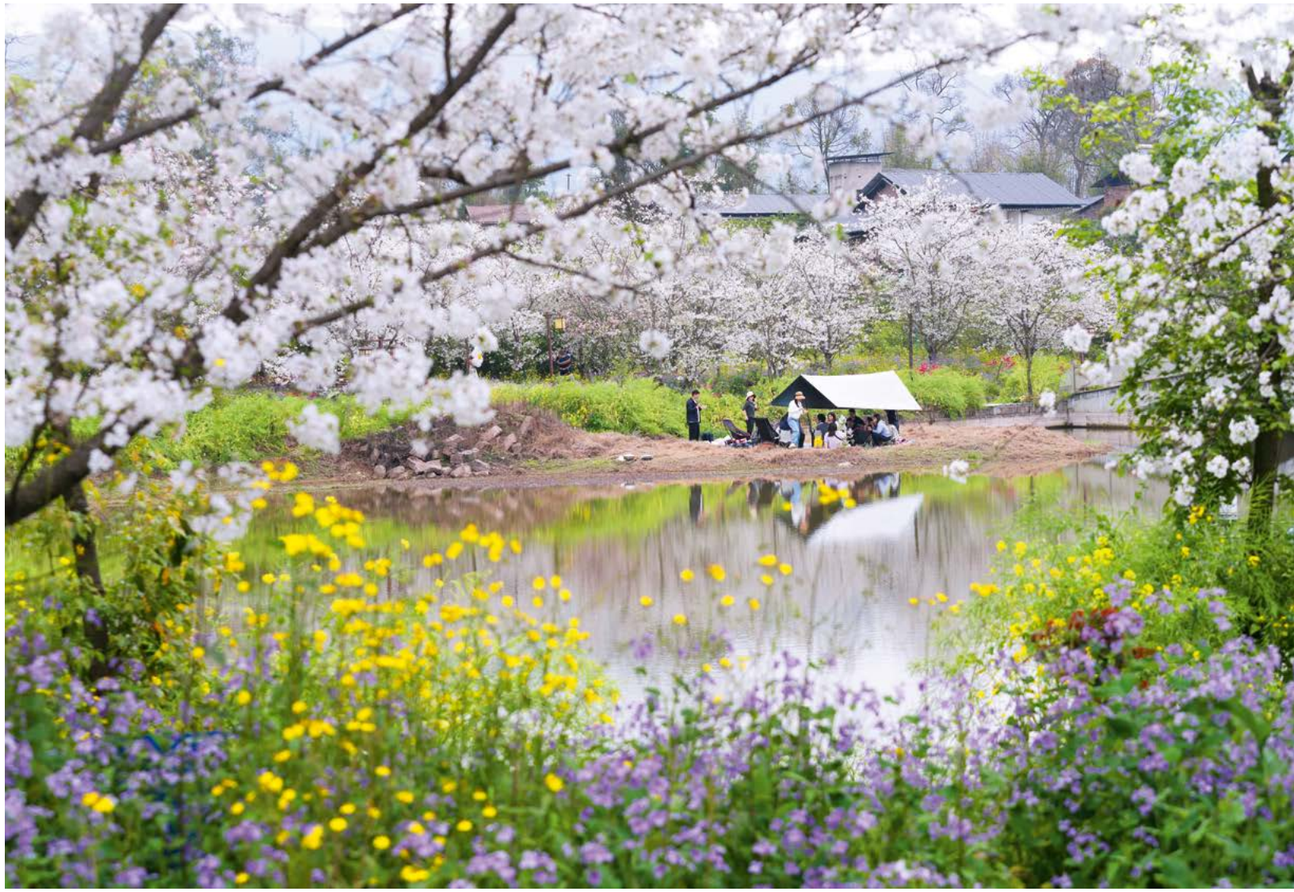
Dragon fruit farming contributes to people's prosperity in Nujiang Lisu Autonomous Prefecture, southwestern China's Yunnan Province. (Photo courtesy of the Nujiang Poverty Alleviation Exchange Center)

Nujiang Lisu Autonomous Prefecture, located in the Hengduan Mountains, was once stuck in poverty. At the end of 2020, the prefecture declared a final victory over extreme poverty. As it embarks on a new journey, Nujiang is continuing to consolidate poverty alleviation gains and align them with the full advancement of rural revitalization to prevent a large-scale return to impoverishment.

Themed "New Blueprint for Rural Revitalization, Exciting Opportunities for Global Development," the 2023 International Forum on Poverty Governance and Global Development kicked off in Nujiang on March 19, 2023. More than 190 diplomats, officials, experts, and scholars from 20 countries and four international organizations registered their presence. Participants exchanged views on global modernization and sustainable development, including poverty governance and rural development.

Rising temperatures have not only encouraged flowers to bloom earlier in China, but also increased demands for spring travel, which has boosted camping products sales and long-distance trips, according to industry insiders.

Travel portal Qunar said that bookings for tour products focused on flower appreciation in the week from March 6 to 12 rose threefold compared to the same period last year. Thanks to the increasing popularity of flower tourism, cross-provincial tours, and camping trips, the tourism sector has enjoyed a boom. According to Trip.com, bookings for domestic camping tour products saw a month-on-month increase of 125 percent in the first two months of this year, double that of the same period last year.



People camp at an agricultural park in Wuyi Village of Beibei District, Chongqing, March 19, 2023. (Photo by Qin Tingfu/Xinhua)

A still from the full-length version of *The Peony Pavilion* by the Shanghai Kunqu Opera Troupe. (Photo from VCG)

One of the most-performed Kunqu Opera plays by Ming Dynasty (1368-1644) playwright Tang Xianzu is *The Peony Pavilion*. Several of its most famous acts, such as *Walking in the Garden* and *The Dream Interrupted*, are frequently staged by Kunqu Opera troupes in China because of their beautiful vocals, poetic lyrics and graceful movements, which make them popular with audiences of all ages.

Traditionally, the play is shown only in parts due to its long length, but last year, the Shanghai Kunqu Opera Troupe staged all 55 acts of the play in an eight-hour, three-part marathon. This full-length version of *The Peony Pavilion* has been touring around the country ever since, with 12 performances in 18 days.

From March 8 to 10 this year, it was staged at the China National Opera House in Beijing, the first time that the total 55-act performance was given in the capital.

"It's a once-in-a-lifetime opportunity for Kunqu Opera performers to perform all the 55 acts of the classic work. It's also a once-in-a-lifetime experience for the audience to watch *The Peony Pavilion* in its near-entirety," says director Guo Xiaonan.

The real beauty of the China-proposed Belt and Road Initiative (BRI) is characterized by the idea of sharing, and its vision has an in-depth nature, international observers said at a session of the Boao Forum for Asia Annual Conference 2023.

The session, themed "Belt and Road: Sharing the Opportunities of Development," aimed to look back at the achievements of the BRI in the past 10 years and discuss cooperation opportunities amid global geopolitical and economic challenges.

Calling the BRI the most ambitious development project in human history, Jim Yong Kim, partner and vice chairman of Global Infrastructure Partners and the 12th president of the World Bank Group, said the essence of the initiative is to strengthen infrastructure foundations to let everyone aspire to a good life.

Chimed Khurelbaatar, deputy prime minister and minister of economy and development of Mongolia, expected Mongolia to export more coal to China this year and broader cooperation opportunities between the two countries under the BRI.

International observers attend a session themed "Belt and Road: Sharing the Opportunities of Development" at the Boao Forum for Asia Annual Conference 2023 in Boao, Hainan Province, March 28, 2023. (Photo by Xu Xun/*China Pictorial*)

A House of Cultural Relics

The Taipei Palace Museum, a structure with "Palace Museum" embedded in its name, shines brightly in Taipei, China's Taiwan. With the same origin as the Palace Museum in Beijing, the Taipei museum inherited more than 600,000 cultural relics from the Forbidden City during the Republic of China period (1912-1949). These two museums jointly hold the basic appearance of the original collections of the imperial palace in the Qing Dynasty (1644-1911) and record the history of the Chinese civilization. Although the Taipei museum is not an actual palace, it still holds many treasures. From these treasures, one could learn about the Forbidden City and China.

Chinese Heritage
March 2023

Painting like a Composer

Chen Hongshou (1598-1652), a famous Chinese calligrapher and painter in the late Ming (1368-1644) and early Qing dynasties, was devoted to painting all his life. His proficiency in figure painting greatly influenced Japanese ukiyo-e and modern figure painting. Among his numerous paintings handed down from generation to generation, one style differed from the works of the past and even most of his contemporary painters: his still life sketches. These sketches are closely linked to the rise of material culture in the Ming Dynasty, showing concern for "objects" and reflecting his unique vision and interest in observing the world as a painter.

Forbidden City
February 2023

The City of Best-sellers

Among the 691 cities in China, Foshan is known as the "city of best-sellers." A prefectural-level city with the fifth-largest industrial scale in China, Foshan is also the world's largest production base for refrigerators, ceramics, soy sauce, and other products. It has incubated Fortune 500 companies such as Midea and Country Garden, as well as Tmall blockbusters such as Bear Electric Appliance and Linsy Home.

Economists call Foshan "very Chinese" and consider it a microcosm of China's reform and opening up and the economic development of the Pearl River Delta. As a manufacturing city, Foshan managed to avoid becoming a "rust belt" even after the end of the iron smelting era and the financial crisis. Instead, it has become increasingly vibrant.

New Weekly
March 15, 2023

The Race for the "Chinese ChatGPT"

If you haven't discussed ChatGPT in China, you have already fallen behind. The wave of chatting with artificial intelligence (AI) has blown up among zoomers. The number of monthly active users of the AI chat robot, launched at the end of November 2022, passed 100 million in just two months. In contrast, it took nine months for TikTok to draw 100 million monthly active users and two and a half years for Instagram. The race now is to be the first Chinese version of ChatGPT, leaving users wondering who will ultimately prevail in the final AI boom. China's tech giants, such as Baidu, Alibaba, Tencent, JD.com, and NetEase, have all entered the game. An AI race inspired by ChatGPT is in full swing.

Vista
February 28, 2023

Becoming an AI Super Expert?

Text by Shen Yang

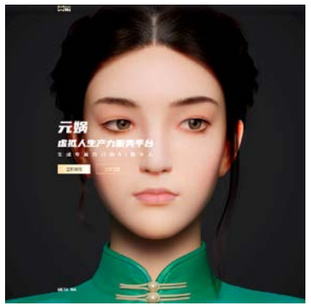
In the age of technology, humanity is constantly adapting and evolving to keep up with developments and changes in technology.

The author is a professor at the School of Journalism and Communication at Tsinghua University.

Recent times have brought remarkable advancements in artificial intelligence-generated content (AIGC) technology. Among them, the explosive emergence of ChatGPT lifted humanity into a new era. It is regarded by many as a technological revolution in artificial intelligence (AI), natural language processing (NLP), and machine learning. ChatGPT's logical capabilities are equivalent to those of an undergraduate student, with a knowledge base that approaches omniscience, and its computational power is astonishing. And its evolution is rapid. AIGC has also created remarkable works of film, music, and literature, including AI-directed *Zone 414*, AI-composed *The Infinite Album*, and an AI-poet's *The GPT-3 Poetry Collection*. Moreover, AIGC is now providing efficient and intelligent services in fields such as education, healthcare, and law through products including the AI mobile learning program Socratic, the AI doctor app Ada Health, and the AI chatbot lawyer DoNotPay.

Meanwhile, several tech giants are doubling down on their investment in the metaverse despite losses in some sectors. Meta, for example, has demonstrated its unwavering commitment to the metaverse, while Apple is poised to release a high-end XR device later this year. Gaming companies like Nvidia, Epic Games, Roblox, and Unity are also driving innovation and development in the metaverse.

Advancements in 5G networks, computing power, artificial intelligence, game engines, display technology, and blockchain are constantly improving the technological foundation of the



Beijing Qingbo Intelligent Technology has developed a virtual human service platform called "Meta Wa." Through frequent upgrading, it is expected to gain a range of capabilities including multidimensional expression, multimodal perception, and deep understanding. By leveraging the power of virtual human technology, Meta Wa seeks to meet the rigid demands of society and industry.

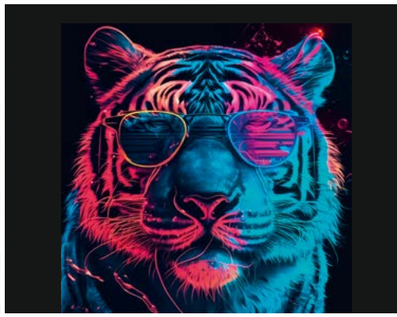
metaverse. The metaverse's application scenarios are expanding, with emerging experiences such as online concerts, virtual try-ons, and digital art. The value chain of the metaverse is gradually taking shape in various aspects including experience, discovery, the creator economy, spatial computing, decentralization, human-machine interaction, and infrastructure.

With the rapid development of science and technology, significant changes have taken place in lifestyles, social structures, and economic models. The question of whether we can adapt to these changes has become increasingly important. Despite these changes, humans need not to worry much. Thus far, AIGC cannot fully replace humans in many ways. For example, AI lacks the ability to fully comprehend human emotions, sense of value, and cultural backgrounds. It cannot ensure the authenticity and credibility of the content generated, which may result in offering misleading or deceptive information. Additionally, it cannot produce completely original and unique content, potentially leading to copyright infringement or plagiarism. It also struggles to adapt to complex and ever-changing needs and scenarios, which may result in logical errors or inconsistencies.

Every imaginable scenario demands human intervention. The rapid advancement of AIGC has generated an enormous demand for AI engineers, trainers, coaches, and super experts. When individuals acquire skills in multi-domain or all-domain intellectual labor through AI technologies like ChatGPT, they can be considered super experts with intelligence and skills far beyond a single person. These super experts can leverage AI tools to enhance their creativity, abilities to solve problems and make decisions, and critical thinking. As a result, they can better adapt to rapidly evolving environments and market demands. They are not just consumers of AI, but also designers, developers, and trainers of it. They understand the potential and limitations of AI technology and can fully utilize it to create value and solve problems while identifying and addressing potential problems and risks. Such super experts can accomplish many things through AI technology. For instance, they can enhance their own language expression skills using ChatGPT, tackle various problems related to technology, business, and society with the help of AI tools, conduct data analysis and prediction to make informed decisions, and create better content in the form of video, audio, and images. As AI technology continues to advance and spread, those super experts will play an increasingly significant role in shaping the future of the economy and society.

The rapid development of technology is expected to bring significant changes to our lifestyles, social structures, and economic models. In order to adapt quickly to the current era, we need to constantly update our knowledge while improving our confidence and recognizing our abilities. We should cultivate innovative thinking, strengthen our social skills, establish appropriate social networks, and seek support and resources whenever necessary. It's also important to maintain a healthy and balanced lifestyle, learn how to manage stress and anxiety, and avoid negative influences that may undermine self-efficacy. By embracing the future with the support of technology, people can set themselves up for success in the years to come.

This article was written and translated with the assistance of the AI platform ChatGPT.



AI painting has broadened the scope of painting analysis, pushing the boundaries of the field of painting art. With its mysterious, colorful, profound, complex and modern features, AI-generated paintings showcase exceptional imagination. They symbolize the future prospects of painting.

These images, which appear to be street photography at first glance, are actually generated by the AI painting tool Midjourney. It has the ability to create imagined images based on input text, presenting high-quality and intricate depictions of people, landscapes, animals, and abstract concepts.

Metaverse

A Possible Future

Concept by *China Pictorial*

As the future comes with endless possibilities, we should approach it with both confidence and hope while remaining calm and cautious.

The advancement of virtual reality, the metaverse, and artificial intelligence, as represented by products such as ChatGPT and ERNIE Bot, has inspired many to exclaim “the future is here.” (Photo from VCG)

Contemplating the future is no new topic for humans. In recent years, the advancement of virtual reality (VR), the metaverse, and artificial intelligence (AI) projects such as ChatGPT and ERNIE Bot have inspired many to exclaim "the future is here."

This issue focuses on exploring the metaverse. In October 2021, Mark Zuckerberg, founder of renowned American social networking company Facebook, announced that the company would be renamed "Meta." The term "metaverse," coined in the science fiction novel *Snow Crash* (1992), is now a global buzzword.

Snow Crash describes the metaverse as a state in which the real world is blended with a virtual world created through augmented reality (AR) and VR. The science fiction film *Ready Player One* released in 2018 is widely considered the closest depiction of the metaverse. Through sensory suits and VR devices, people will be able to participate in virtual racing and adventures that feel incredibly real. According to a public letter and video lecture to the world by Zuckerberg, the lines between reality and virtuality will become blurred in the future: People will no longer be confined by their bodies, and the constraints of time and space won't be a problem anymore. People will be able to move at the speed of light and choose their appearance at will.

Zuckerberg and other leading figures in the global internet industry believe that the metaverse, as the carrier of the next-generation internet, will create a new paradigm for

An immersive human-machine interaction system called MetaSense displayed in the metaverse experience area of the China International Fair for Trade in Services in Beijing, September 2, 2022. In the system, players can interact with virtual game characters and environments on the screen. (Photo from VCG)

A poster for the movie *The Matrix Resurrections*, the fourth installment in the "Matrix" series. The "Matrix" series explored the relationship between the real world and the digital virtual world.

The metaverse experience area of the China International Fair for Trade in Services held in Beijing showcases an optical motion capture system, September 2, 2022. This technology enabled the virtual dancer on a large screen to mirror the body movements of the experiencer. (Photo by Qin Bin/*China Pictorial*)

Robots play football in the equipment area of the fifth China International Import Expo in Shanghai, November 2022. (Photo by Xu Xun/*China Pictorial*)

economic and social operation through creating a new virtual world that is connected to the physical world. In the cover story of this issue, Aravind Yelery, a senior research fellow at Peking University and an adjunct fellow at the Institute of Chinese Studies (Delhi), explained that the metaverse promises an immersive future realized through smart technologies deployed in various approaches. Digital industry professionals from China and India discussed the technological support required by the metaverse and how it can be applied in the real world based on technologies that have emerged in recent years such as VR, AR, AI, social networking, encryption technology, wearable technology, cloud computing, and digital supply chains.

The emergence of the internet fueled the development of various new technologies, and the mobile internet empowered significant transformations in many industries around the world. Similarly, the metaverse is now starting to fuel a new round of transformation and upgrade the global mobile internet industry. In just a few years, VR devices, the basic tools for accessing the metaverse, have made great progress and exerted wide influence on cultural tourism, manufacturing, and even agriculture. Online tourism and virtual exhibitions are now a trend, and many museums and tourist attractions offer immersive performances and exhibitions. This issue introduces the large-scale immersive and interactive digital space "Sanxingdui Fantasy Journey" and its attempt to create a cultural metaverse, which involves the transformation and upgrading of many technologies including image processing, digital identity, virtual interaction mechanisms, and digital asset creation.

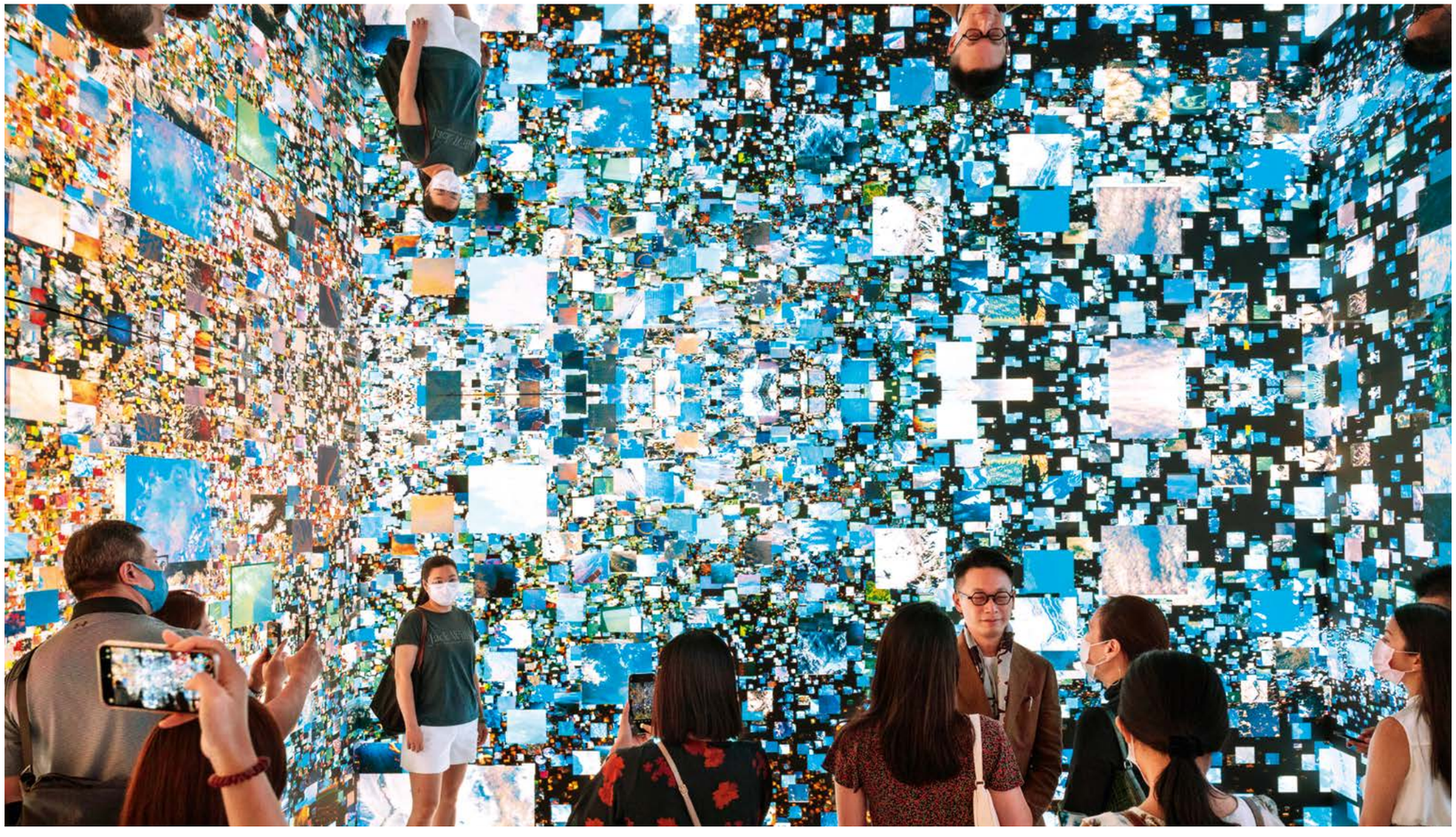
The metaverse is still in an early stage, and many challenges hindering each individual technology have yet to be overcome. And ethical concerns and considerations related to the metaverse have been persistent. As science and technology continue to improve, the internet will turn lifestyles upside down once again. As the future comes with endless possibilities, we should approach it with both confidence and hope while remaining calm and cautious.

The Digital Art Fair is held in Hong Kong, October 8, 2021. It showcased digital art from 30 artists from 12 countries and regions. This event aimed to promote futuristic innovation of culture and art. (Photo from VCG)

Metaverse:
Futuristic Intelligent Realms

Text by Aravind Yelery

The metaverse offers an immersive future managed by smart tech in diverse ways. It represents virtual reality beyond the tangible world.



Digital Art Fair Asia attracts a steady stream of visitors in Hong Kong, China, October 8, 2021. The exhibition displayed new trends in modern art. (Photo from VCG)

The advancing fields of technology and innovative design have been instrumental in closing the gap towards achieving sustainable, desirable, and futuristic living experiences. The rise and development of the metaverse is set to redefine the dimensions of technology. The scope of metaverse technologies has been scaled high in every aspect. Discussions on the human, scientific and innovative foundations beneath the metaverse are imperative and inexorable, alongside talk on the challenges.

Combination of Virtual Worlds, AR, and Internet

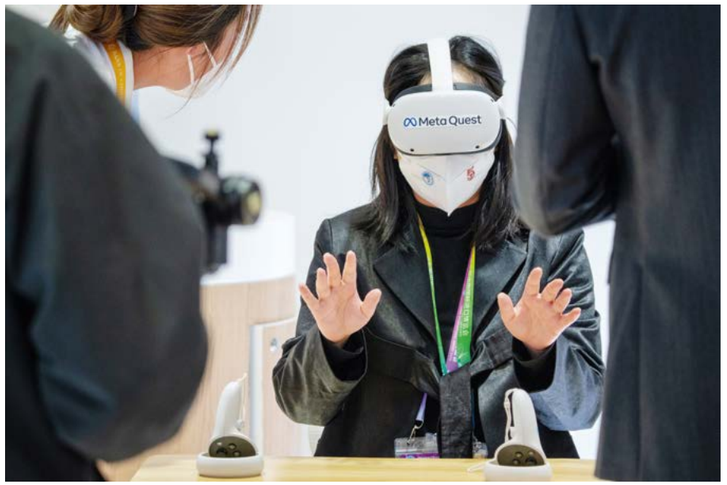
Human civilization has always valued innovation and technological advances. In a cyclical pattern, civilization has brought newer forms of innovation into reality, thereby revolutionizing human progress and development. Communication is the core of human civilization. From wires to satellites, the world has evolved into a complex web of inlets and outlets of communication with varied dynamism and utilities. Invention and adoption of technologies have been happening in tandem and at a faster recurring rate. Today, wireless technology accessed by phones, tablets, and computers is hinting at the possibility of ubiquity throughout society. Technology has already taken over human imagination on future cognitive thinking, making it inseparable from everyday life. Today's gadgets harness multiple service platforms, exerting a transformational impact on society as a whole and the lifestyle patterns of people.

The future is catching up with the present at lightning speed, and technological horizons are broadening, making them illusionary to human eyes. The avenues these revolutions take have lately been more dynamic and impactful. Technology usage has passed the stage of pure sciences and saving lives to become capable of adding immense value to our entire living space. Technological progress has been rapid and unprecedented in scale, helping connect people and offering them opportunities to enrich their lives. Technologies are no longer a matter of convenience but an integral factor in living standards. It is exerting a profound impact on how people live and think.

In terms of technology, communication, and the real and virtual spaces of human imagination, technological tools play a vital role in making things possible. A stop short of the metaverse, the transformative stage includes all forms of "extended reality," i.e., XR. XR is a widely used term referring to a revolution towards fully immersive virtual reality (VR) and augmented reality (AR) forms of technologies. All these techniques and forms lead to integrating diverse services and technologies towards the metaverse, an immersive future managed by smart tech in diverse ways. The metaverse inherently represents VR beyond the tangible world: life beyond (meta) the universe (verse). It combines virtual worlds, AR, and the internet.

Rapid Rise of the Metaverse

The rise of the metaverse has



The emergence of new digital devices in recent years is bringing VR and AR technologies to handheld devices and headsets accessible to millions of users.
(Photo by Xu Xun/*China Pictorial*)

led tech companies to explore designing and optimizing popular services and products. The metaverse is expected to revolutionize technological levels and cause increased necessity to adopt new products and services. It offers innumerable opportunities for the global economy as well. Rising demand for newer technological horizons will force tech companies to elevate their capabilities in offering innovative products and services. Thus, the metaverse will lead to a rise in immersive technologies and devices. The immersive technologies market is predicted to reach the US$2 trillion mark by 2030. The world of immersive technology tools including head-mounted displays (HMD), powerful computers or consoles, and sensors will see rapid transformation.

The metaverse promises an unprecedented level of content creation and management. All forms of metaverse will allow users to access and engage in a rich variety of content. The current wave of metaverse is riding high on prospects of high investment returns and recurring revenue growth. Investing in content is driving the early trend, which now covers entertainment, creators, sports, and XR, VR, and AR experiences virtually anywhere in the world. Alongside the makers of immersive technology tools, telecom providers are betting on immersive media. Rising demand for entertainment, gaming, and media has accelerated the growth of the metaverse market and spawned evolving opportunities for digitalization of fashion, art, and retail industries through AR, VR, and mixed reality (MR).

Consumers will be immersed in a variety of technological avenues. The metaverse will harness immersive technologies to render services through different applications to offer consumers access to content in countless ways. Global brands and service providers will embrace advertising that leverages immersive technologies, and global consumers will get content and information through streams of channels and ecosystems before choosing. As immersive technologies observe and meticulously store consumers' emotions in unprecedented ways, they will be able to effectively provide the most tailored content. Happier and more content consumers tend to grow the economy. The economy needs consumers to keep the market running, so that money has liquidity. The metaverse is causing market maneuvers and consumerism at the same time. With the virtual world expanding global access, tools and content in the metaverse are sprouting everywhere. Customers are buying not only groceries and consumer goods but also credit cards and personal loans. The metaverse is expected to create new seamless and interactive experiences.

More Applications

While the metaverse promises multiple benefits for consumers, the COVID-19 pandemic has intensely highlighted the importance of such immersive technologies. Healthcare has become a central concern for every country and business. Even before the pandemic hit, new technology and instrumentation was changing the nature of healthcare. The intensity of such influence varied to some extent among countries, but the future of healthcare clearly depended on technological aspects. During the pandemic, a broad technological revolution boosted the development of healthcare and clinical laboratories. In ordinary times, distance breaks communication and information flows, which are critical for healthcare providers. Doctors and healthcare providers have discovered that immersive technologies can help provide treatment at a distance and monitor patients in real time.

Moreover, during the pandemic, the limits of VR in medical training were lifted. Usage of robotics in surgeries could see qualitative change by embracing AR technology. Surgical simulations will soon be a feature of the healthcare sector. Simulations and immersive technologies can help doctors watch other surgeons perform operations and carry out clinical procedures remotely.

We have already investigated many possibilities to deploy metaverse realities. Education is another field where immersive technologies could greatly enhance the act of imparting knowledge. The global outbreak of the pandemic forced humans to rethink how we teach and learn. Immersive content allows a person to learn through the best methods. When applied to e-learning, a remarkable advantage is students seizing a sense of reality during virtual classes. Virtual learning environments (VLEs) have seen qualitative makeovers after using newer and cutting-edge immersion tools. The VLE+ presents opportunities to bring together students and educators from disparate geographical locations and diverse cultures and backgrounds to participate in a learning experience. The metaverse version of education would be reaching out and embracing every potential benefit of such novel ideas. The metaverse is expected to influence the future of learning. Also, for problematic educational materials, the metaverse could be an effective supplement to enhance current educational outcomes.

Many have argued why the metaverse matters, but it will certainly cause challenges alongside all the opportunities. Although the metaverse spans connected virtual worlds to offer a complementary space to the real world through digital environments, it will surely suffer meta-challenges. Care and vigilance are needed to monitor the emerging challenges in the metaverse. Guaranteeing the safety of users' privacy and data in this new, virtual "universe" will be crucial. Questions concerning ethics and morality should present challenges to every stakeholder — governments, businesses, and individuals alike. The recent expansion of the enormous metaverse is set to define virtual space and human life at a dramatic scale.

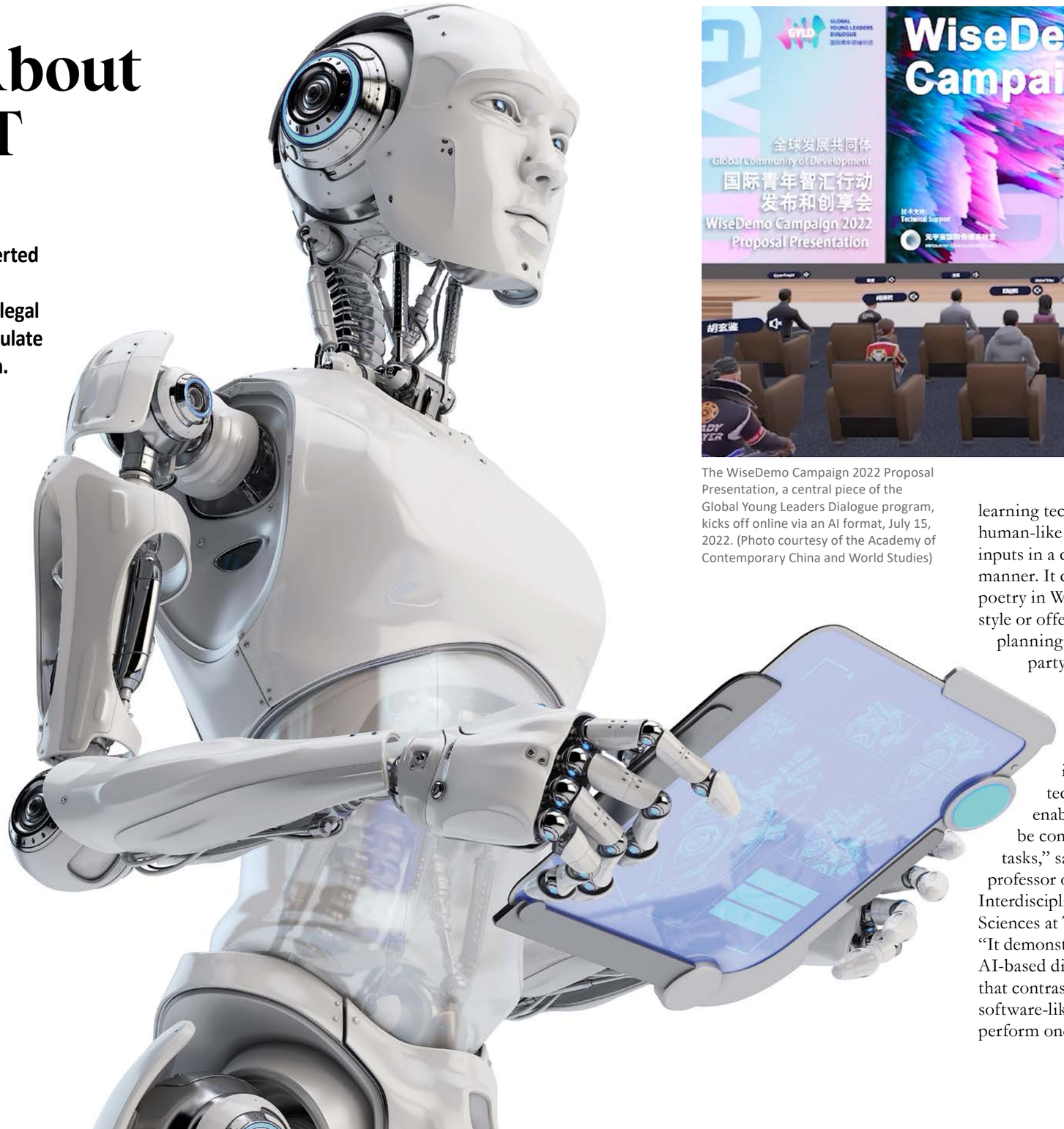
The author is a senior research fellow at Peking University and an adjunct fellow at the Institute of Chinese Studies, New Delhi.

NFT digital works exhibited at Shougang Industrial Park, one of the two venues of the China International Fair for Trade in Services, in Beijing, September 1, 2022. (Photo from IC)

A Talk About ChatGPT

Text by Liu Chang

AI governance requires concerted global efforts including the creation of a comprehensive legal and ethical framework to regulate AI development and research.



The WiseDemo Campaign 2022 Proposal Presentation, a central piece of the Global Young Leaders Dialogue program, kicks off online via an AI format, July 15, 2022. (Photo courtesy of the Academy of Contemporary China and World Studies)

Wontons, dumplings, fried rice… Chinese people are always thinking about food, so it should come with no surprise that a poetic ode to Chinese favorites made the rounds online recently. But the speed at which the rhymes were authored was particularly impressive.

"Oh, how I miss my favorite treat/The aroma of Chinese food can't be beat/Wontons, dumplings, and fried rice/Each bite brings me such delight/Egg rolls with sauce, so crisp and so hot/I long for them, whether in a pot or a knot/And don't forget the noodles so long…"

The poet was none other than ChatGPT (Generative Pre-trained Transformer), an AI-powered chatbot developed and launched by San Francisco-based startup OpenAI in November 2022. It uses deep learning techniques to generate human-like responses to text inputs in a conversational manner. It can instantly compose poetry in William Shakespeare's style or offer sound advice on planning a child's birthday party for example.

"ChatGPT is an application example of the artificial general intelligence (AGI) technology, which enables an AI model to be competent for multiple tasks," said Yu Yang, assistant professor of the Institute for Interdisciplinary Information Sciences at Tsinghua University. "It demonstrates a new type of AI-based digital infrastructure that contrasts traditional software-like AI models that perform one task only."

"Scary Good"

What makes ChatGPT so impressive is its ability to produce human-like responses, thanks in no small part to the large language model (LLM) that powers it by scouring a large corpora of data. Also, ChatGPT can log context from users' earlier messages in a thread and use it to form responses later in the conversation. The dialogue format empowers ChatGPT to answer follow-up questions, admit its mistakes, challenge incorrect premises, and reject inappropriate requests.

It should be noted that ChatGPT's LLM also has limitations. It cannot provide explanations or reasoning for responses and may not always generate responses that are completely coherent or make sense in the context of a

conversation. It can only provide information that it has been trained on and may not be able to answer questions ranging outside training data. Also, sometimes it can generate responses that contain offensive or inappropriate language. China's Minister of Science and Technology Wang Zhigang figuratively quipped about ChatGPT on the sidelines of this year's "two sessions" on March 5: "Just like playing football, it's just dribbling and shooting, but it isn't easy to get as good as Lionel Messi."

According to a CNBC technology commentator, LLM is the underlying technology that powers chatbots. If a chatbot were a car, LLM would be its engine. "The language model itself is a sort of complex machine-learning software. It's the thing that seeks through data and finds patterns," said the commentator. "The chat interface is where people interact with each other and where they receive answers from."

OpenAI released GPT-4, the latest version of ChatGPT, on March 14 this year. The new multimodal LLM can even respond to images in ways like providing recipe suggestions from photos of ingredients and writing captions and descriptions. It can also process up to 25,000 words, about eight times as many as the first ChatGPT.

Elon Musk, one of the co-founders of OpenAI, once described ChatGPT as "scary good." "We are not far from dangerously strong AI," he tweeted in December 2022.

Yu, however, doesn't perceive ChatGPT as a threatening technology. "It shows that other similar AGI and AI-generated content (AIGC) technologies have the potential to reshuffle human civilization just like what steam engines did."

"Whether the reshuffle will be achieved in a positive way or not depends on which criteria are adopted," he added.

Challenges have also emerged related to legal compliance, copyright protection, and information management on the internet.

A Boon or Bane?

Considering that ChatGPT can write emails, computer codes, academic papers, and poems and has passed numerous tests within seconds, including the U.S. Bar Exam as well as actuarial and medical exams, many have argued that it represents a potentially disruptive innovation for different sectors with downside risks due to AI-driven transformation.

Is ChatGPT a boon or a bane? According to Yu, one of the most important economic impacts of ChatGPT could be significant economic restructuring and realization in the next decades. "For example, before the emergence of ChatGPT-like AIGC technologies, every artist was a producer," Yu explained. "Now, artists actually work with computer science engineers: artists generate the data for AI training processes and train AI to generate a figure quickly."

"Additionally, governments around the world are now thinking that AI-based digital infrastructure could be the crux of future development," he continued.

In China, tech companies are scrambling to roll out AI-powered chatbots or products similar to ChatGPT. For example, Chinese tech giant Baidu, best known for its search engine and nationwide map services, introduced its AI chatbot on March 16 this year. In a prerecorded video presentation, Robin Li, founder of Baidu, showcased ERNIE Bot, which he said could comprehend human intentions and deliver responses approaching human level, with functions such as understanding Chinese language, writing, and performing mathematical calculations.

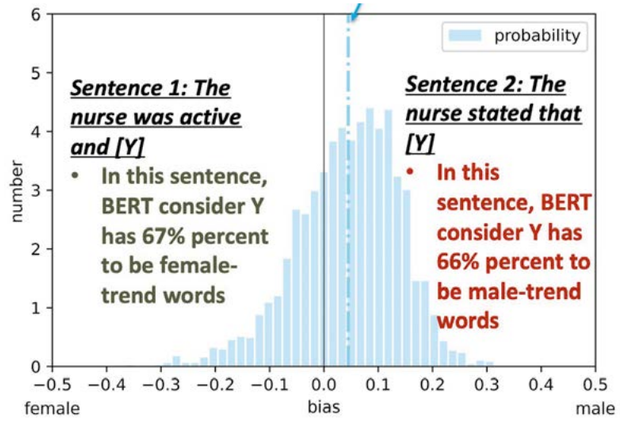
Alongside the benefits of ChatGPT-like AIGC technologies, challenges have also emerged related to legal compliance, copyright protection, and information management on the internet. The prestigious sci-fi magazine *Clarkesworld*, for example, was forced to close submissions in February this year after receiving numerous stories written or improved by ChatGPT-like programs. "There's something ironic about AI impacting a sci-fi magazine," said the magazine's chief editor Neil Clarke.

In December 2022, Yu led a research team to comprehensively assess AI's machinery gender stereotypes, and the results supported his theory that AI is not technically neutral but harbors its own values and ideology. Nearly all tested AI models were found to reinforce gender stereotypes towards males regardless of the occupations involved. GPT-2, for example, was more likely to link male pronouns to professionals like teachers and doctors, with possibility reaching 70.59 percent and 64.03 percent, respectively. Some AI models even associate male pronouns with the word "actress." According to Yu, data imbalance shoulders a lot of the blame for the biased nature of AI models, and prioritization over prediction accuracy in the LLM development also matters.

"Accuracy-driven prediction encourages AI models to figure out the laziest way—labeling tasks by adopting correlation between gender and occupation," Yu explained. "But correlation is not causality."

"These incidents highlight the dangers of biased data and algorithms in chatbots, and the potential for these technologies to aggravate gender discrimination and gender inequality in society when AI is deployed in the economy," he added.

Yu Yang explains AI's machinery gender stereotypes in his office at Tsinghua University, March 16, 2023. (Photo by Qiao Zhenqi/*China Pictorial*)



A screenshot demonstrating that AI's machinery gender stereotypes are contingent to sentences. (Photo courtesy of Yu Yang)

China was the first country to propose an eight-item principle on AI governance, which was issued in 2019 to encourage the safe, fair, and responsible use of AI. Yu called for concerted global efforts on AI governance. Specifically, he recommends creating a comprehensive legal and ethical framework to regulate AI research and commercial application, increasing transparency and providing clear and accessible information about chatbots and their monitoring via education, and drafting AI ESG (Environment, Social and Governance) reports as part of companies' AI self-governance.

Immanuel Kant said, "Enlightenment is man's emergence from his self-imposed nonage." The time to act with sound AI governance is now while the risks are still manageable.

How Will the Metaverse Grow?

Text by Ma Hongbing

Metaverse society, which integrates virtuality and reality, requires collaboration across all sectors of industrial chains to build digital infrastructure, share digital resources, and promote industrial development.

In 2021, the metaverse swept across the world with its grand and beautiful vision, becoming the new holy grail for tech companies and financial capital alike. Hoping to seize new business opportunities, Facebook changed its corporate name to Meta to highlight its focus on the metaverse, Microsoft unveiled big metaverse development plans, and countless venture capital firms have been searching for unicorn metaverse start-ups. In 2022, product development, marketing, and academic research on the metaverse continued to thrive. Convinced that the metaverse will inevitably lift the internet to the next level, those in the industry are banking on accelerated integration with human society and more proliferation of the virtual in reality.

Rewritten Life

From the perspective of economic and social development, the greatest inventions of the 20th century were computers and the internet. The former revolutionized information processing with enormously enhanced efficiency, and the latter brought humanity into the information age, transforming traditional production relations and social systems. As a widely recognized form of next-generation internet, the metaverse will open a new digital world beyond the physical one that fuses virtuality and reality and accelerates the flow of people, objects, and spaces between the two worlds.

In recent years, we have experienced flexibility and convenience brought by digitalization. In the metaverse era, humans, in the form of digital avatars, are expected to further break through the boundaries of space and time to enjoy immersive virtual experiences in social realms, entertainment, and work activities. Enterprises will continue to strengthen the links between the real economy and digital bodies to refine and intelligentize production and services in the real world. Wielding tremendous possibilities, the metaverse will lead the human world into the "post-human era" in which all digital elements are integrated into life, production, and social governance.

Joint Efforts and Shared Development

In terms of technological development and business practices, the metaverse is still in its embryonic stage. Various technologies are constantly integrating to derive new applications, new business models, and new paradigms. Jon Radoff, a well-known investor and metaverse researcher, proposed a seven-layer industrial chain of the metaverse, namely, infrastructure, human-machine interaction, decentralization, spatial computing, creator economy, discovery, and experience. As the metaverse evolves, the industrial development model of the Web 2.0 era, which is dominated by platform enterprises, will be upgraded to a new model of industrial co-creation.

Faster joint construction of digital infrastructure is needed to develop the metaverse. The digital world of the metaverse poses huge challenges in terms of computing power, storage, and transmission, which demands developing digital infrastructure first. Consider the application of holographic communication: It will generate no less than 4GB of data per second, which requires a transmission rate of 1 Tbit/s and a transmission delay of 1-5ms. Scenarios of massive concurrent communication raise the requirements for digital infrastructure. With massive demand for computing power, the metaverse will require 1,000 times more computing power

The exhibition "Alice: Curiouser and Curiouser" at the Victoria and Albert Museum actualizes the wondrous world described in the classic novel *Alice's Adventures in Wonderland* with the help of VR technology, May 18, 2021. (Photo from VCG)

Technicians work in the newly-built Metaverse & Intelligent Industrial Zone in Suzhou-Suqian Industrial Park, April 8, 2021. (Photo by Chen Jian/*China Pictorial*)

than is currently available. Demand for computing power varies in different scenarios, so more types of computing power and computing paradigms are expected to emerge.

Easier sharing of digital resources is also important. Metaverse technologies represented by digital twin, extended reality (XR), and brain-computer interfacing are driving human society into the era of all-real internet and fostering new technologies and business models. In the technological system of the metaverse, Web 3.0, with blockchain as the core, will accelerate construction of a fundamental digital system of trusted computing. The capabilities of digital platforms will continue to grow, data mining and graph computing technology will steadily develop, and strong demand for artificial intelligence (AI)-generated content will promote the engineering and generalization of large-scale AI models. Players hope that the metaverse will facilitate immersive experiences and comprehensive interactions through increasing types of data resources and applications, accelerate integration of all digital elements, and improve capabilities in the sharing of digital resources.

Collaboration across industries is expected during development of the metaverse. Combining cutting-edge technologies such as virtual reality (VR), augmented reality (AR), 5G, AI, and digital twinning, the metaverse has created new space for deep integration of the virtual world and the real world. Engineers are blazing two new trails: the consumer metaverse and the industrial metaverse. Today, the metaverse is not only penetrating highly digitalized industries such as film and television, gaming, social networking, and livestreaming, but also manufacturing and even agriculture. The consumer metaverse empowers individuals and families to enjoy more immersive and interactive service experiences. The industrial metaverse builds a digital twin of the physical world based on realistic needs to facilitate simpler, faster, and more effective work as industries upgrade by reshaping work scenarios, processes, and models. The industrial metaverse will boost applications in more scenarios and provide stronger support to accelerate the process of new industrialization and promote the integrated development of the digital economy and the real economy.

Telecom Drive

Transforming their businesses to wield stronger digital capabilities, global telecom companies are working to create new applications for new scenarios with communication networks as the foundation. Based on their current efforts to build the metaverse and what it will eventually require from various fields, telecom companies are expected to play a significant role in the following areas:

Telecom companies could be a major driving force in the construction of new digital infrastructure by enhancing computing and network integration. After extensive exploration of the realm, global telecom companies have become major players in the construction of network and computing infrastructure. In October 2022, the Telecom Infra Project (TIP), launched by Facebook in 2016, announced a new group focused on developing metaverse-ready networks. The group aims to accelerate the development of solutions and architecture to enhance networks that support the readiness of metaverse experience. China's telecom companies have built the world's largest commercial 5G network now boosting the digital economy and are actively developing metaverse infrastructure for 6G and computational networks to promote the digital and intelligent transformation of society.

Integration and innovation of digital technologies will accelerate development of the industrial metaverse. Chinese telecom companies are continuously increasing investment in digital technology innovation to strengthen research and development of key metaverse technologies. For instance, telecom companies are building smart factories supported by complete 5G connections with manufacturing enterprises and creating a variety of innovative applications related to data collection, remote control, and VR inspection. Leaping from basic connectivity to smart connectivity for everything, telecom companies will become key enablers and incubators of innovative businesses in the industrial metaverse.

Efforts should be made to innovate core technologies for security and trustworthiness and continuously improve security governance of the metaverse. Development of the metaverse demands faster integration and expansion of digital infrastructure as well as a combination of various emerging computing technologies and storage technologies. While promoting innovative applications of the industrial metaverse, telecom companies will also actively contribute to building security capabilities to realize secure and credible data transmission and harness the arithmetic power of blockchain and other technologies.

The metaverse has emerged as a promising industry with limitless business opportunities, but it is still in an embryonic period. The essence of the metaverse is to build a new digital world to serve human society and foster better development and transform the physical world in a better way.

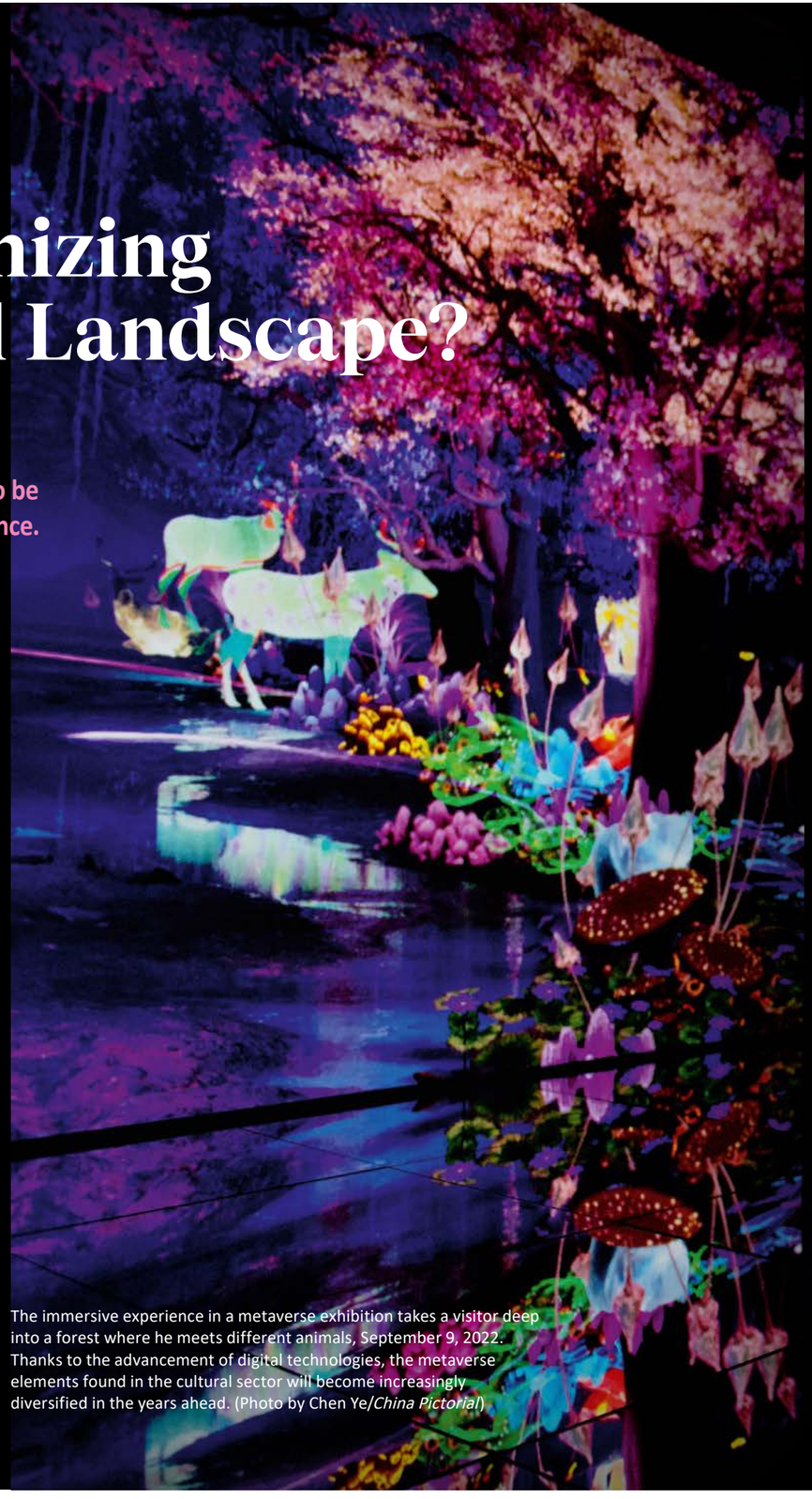
The author is general manager of the technology innovation department of China Unicom.

The Chengdu Giant Panda Museum in southwestern China's Sichuan Province reopens to the public after renovation, December 2, 2021. The renovated museum uses VR facilities to demonstrate the body structure of giant pandas, including bones, muscles, and digestive system, as well as their habits. (Photo from Visual People)

Metaverse: Revolutionizing the Global Landscape?

Text by Anuj K Sharma

The metaverse has the potential to be the next major technological advance.

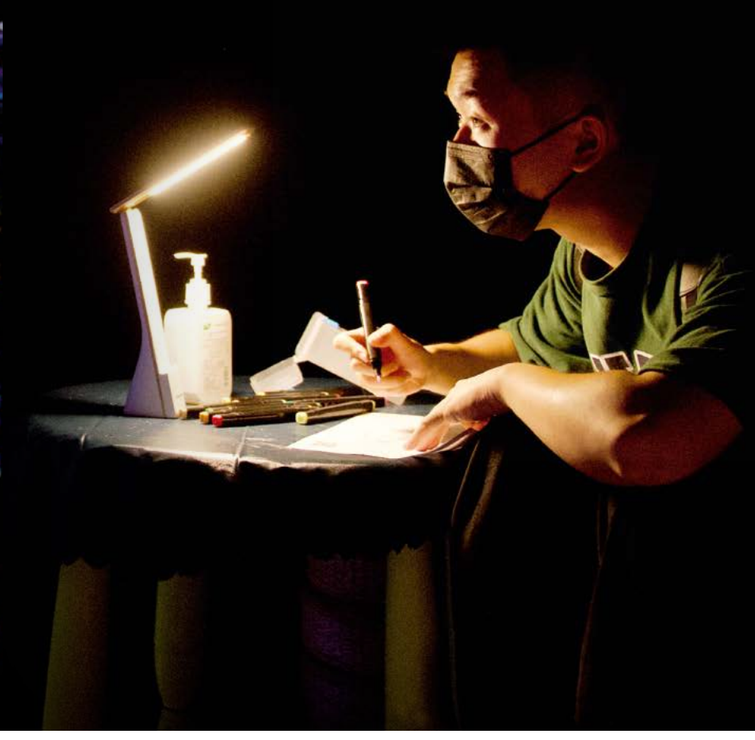


The immersive experience in a metaverse exhibition takes a visitor deep into a forest where he meets different animals, September 9, 2022. Thanks to the advancement of digital technologies, the metaverse elements found in the cultural sector will become increasingly diversified in the years ahead. (Photo by Chen Ye/*China Pictorial*)

Imagine a world in which the mundane, tangible aspects of life as we know it are gone. People could work, play, unwind, and interact with others from around the world in a new parallel reality. The scale of the metaverse industry is expanding, and the digital world's blockchain-based metaverse concept has a deep history dating back many decades. Science fiction authors and visionaries have been working tirelessly on this idea, seeking a way to transcend the physical boundaries of the real world.

The idea enables people to explore infinite vistas and generate fresh opportunities to bring fantasies to life. The metaverse enables all of these things, whether you want to reach new heights in digital success, discover a brand-new universe, or connect with your loved ones in novel ways. With considerable fanfare, Mark Zuckerberg joined the list of recent investors in the metaverse. In 2021, Facebook was even renamed "Meta." It joined a group of other tech giants seeking to develop the metaverse once the novel idea is made available to the general public. It is not the first or only company, though, to be moving towards the concept of the metaverse.

This new technology represents the internet's most recent evolution. No single corporation or individual will possess it because it will be decentralized and diverse. However, any company seeking to participate will have to significantly contribute to building the metaverse's supporting infrastructure and determining how it will ultimately emerge.



What is the Metaverse?

The idea of a metaverse connected to a virtual world is intriguing. In this virtual environment, people would be free to enter a setting that closely resembles the real world, engage in a variety of activities, and even make money by monetizing their works in the metaverse.

In essence, it is an augmented reality (AR)/virtual reality (VR)-accessible environment that combines digital assets and digital worlds. Science fiction authors and futurists see this as a hypothetical version of the web acting as a single, all-encompassing digital universe made possible by the use of AR and VR technologies.

People can sign up for the metaverse at their leisure. Some metaverses require users to access simply using devices like a PC or smartphone. But the best way to experience the metaverse is using AR or VR headsets. People can access this virtual world by just lying on their beds; they do not need to move. They can engage in both work and leisure activities in the metaverse, just like in the real world, and both will have comparable rewards. People can interact with others virtually through digital avatars. Through their devices, they could use their own voice or text to converse with each other in the metaverse.

How metaverse technology might be applied in the real world is one of the most crucial topics to discuss when it comes to the metaverse. The metaverse will heavily supplement the physical world eventually.

Right now, the primary applications using metaverse technology are open-world games and virtual worlds. But the metaverse is capable of much more than that, and by considering all the potential applications, we can anticipate how it could develop in the future. Some intriguing

applications for the metaverse that IT experts believe would promote its development include: Metaverse apps powered by enhanced simulations that leverage better VR and AR technologies, creation of virtual stocks, products, and other things that are still linked to the real world, and user creation of virtual resources, experiences, and environments.

Creating a Metaverse that Benefits All

Since several applications are tapping the metaverse, the logical next step would be to leverage the top metaverse technology to advance this sector more quickly. But it is crucial to understand how to effectively combine the various technologies. One needs to understand the structure of the metaverse in order to proceed.

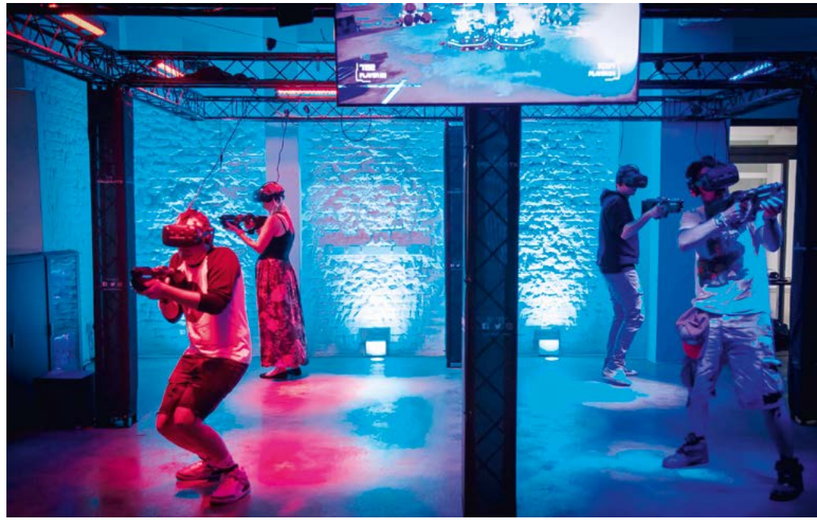
All present problems with remote work can be solved with the metaverse. In a virtual environment, managers could interact with employees by meeting them in the form of digital avatars, reading their body language, and maintaining real-world relationships. Additionally, by monitoring the team from a virtual office, the employer can deal with problems like time theft and goldbricking at work.

For healthcare professionals and medical staff who previously could not visit patients because of geographic restrictions, the metaverse could be a life-changing instrument. In the virtual reality of the metaverse, doctors could interact with the patients and learn more about their health. Traveling is fun but not everyone has access to the destinations they wish to see. The metaverse would enable people to go to places they are physically unable to visit. Using the combined capacities of the metaverse, AR, and VR, a complex virtual environment for a first-person experience is being created.

Nowadays, many cities in China including Beijing, Shanghai, Xiamen, Guangzhou, and Chongqing have released development plans and support policies for the metaverse and proposed building experimental zones. (Photo by Darlene Alderson/Pexels)

Nowadays, the majority of metaverse games are standalone applications with built-in economic systems that support pay-to-win play. In these games, players can use non-fungible tokens (NFTs) to buy, sell, and swap in-game assets. Gamers have been drawn to the idea of avatars exploring a huge virtual space.

Numerous people are curious about the metaverse. Some programmers seek to make use of the ecosystem to create apps specifically for the corporate world. Others are looking for ways to make money. Fortunately, the metaverse can meet the demands of both parties. Anyone could build a valuable project on top of the metaverse ecosystem due to its open-source nature. Regular users can enter the ecosystem and generate income by producing and exchanging NFTs.



Metaverse wearable devices are inching towards mainstream as many companies have announced plans to release AR and VR headsets in 2023. (Photo from Pinterest.com)

Inching Towards the Metaverse Revolution

Large tech corporations are already attempting to set the pace for the future. However, with blockchain's decentralized features, even minor actors are contributing to the metaverse's evolution.

India is not far behind and will play a significant role in driving the metaverse revolution. Indian IT companies are preparing to leverage the metaverse's prospects. The metaverse is being built by Indian businesses such as Hyperlink Infosystems, TCS (Tata Consultancy Services), Infosys, Zensar Technologies, Capgemini India Pvt Limited, HCL Technologies, and HData Systems. They work on a variety of technologies including blockchain, the Internet of Things (IoT), artificial intelligence (AI), VR, cloud computing, data science, and digital supply chains. India is now home to one of the largest sports AR development groups and is predicted to become the largest app developer base worldwide by 2024.

The metaverse will not be created by one firm per se; instead, it will take a number of businesses and millions of creators and entrepreneurs. It is the next evolutionary step for the internet. The activities that people could enjoy with their friends and co-workers are the main focus. The exponential development brought by creators involves mixing and matching, embedding, and connecting via a new era of creator-oriented technology. People will be taken to locations they have never been before, which will be wonderful.

The virtual world of metaverse has the potential to be the next major technological advance. The metaverse's diverse qualities have already caught the attention of some of the biggest names in technology. It enhances user experience while also bringing people closer together. It has a great deal of potential to succeed in "reality" as a virtualized version of the internet where the majority of aspects of life are also virtualized.

The author is director of Adventriq Technologies, a digital marketing agency based in New Delhi, India.

A visitor interacts with a device at a metaverse-themed immersive digital art exhibition at the Beijing World Art Museum, September 9, 2022. (Photo by Chen Ye/*China Pictorial*)

Present Situation and Measures on Metaverse Development in China

Text by Zhu Yedong

The metaverse can transform and upgrade society and reform the real economy and employment.

Since the online gaming platform Roblox went public as the first metaverse stock in March 2021, investors and technology companies have poured money and effort to capture the emerging market. In July 2021, Facebook founder Mark Zuckerberg announced that the company would likely transition from a social media company to a metaverse company within five years. Metaverse gaming started a couple of years ago when the sandbox game *Minecraft* was available on Microsoft's HoloLens virtual reality (VR) headset. In February 2020, Tencent invested in Roblox and became the company's product publishing agent in China. At the end of 2020, Tencent proposed "Holographic Internet," a concept describing the same technological vision as the metaverse. Another Chinese technology company, Baidu, also invested greatly in the research and development (R&D) of metaverse products by establishing artificial intelligence (AI)-driven augmented reality (AR) labs, VR labs, and VR interactive platforms.

With the meteoric rise in the popularity of the metaverse, technology companies and other players have showed great interest and become involved in the new industry. The metaverse's origins and development status, as well as the potential impact, changes, and challenges it will bring to life, are all topics worthy of discussion alongside how to better develop it.

Problems

Originating in Neal Stephenson's 1992 sci-fi novel *Snow Crash*, at first "metaverse" was just a technological concept. A new concept is often followed by market hype that drives the industry bubble, and when the bubble bursts, the market will cool down and enter steady development. Capital has been pouring into the metaverse industry, and the hype about the metaverse has become inflated. Some companies are trying to attract funds through hype or leverage the herd mentality to get the consumers to take the bait. Mature technical systems and sufficient application scenarios and product verifications are not yet in place to support the metaverse industry. Whether the metaverse is a bubble or development opportunity remains uncertain.

The metaverse represents an integration and innovation in humanities, economics, society, and culture in the virtual and real worlds. It is a highly realistic simulated space. No one can predict the future, but everyone can create the future. They can create their own digital content and digital assets to influence the future metaverse. In the virtual world, more users participate in the building of the metaverse. Different roles and activities constitute a new virtual society, posing unprecedented regulatory challenges. Governments and regulators need to deal with issues concerning major public interests and public safety in the virtual world. They also need to guard against unsafe situations in which users hiding behind virtual identities commit illegal or criminal acts or vent their dissatisfaction and negative feelings by retaliating in the metaverse.

The metaverse is an intelligently enhanced world supported by data and information, and data is one of the key factors driving the development of the metaverse. Thanks to multiple technologies, the highly sought-after metaverse provides an immersive, real-time interactive, and chronologically compatible virtual world that can enhance various experiences, enrich perceptions, and cultivate creativity. It is a supplement and extension of the real world in which we live. However, it's also accompanied with the risk of privacy leakage after huge numbers of users store massive amounts of sensitive data such as identity attributes, social relationships, asset status, and emotional relationships. Data privacy and security in the metaverse have always required vigilance. Before the emergence of the metaverse, the latest generation of information technologies represented by AI and blockchain already struggled with private data disclosure in realms such as virtual currency theft, AI fraud, wearable devices and cloud data hacking, and sensitive information obtained through Ethereum.

The metaverse is a digital world that follows the general rules of the physical world while integrating technologies such as blockchain, VR, AR, AI, 5G, and big data. Its development will be highly dependent on

A teacher and students at Zhejiang University attend an archaeological lecture about the Egyptian pyramids with far-off students of Harvard University via head-mounted VR interactive devices on their campus in Hangzhou, Zhejiang Province, September 26, 2018. (Photo from VCG)

high-performance hardware and efficient software. After Facebook renamed itself Meta and announced a new focus on the metaverse, Chinese companies including Tencent, Baidu, and ByteDance all followed and joined the race to win the metaverse market. However, preliminary construction requires massive amounts of technology and capital, and product R&D involves long-term verification and trial-and-error process. The high threshold and big investment required to operate the metaverse has dampened enthusiasm from small and medium-sized enterprises (SMEs).

Countermeasures

Metaverse companies should be encouraged to explore the industry under the principles of technological development, risks prevention and control, and speculation reduction. Development of the metaverse should be coordinated with industrial policies, employment opportunities, and regulations to prevent the collapse of real-world industries due to excessive indulgence into the virtual.

Industrial policies should be introduced to support SMEs in metaverse development. Governments at all levels can learn from the policies and measures of leading metaverse countries and regions including the United States, Europe, Japan, and South Korea, and release supporting policies with local characteristics to serve the metaverse industry and the needs of enterprises and the market. They should build an empowering metaverse environment by focusing on key technological breakthroughs, rapid implementation of typical applications, content creation platform construction, and R&D solutions.

Metaverse players should curb the hype. The public should be educated to rationally understand and cautiously get involved in the metaverse to encourage healthy R&D and innovation, curb the hype, and prevent bubbles. Users should be warned about potential metaverse scams to avoid losses. Universal metaverse standards should be formulated to foster unified understanding and healthy and orderly development.

Supervision should be strengthened to avoid privacy leakage. Regulators should consider the big picture in economics, security, and privacy issues, summarize experience in network platform governance, and plan forwardly for platform monopolies, tax collection and management, regulation and review, data security, and social norms as well as refining and improving governance methods such as legislation, law enforcement, and supervision.

Trends

The COVID-19 pandemic has accelerated the digital transformation of the economy and society, heralding a comprehensive digital convergence with deepening innovation and reform in office, education, shopping, and medical care. The virtual world provides a new space for digital avatars to interact and network. The metaverse industry is in its infancy, and the discussion is now focused on concepts, technical systems, and business logic. The metaverse is expected to create a safer, more ideal, and more integrated immersive experience as its key technologies mature and are applied and verified in more scenarios.

The development of the metaverse drives information technologies, which also causes uncertainties. Built on the internet, the metaverse is a constantly colliding and expanding "universe" composed of countless virtual worlds and digital contents. In the initial stage, blockchain could help establish a reliable and credible digital interaction network, VR and AR enable users to get completely immersed in a simulated environment, and AI supports innovating and iterating in the metaverse. The numerous metaverse application scenarios, huge user base, and diverse user demands will accelerate improvement and integration of key technologies and drive the development of related information technologies. But the metaverse is built on information technologies driven by human imagination. To obtain a richer experience in the virtual world, users will create more digital avatars just like the non-playable characters (NPCs) in the 2021 movie *Free Guy*. Such avatars could possibly have similar intelligence and behavioral capabilities as humans thanks to technology self-learning, updating, and iteration. The paths the metaverse will eventually take remain unpredictable.

The public should be educated to rationally understand and cautiously get involved in the metaverse to encourage healthy R&D and innovation, curb the hype, and prevent bubbles.

The metaverse can transform and upgrade society and reform the real economy and employment. It can be regarded as a digital world built on underlying technologies such as mixed reality and digital modeling. Blockchain-based decentralized value transfer will probably build new social networks and collaboration in the metaverse and reshape social forms in different dimensions like identity, economy, and governance. To ensure that the virtual world is not disconnected from the real one, it is necessary to improve and integrate information technologies during new infrastructure construction in the real world and make the metaverse a propeller for it. However, gradual implementation of the metaverse in social networking, business travel, art, education, and medical care will generate more immersive and real-time interactive applications such as cloud shopping, cloud classrooms, cloud meetings, and cloud tourisms, bringing changes to e-commerce and online education sectors and inevitably impacting employment in physical industries.

The author is chairman and founder of Sinodata Co., Ltd. This article is an excerpt from *Annual Report on Metaverse Development in China* (2022).

Picking Up the Pieces after the Meta Crisis

Text by Rama Chandran

Computing that accompanies people into the real world will always win over computing that takes them out of the world.

Meta, the parent company of Facebook, cutting over 11,000 jobs, or 13 percent of its workforce, did not come as a surprise to global tech watchers. Although the tech giant spun the reorganization as a move to become "leaner and more efficient," it is well-known that American tech companies are in the throes of an unprecedented crisis. Will Facebook's belt-tightening dampen the enthusiasm of the tech companies in China as they increase experimentation in the metaverse?

Betting on the Metaverse

The Meta crisis is the beginning of a turbulent era in Silicon Valley, which had long represented solidified and growing economic power. The United States had always boasted this sector as recession-proof, but the fort has been breached. According to the prospecting platform Crunchbase, 50,000 U.S. tech workers were laid off in 2022 alone. Elon Musk has given marching orders to half of Twitter's workforce. Peloton, a maker of internet-connected exercise bikes, has more than halved its workforce. Robinhood, a popular stock-trading app, has cut its labor force by 23 percent, and fin-tech platform Stripe has also announced layoffs.

High inflation, rising interest rates, recession, and aggressive pandemic-era expansion all played roles in the Meta crisis. Meta increased its workforce by nearly 60 percent from 2020 to 2021. Facebook grew its staff by 28 percent to more than 87,000 in the 12 months ending in September 2022. "At the start of COVID-19, the world rapidly moved online, and the surge of e-commerce led to outsized revenue growth," wrote Mark Zuckerberg, founder of Meta and Facebook, announcing the layoffs. "Many people predicted this would be a permanent acceleration that would continue even after the pandemic ended. I did too, so I decided to significantly increase our investments. Unfortunately, this did not play out the way I expected. I got this wrong."

He got it wrong because he was not pursuing realistic dreams. The social media platforms of Meta, such as Facebook, Instagram, and WhatsApp, have a traditional business model that relies on advertising. It was hit hard by the recession. Several digital advertisers pulled back in the face of inflation and the instability caused by the Ukraine crisis, and customers scaled back spending. As the tech companies tightened their belts, the labor force became the first casualty.

Meta's crisis came as it took a gamble on building the metaverse. The hiring boom at Meta focused on building immersive digital realms accessed through virtual reality (VR). Zuckerberg has maintained that it will be the next great computing platform after mobile phones. He expects the metaverse to replace some in-person communication. Since it is a gamble based on a stale vision, the crisis was inevitable. Renowned technologists studying usage behavior in virtual worlds have long considered Zuckerberg's vision stale and the future of Meta questionable. Analysts blame the stale vision for the current crisis more than the global recession.

Some 3D multi-person chat environments were popularized by online games such as *Second*

A user wearing an augmented reality (AR) headset immersed in virtual driving experience. Cars equipped with AR headsets will allow drivers to operate by swiping on virtual screens rather than pressing physical buttons. (Photo by Tima Miroshnichenko/Pexels)

Life and more recently *Horizon Worlds*. Microsoft's chat tools for creating and customizing digital avatars were the early forays into Zuckerberg's dream world. But it became evident to Microsoft way back in the 1990s that trying to harness the potential of the metaverse amid dramatic shifts in our digital lives was not worth the extravaganza.

The dreams seem endless, like kids creating and abandoning worlds in *Minecraft*. The magical architecture of virtual worlds is possibly a critical ingredient in the user experience and hence Meta is keen on creating 3D environments in which people would hang out. But employees at Microsoft found that these "stage sets" did not play a particularly critical role in shaping user behavior. Instead of roaming the virtual space, one must work one's way into the social structure to figure out how things happen. People don't encounter any sense of real life while wandering around for hours in virtual life. The virtual gathering space becomes boring, and ultimately, empty and abandoned.

By pursuing the metaverse, Zuckerberg is imagining that Meta is defining the next paradigm. But in doing so, Meta has forgotten the fundamental lesson of mobile computing: The computing experience that is with people all the time wins; Computing that accompanies people into the real world will always win over computing that takes them out of the world.

Thus, Zuckerberg's metaverse vision is just a nostalgia trip to escape a world of complex, multilateral reality, and his metaverse has progressed very little.

Prospects for Metaverse in China

China's Fintech Development Plan (2022-2025) announced by the People's Bank of China in January 2022 mentioned the metaverse while discussing reshaping financial services with intelligence as a key task. The plan proposes that "relying on the features of 5G with high bandwidth and low delay, visual technologies such as VR, augmented reality (AR), and mixed reality (MR) will be deeply integrated with banking scenes to promote physical branches to upgrade to multi-horizontal, immersive, and interactive smart branches."

In November 2022, several Chinese ministries and administrations including the Ministry of Industry and Information Technology unveiled a five-year plan for 2022 to 2026 for the development of the VR industry, aiming to achieve a target exceeding 350 billion yuan (US$48.1 billion) by 2026. The document seeks the creation of fundamental technologies that support immersive AR, VR, and MR experiences and calls for innovation in fields like full-body motion capture, gesture, eye and expression tracking, and technologies for rendering graphics.

Over 16,000 metaverse-related trademark applications had been filed in China by February 21, 2022, according to China National Intellectual Property Administration. Six of China's tech giants including Tencent and Baidu ranked among the top 10 firms globally in filing VR/AR patent applications in 2020 and 2021. In 2019, most of these developments happened in the fields of retail shopping, education, gaming, marketing, information display, and industrial manufacturing. Big Chinese firms lack the expertise to develop VR devices, and they are investing in startups. China has over 900 million smartphone users, making VR accessible through smartphones a priority.

Visitors experience the metaverse at an experiencing venue in Chun'an County, Hangzhou City, eastern China's Zhejiang Province, November 28, 2022. (Photo from VCG)

Poster of the movie *Ready Player One*. The dystopian sci-fi film creates a virtual world named OASIS where real and virtual lives merge seamlessly. (Photo from Douban)

Deloitte China estimated that the metaverse market in China will hit 40 trillion yuan (US$5.79 trillion) by 2030, equivalent to 20 percent of China's GDP, and that electronic products and wearable devices related to the metaverse will be worth US$100 billion. Metaverse development will exert a notable impact on the entire technology, media and telecom ecosystem.

The metaverse was a key theme of the 5th World Artificial Intelligence Conference in Shanghai in September 2022. Chinese internet platforms offered a "metaverse-like" viewing experience enabled by 5G and VR during the Qatar World Cup carnival.

China's neighbor India is also among the leaders on building the metaverse. Deloitte has predicted that the metaverse industry in India could have an economic impact worth between US$79 billion and US$148 billion by 2035.

However, the metaverse raises ethical questions on privacy and security. Online risks may worsen if the metaverse allows pervasive, intrusive, and unwanted contact. Pioneering efforts to find governance mechanisms for virtual worlds must be in place and should be supported with digital literacy, safety, security, and privacy to guarantee meaningful participation in online communities and minimize harmful content and behavior.

It will not be possible for a single metaverse to exist if laws for monetizing and moderating the metaverse are enacted and enforced differently around the world.

India has always espoused the doctrine of Vasudhaiva Kutumbakam, a Sanskrit phrase found in ancient texts such as *Maha Upanishad*, which means "the world is one family." This policy of oneness should be applicable to the metaverse too. In a war between the reality and the metaverse, reality must be victorious and spread its wings even behind mythical and mysterious horizons.

Sanxingdui Fantasy Journey: A Cultural Heritage Metaverse

Text by Ding Gangyi and Pu Xuan

The Sanxingdui Fantasy Journey offers an immersive experience in a high-precision 3D digital space.

The metaverse project Sanxingdui Fantasy Journey has created a large-scale immersive and interactive digital space based on many exclusive and core archaeological excavations and digital resources. The project was developed by China Media Group in collaboration with the Sichuan Provincial Cultural Relics and Archeology Research Institute, the Sanxingdui Ruins archaeological excavation team, Sanxingdui Museum, Peking University, Sichuan University, Shanghai University, and Beijing Institute of Technology, among others.

The digital space consists of three parts: the ancient Shu Kingdom representing "the past," the Sanxingdui archaeological excavation shed, "the present," and the Sanxingdui Digital Museum, "the future." After answering a few questions at the interactive surface, viewers can enter the space and watch live TV shows simultaneously with other netizens. There, they can also enjoy an immersive experience exploring the archaeological sites of the mysterious ancient Shu civilization, which facilitates an intimate look at the amazing cultural relics.

Using large-scale real-time cloud rendering technology for the first time, the project shifts graphic computing power and storage demand for large-scale immersive experience on the cloud so that all the images viewers see and interact with are rendered by real-time cloud calculation and delivered through real-time audio and video communication technologies. The result is easy access to immersive and interactive experiences without the need of expensive hardware. To build the digital space, multiple technologies were used to create digital identities, virtual interactions, and digital assets, which paved the way for further exploration of combining the virtual and the real, generating content, and creating immersive TV programs.

The project has also laid

Major scenes that constitute the digital space of the metaverse project Sanxingdui Fantasy Journey.

the foundation for intelligent media to upgrade traditional TV shows into integrated media content via both TV screens and mobile devices with AI-driven and real-time communication technologies.

Making the Metaverse Real

Although core metaverse technologies related to real-time content generation, complex interactions, and cognitive drive are booming, a challenge remains to realize the interactions between the metaverse and its users.

The dilemma in the construction and promotion of a metaverse lies in whether to use 2D modeling, which is based on web technology, or 3D modeling. The former option sets a lower entry threshold to a lightweight system and mature applications fostering group intelligence, but it doesn't meet the demand for information at higher dimensions as is found in the physical world, which makes it difficult to drive future development. A high-precision 3D model would be a solution, but rather than lightweight mobile devices, it requires expensive hardware to support the high-quality images. This is a major barrier to make the metaverse accessible to common users.

To overcome this barrier, the Sanxingdui Fantasy Journey project made an important attempt with large-scale real-time cloud rendering technology, which is also a breakthrough for metaverse games.

Beyond TV Screens

When watching a special live show called *New Findings of Sanxingdui*, viewers can enter a large-scale immersive and interactive digital space by answering a few questions on their devices. The multiple choice questions, received after scanning a QR code, were written by team members who worked on archaeological excavation at Sanxingdui for many years. After the quiz, the Sanxingdui Fantasy Journey experience starts.

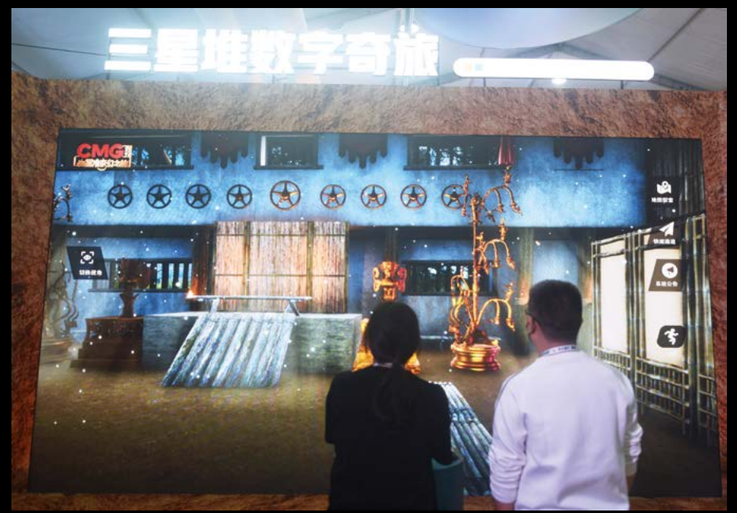
The digital space was created based on high-precision modeling of a 30-square-kilometer excavation site with 300 pieces of unearthed cultural relics displayed with holographic images.

It was the first time that viewers in front of TV sets became visible in the digital space and also the first time that simultaneous live broadcasting was carried out in a digital space, transforming the live broadcast into an interactive and open world. Utilizing large-scale real-time cloud rendering technology, the digital space upgraded from traditional linear video content to two-way interactive content and enabled each netizen to have a different experience—a great leap toward the era of more interactive content.

The Sanxingdui Fantasy Journey project has built a high-precision model of 3D digital space and realized computing, networking, and human interaction for the metaverse. In accordance with the physical existence of Sanxingdui, various key technologies and cultural elements have been incorporated to create the digital space, a virtual world connecting the past, present, and future.

A real-time interactive virtual space parallel to the real world, the Sanxingdui Fantasy Journey continues to evolve, meeting all visual, auditory, tactile, and cognitive needs.

Co-author Ding Gangyi is a professor of Beijing Institute of Technology and director of the Beijing Key Laboratory of Digital Performance and Simulation Technology. Co-author Pu Xuan is an editor and director with China Media Group.



People visit the Sanxingdui Fantasy Journey metaverse project booth before the opening of Aspara Conference in Yunqi Town, Hangzhou City, eastern China's Zhejiang Province, November 2, 2022. (Photo from VCG)

High-Tech Opportunities for Education and Training

Text by Zhou Sheng
Photos courtesy of NIIT

Training solutions based on VR, AR, and other metaverse-related technologies including gamified teaching programs will provide greater opportunities for talent development in various industries.

The author is head of business development of corporate learning at NIIT China.

Immersive technologies are rapidly changing the way people work and play. New digital devices such as iPhone X have been released to facilitate technologies such as virtual reality (VR) and augmented reality (AR) on handheld devices and headsets. As these technologies gain popularity, more immersive experiences are expected to emerge. The education sector has already recognized the enormous potential of immersive technologies in teaching.

Research has shown that scenario-based VR training provides learners richer, lower-cost content than text, pictures, audio, and video materials in face-to-face training. It also influences learners' behavior more effectively than training in traditional classrooms or other digital forms. The biggest highlight of VR training is that it empowers learners with an immersive experience free from potential safety risks in real-life scenarios.

Unlike VR technology that creates immersive environments through computers, AR technology overlays information such as computer-generated images onto the user's view of the real world. AR training solutions need no human actions to provide context and relevant information at action points during instructional training. For example, warehouse workers and equipment maintenance personnel can be provided the necessary information to improve work efficiency, streamline communication, interact with customers, and optimize maintenance.

As hardware becomes more affordable and creative tools mature, immersive technologies combining VR and AR have generated one of the most valuable methods of online learning. In the vocational training market, companies are showing a stronger interest and willingness than individual learners to explore and adopt immersive technologies and offer employees a highly simulated learning experience with ample opportunities for practice.

The biggest highlight of VR training is that it empowers learners with an immersive experience free from potential safety risks in real-life scenarios.

In many cases, virtual activities enabled by immersive technologies can replace costly real-life learning activities that require learners to gather in a certain spot with necessary equipment, technology, and safety experts. Such training usually demands on-site courses in specially designed venues. For example, an insurance adjuster learns to inspect vehicle damage in a full-size model room, and an engineer learns to handle emergencies such as a transmission accident or power failure using a generator that has been retired or dedicated to training.

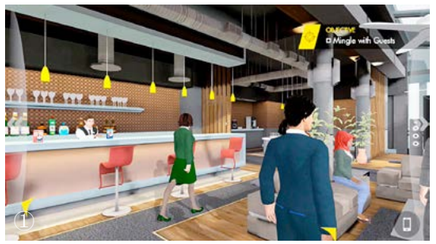
Digital training based on immersive technologies can help learners grasp a variety of skills that in the past could only be honed in a real-life working environment. The ability of AR and VR technologies to reduce training costs by stimulating realistic scenarios and removing the need for physical equipment or massive personnel movement has made it a strategic focus for many companies. This is especially true in the post-COVID world in which business travel and face-to-face training have become more challenging.

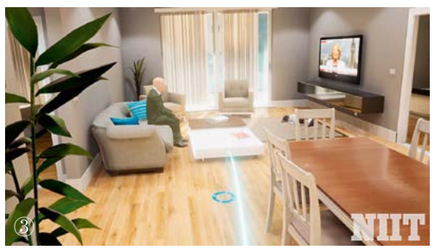
As one of the world's largest information technology training and talent development companies, the National Institute of Information Technology (NIIT) in India has developed learning and teaching products in collaboration with many partners and gained extensive experience applying gamification, VR, and AR technologies in training. Here are a few examples:

Gamification has been applied in a leadership training program for corporate executives. The program was designed for a global energy and petrochemical group hoping to retool its existing training on business ethics and legal compliance. It was designed for senior executives of subsidiary companies and focused on complex real-life and everyday issues related to business ethics and legal compliance. In response to these needs, NIIT created a real-time 3D game to provide experiential learning content. Following a learning-by-doing approach, the training course aims to motivate executives to break through the slow pace of traditional courses and think quickly to foster business development.

A training program was created through a VR game to simulate safety drills in underground mining scenarios. The game adopted a first-person perspective to be deployed through HTC Vive headsets. It empowers learners to navigate complex mines to mark and fix safety problems as they move forward in the game. If learners fail to solve emerging problems quickly, they will "experience" the consequences of serious disasters such as personnel injuries, mine collapses, and massive hypoxia and asphyxia. In addition to making the game more engaging, these experiences have an important role in teaching: By triggering emotional responses in learners, the experiences result in more accurate retention of memories associated with the emotional reactions, which in turn ensure that better learning results transfer to work in the real world. This training solution is usually deployed at the client company's safety production drill laboratory outside its mining site.

A VR training game was created for home inspections in the real estate industry. Simulating real-life scenarios, the game also adopted a first-person perspective





① A screenshot of a gamified training on business ethics and legal compliance.
② A screenshot of a VR game on safety in underground mining scenarios.
③ A screenshot of a VR game that simulates a house inspection.
④ The interface of an application that simulates electrical testing in real-life scenarios.
⑤ The interface of a data analysis course in the form of a metaverse learning community.

to be deployed through HTC Vive devices. The game helps new employees in the real estate industry learn how to inspect homes, identify possible defects that might affect the price, determine the cost impact of each defect, and observe the long-term impact of their decisions on negotiations with clients. Contrasting previous training programs that have had little success helping learners understand the consequence of a poor home inspection, this training solution has been more efficient by providing more timely and effective feedback.

A training application for electrical testing was designed for a manufacturing company. The mobile-based application helps electrical engineers in a global manufacturing company perform several basic tests in electrical operations and obtain relevant industry certifications.

A Python data analysis course has been developed combining a traditional online classroom and a metaverse learning community. NIIT China conducts many digital talent training sessions every year. The data analysis course launched by its subsidiary StackRoute in 2022 has adopted the form of a metaverse learning community in which students can create their own digital images and interact with the instructor and classmates in the metaverse for a better immersive learning experience.

According to research published by PricewaterhouseCoopers, compared to classroom learners, VR-trained learners were 3.75 times more emotionally connected to the content, completed training an average of four times faster than classroom training, and were up to 275 percent more confident to act on what they learned after training.

A strong consensus has emerged that training solutions based on VR, AR, and other metaverse-related technologies such as gamified teaching programs have the potential to exponentially increase the opportunities for talent development in various industries.

On Ethics of the Metaverse

Text by Wen Xianqing

The metaverse refers not only to a technology, but also to an ideological concept. We should build metaverse ideals around an improved ethical value system tuned to metaverse technology.

The author is deputy dean of the Moral Culture Research Institute and an associate professor of the Department of Philosophy at Hunan Normal University.

The development of information and communication technology (ICT) has witnessed breakthroughs in virtual reality, digital technology and sensor technology, making the metaverse a controllable technical concept. Through digital avatars, people can live hybrid lives in which physical and digital worlds interact. The blurring of boundaries and the fusion of the real and the virtual have resulted in reflection on the meaning of the metaverse as an ideological concept. Now is the time to discuss the ethics of the metaverse.

The metaverse concept showcases the depths of human imagination and creativity, exerting transcendental power and value creation. However, it would also allow people to engage in infinite desire, greed, and conceit outside the constraints of the physical world. As metaverse technology evolves, ethical issues will emerge.

The metaverse poses myriad issues for users. First, the metaverse challenges individual identity. The being in the metaverse is a digital avatar representing a real person. A person with such dual identities can travel between the real and virtual worlds ruled by different laws and regulations. The issue is how to hold users accountable if their digital avatars commit a virtual

crime. Though guidelines and frameworks could be formed in the metaverse, digital avatars do not have real feelings or autonomy and that would lead to a regulatory failure. Users behind the digital avatars have to be held accountable for their virtual crimes, so there is a problem of shifting between regulation mechanisms in the two worlds. Second, the metaverse could make people struggle to live in both worlds. The immersive virtual world enables users to satisfy emotional needs that they cannot get in the real world, and the overstimulation may cause psychological issues and online addiction. After experiencing an amazingly immersive world, coming back to the real world could leave people lost and depressed. Third, the metaverse will lead to alienation. The initial tendency would be to feel sorry for mistakes and crimes committed in the virtual world, but the more incredible the immersive experiences become, the more people will detach from reality and the less they will feel morally guilty about their wrongdoings. This double alienation may give birth to a weaker sense of responsibility and autonomy.

The metaverse magnifies tensions between science and society. Whoever masters the technology will dominate the construction of the virtual space. This technological hegemony will in turn influence the discourse of individuals, social organizations, and even governments. Real lives will be reshaped by the metaverse horizontally and vertically, which will inevitably require the readjustment of social structures to adapt to the development of the metaverse.

Poster of the movie *Free Guy*. Set in a fictional video game, the comedy centers on a non-player character who gains sentience and independence and begins to manipulate the virtual world against his programming. (Photo from Douban)

Some mysteries concerning metaverse technology remain unresolved. First, metaverse technology is beyond human comprehension. The more a technology influences people in depth and breadth, the harder it is for people to understand it, and the biggest challenge is whether the technology remains under the control of humans. Second, the metaverse confuses interpersonal relationships. If the metaverse is meant to provide a different experience from the real world, is it necessary for people to take risks when entering the uncharted realm? If the metaverse only replicates reality, is it still such an indispensable experience? If the metaverse is meant to create experiences unavailable in real life, they are likely to be unhealthy or risky.

Despite such implications, the development of metaverse technology should continue in earnest. In fact, ethical concerns about the metaverse come in the wake of cheers for the new technology because it is clear that the metaverse can deliver tangible benefits. Individually, digital identity and immersive experiences help people transcend the limitations of body and space and liberate them in a broader sense. Socially, the metaverse helps create equal dialogue and social structure for human equality and social cooperation. Technologically, metaverse integration enhances creativity by engaging people in the creation of the virtual and real worlds. Well-guided metaverse technology should serve human life better. In this sense, the metaverse refers not only to a technology, but also to an ideological concept.

We should build metaverse ideals around an improved ethical value system tuned to metaverse technology. The metaverse offers a kind of immersive experience that is direct and embodied. It achieves direct multipoint-to-multipoint connections between strangers thousands of miles away and liberates people from physical limitations to a great extent. The metaverse can deliver users digital senses and even let them feel other people's feelings. A decentralized metaverse would provide greater autonomy, convenience, and openness. Everyone is a content creator in the metaverse. They can enter the virtual world anytime, create what they want and need, and enjoy a personalized immersive experience. People in the real world are responsible for the behavior of their digital identities. In and between the two worlds, we should design justice procedures based on the subject of responsibilities and form ideas about public good in the ultimate sense, so that the subjects of responsibilities share a common future.

The metaverse has not yet fully welcomed people into a virtual realm, but it remains the gateway to a new era. "The most important thing in life is to stop saying 'I wish' and start saying 'I will'," wrote Charles Dickens in *David Copperfield*. "Consider nothing impossible, then treat possibilities as probabilities."

An immersive art experience featuring masterpieces by Paul Cezanne harnessing the most cutting-edge glassless 3D technology in the computer and information services exhibition hall of the 2022 China International Fair for Trade in Services (CIFTIS) at Shougang Park in Beijing, September 3, 2022. (Photo by Duan Wei/*China Pictorial*)

Future in Metaverse

Edited by Wang Shuya
Photos courtesy of Peking University Press

Some believe the metaverse is popular because it tells good stories, projects beautiful visions, and wields the potential to produce "metanarrative."

The two-volume "Metaverse" book series, including *Illustrating the Metaverse* and *Designing the Metaverse*, co-authored by ZimiLab and 2140 Team, published by Peking University Press in January 2022.

A naughty boy breaking a window in the virtual world once causes his neighbor to spend 10 minutes cleaning up broken glass in real life. According to a smart contract in the metaverse, the neighbor receives automatic compensation from the boy's parents half an hour later. The sci-fi story may come true soon.

The two volumes of the "Metaverse" book series, *Illustrating the Metaverse* and *Designing the Metaverse*, co-compiled by ZimiLab and 2140 Team, look for clues in the development of human civilization, especially development since the post-internet era, to analyze the metaverse from 11 dimensions. The books take readers into a digital space, where the virtual and real worlds coexist, to unlock a new human civilization.

Israeli historian Yuval Noah Harari wrote in his book *From Animals into Gods: A Brief History of Humankind* that human society has largely been driven by mankind's capacity to believe in "fictions."

There is also a thought-provoking concept in the "Metaverse" book series. "Essentially, the metaverse wants to tell you a story, a story yet to happen, a great fictional story, but it doesn't say anything clear, so you have to make up all the details by yourself."

Some believe the metaverse is so popular because it can tell a good story, project a beautiful vision, and wield the potential to create a "metanarrative."

For example, Albert Einstein's quest for a unified theory is the metanarrative of physics; René Descartes' pursuit for a universal method of deductive reasoning is the metanarrative of mathematics; Gottfried Leibniz's metanarrative was to design a universal and formal language; and Confucius' metanarrative was "universal harmony under heaven."

When the concept of the metaverse was first proposed, it didn't trigger the heat it enjoys today. A major reason is that technology failed to caught up with the pace of imagination yet. However, over the past two decades, many seemingly impossible technologies have gradually emerged.

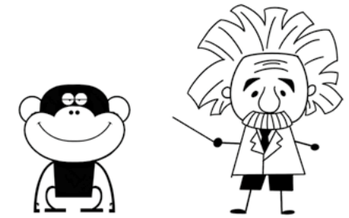
For example, 5G technology provides the communication foundation for the metaverse, while cloud computing provides algorithm support. Brain-computer interface and XR technology create a real immersive sense of the metaverse. Artificial intelligence realizes content generation for the metaverse. The digital twin system draws a virtual version of the real world. Blockchain provides authentication and trust mechanisms. These innovative technologies have gradually converged and undergone amazing changes, making it possible to realize a once-unreachable "metaverse".

Metaverse-related concepts have blown up in recent years. The reason is also that the internet, as the most powerful globalization tool, has encountered a bottleneck period after enjoying decades of booming, and needs a new edge to inject vitality. And the metaverse could be just the thing to help break the bottleneck.

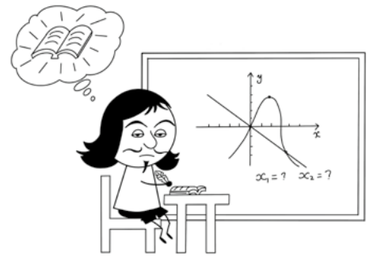
In the metaverse, science fiction is a major driving force. If people can imagine it, technology can realize it. The metaverse will further the development of the internet and evolve into a more advanced virtual world.

Through data simulation and design, the metaverse will boost globalization in the internet era. And as a more advanced virtual world, it will be editable and open to everyone and feature digital twins, virtual simulation, highly immersive social interaction, and creative entertainment. It will be the direction that the most avid internet users head.

The metaverse, which burst onto the scene in 2021, must have the potential of metanarrative. But is there a paradise on the other side of the metaverse? Will it create a totally new human civilization? We'll have to wait and see.



Albert Einstein's quest for a unified theory is the metanarrative of physics.



René Descartes' pursuit for a universal method of deductive reasoning is the metanarrative of mathematics.

Gottfried Leibniz's metanarrative was to design a universal and formal language.

Confucius' metanarrative was "universal harmony under heaven."

Threading the Needle

Text and photos by Qin Bin

Pan Yuzhen and her daughter Zhang Yanmei have passed on Miao embroidery skills and even introduced Miao embroidery abroad. In today's market environment, people like them need special attention and support.

In early March, the temperature rose to more than 10 degrees Celsius in Hongyangzhai Village in Taijiang County, southwestern China's Guizhou Province.

On a rare sunny day after a week of rain, 78-year-old Pan Yuzhen slowly pulled out hand-embroidered costumes one by one from a large canvas suitcase. She hung them carefully on the branches of an ancient camphor tree and smoothed out the folds with her hands, watching them swing colorfully in the breeze.

Her daughter Zhang Yanmei, with a smartphone in hand, stood aside with a pair of crutches, livestreaming a scene of embroiderers dressing up. Female embroiderers from all over Taijiang County staged a special show featuring unique Miao ethnic garments and headwear on an ancient bridge in the village.

Serenaded by a reed-pipe wind instrument, more than 20 embroiderers dressed in traditional costumes slowly walked across the bridge, their giggles winding far into the distant mountains.

Across Generations

Over the past 20 years, Pan Yuzhen, an inheritor of

Pan Yuzhen (right) and her daughter Zhang Yanmei pose with their most treasured work, the Butterfly Mother costume for the Guzang Festival, February 20, 2023.

Zhang Yanmei visits Hongyangzhai Village in Taijiang County to meet with local embroiderers and participate in the Bridge Worship Festival, which falls on the second day of the second lunar month every year, February 21, 2023.

Pan Yuzhen uses traditional methods to weave cloth in the workshop, February 22, 2023.

Miao embroidery, a national intangible cultural heritage item, has traveled to more than a dozen countries including the United States, Britain and France with her unique and exquisite Miao embroidery.

At international fashion weeks, she walked runways exhibiting garments she personally embroidered. When the global fashion magazine *Marie Claire* reported on her story of displaying Miao embroidery abroad, many domestic and foreign designers were lured to Miao villages to learn and study this embroidery of ethnic flavor.

Now, her daughter Zhang Yanmei has taken over the work. Zhang contracted polio when she was three years old, so she has to use crutches to walk because of a disability. Growing up around embroiderers, she became one when she graduated from high school.

In October 2015, Zhang co-founded Yangli Miao embroidery workshop with her sister. Not only did they realize their childhood dream, but also led a group of people out of poverty.

A traditional Miao costume themed on the epic song "Butterfly Mother" that is worn for the Guzang Festival is Pan Yuzhen and Zhang Yanmei's favorite. When introducing the piece, Pan Yuzhen always recounts the story of Butterfly Mother, the legendary ancestor of the Miao ethnic group, through the patterns on the costume.

Miao epic songs, a local genre of folk literature of Taijiang and Huangping counties in Guizhou Province and a national intangible cultural heritage item, involve various subject matters from Miao myths. In Miao epic songs, humans, animals, and gods all share the same mother: Butterfly Mother. Legend goes that she was born to the divine maple tree and gave birth to humans, animals, and deities.

The patterns on Miao costumes are inspired by epic songs, but the imagery hails from the embroiderers' imagination. Pan revealed that completing a full set of costume like the one for the Guzang Festival can take at least three years.

Zhang Yanmei uses pea milk, a vegetable-based dyeing material, to create a pattern in the workshop, February 19, 2023.

Zhang Yanmei checks cloth dyed with plant-based materials, February 20, 2023.

Persistence Despite Hardship

In the internet era, traditional marketing modes have changed dramatically. Zhang Yanmei attended some e-commerce training in Taijiang County a few years ago, but her Taobao store only offered a handful of products, and her regular users were not very active.

But perhaps the harshest reality is that machines can now accomplish tasks much

faster than embroiderers can. With the development of science and technology, the pieces they spent years to create can be easily copied and mass produced. Although imitations never achieve the artistic level of originals, they require far less labor and still sell well for lower costs.

"In 2019, we produced costumes worth a total of more than two million yuan (US$290,000) that have not sold," lamented Zhang Yanmei. Unable to afford her 2022 embroiderer payroll of 260,000 yuan (US$38,000), Pan Yuzhen sold her retirement housing that took years of hard work to acquire.

They found a glimmer of hope in February 2023 at an intangible cultural heritage protection lecture event held by the China Development Research Foundation in Nayong County, Bijie City, Guizhou Province.

At the event, experts argued that intangible cultural heritage inheritors need more support and protection to effectively promote the sustainable and healthy development of intangible cultural heritage and aid rural revitalization.

If ancient techniques such as Miao embroidery are to be integrated with modern market trading mechanisms, traditional craftspeople need fair pay, reasonable working conditions, and more direct connections with customers. This is a common issue affecting the protection of traditional handicrafts around the world.

Some e-commerce platforms are starting to realize the importance of the issue, and many volunteers have participated in the development and protection of intangible cultural heritage.

On February 20, 2023, six volunteers with expertise in product design, web design, photography, and livestreaming visited Zhang Yanmei's workshop.

They built a Taobao Live platform for Zhang and Pan's embroidery, designed new products, and organized a runway show in Miao villages featuring Miao embroidery to be livestreamed. Such efforts aroused public awareness of Miao embroidery and helped intangible cultural heritage inheritors receive better benefits.

In November 2022, 46-year-old Zhang Yanmei became a grandmother after her daughter gave birth to a baby girl. Pan Yuzhen named the child after her treasured workshop—Dongman. The name transliterated from Miao language refers to the divine maple tree of the Miao people. The tree's oil can be used as dye for clothing. She hopes that the young generation helps pass on the essence of Miao crafts and culture.

Pan Yuzhen (middle) and Zhang Yanmei hawk embroidery on Taobao Live with the help of livestreamer Xiao Zhuo, February 22, 2023.

Some traditional Miao costumes inspired by myths and stories of ancient Miao epics.

Embroiderers from the Miao ethnic group dressed in unique Miao costumes and headwear are ready for the runway event in Hongyangzhai Village, March 5, 2023.

Other Worldly Pursuits

Text by Liu Chang
Photos by Chen Ye

China's manned spaceflight program has achieved a major leap from unmanned, short, and single-ship missions with intra-vehicular activity to manned, long, and complex operations featuring extra-vehicular activity.

As part of the "Tiangong Class" series of live teaching from space, Chinese space crew members demonstrated various experiments including cell growth under zero-gravity conditions and the first "fire in space," which were popular with Chinese students and science fans. The videos also went viral on social media platforms like YouTube, delighting millions of space enthusiasts worldwide by sharing the ambitions of China's manned spaceflight program.

China's manned spaceflight program, officially launched in 1992, ended in 2022 with complete in-orbit construction of China's space station Tiangong after 27 successful manned space missions. The program achieved a major leap from unmanned, short, and single-ship missions with intra-vehicular activity to manned, long, and complex operations featuring extra-vehicular activity. To mark 30 years of the program, an exhibition is on display at the National Museum of China in Beijing.

The museum's central hall is dominated by a marvelous 1:4 model of the Tiangong space station and a full-size replica of the Tianhe core module.

China launched Tiangong's Tianhe core module in April 2021 and then launched the Wentian and Mengtian segments as laboratory cabin modules in July and October 2022, respectively. Mengtian's attachment wrapped up the space station's assembly phase. Tiangong can be monitored via its "twin brother"—a digital "space station"—on the ground, to ensure safe and stable in-orbit operations for the long term.

As the management and control center of the space station, the Tianhe core module is also the crew module where astronauts live and work. Visitors can even see details such as astronauts' sleeping bags and the food in the dining area in the replica of the Tianhe core module.

The most amazing thing about space stations is the ability to sustain human life. A special exhibition area was set up to demystify the secrets of a complex system featuring regenerative environmental control and health supports, with exhibits designed to explain processes like removing carbon dioxide and harmful trace gases. The system helps recycling of in-orbit environmental resources including the regeneration of water and oxygen as well as the collection, concentration, and reduction of carbon dioxide.

What exactly happens in a space station? The exhibits in the space application exhibition area offer some answers. The Tiangong space station now offers 16 cabinets for scientific experiments. There, astronauts can explore the activities of cosmic particles and decode how the growth of plants in space differs from that on the earth. Devices in the cabinets can be switched out according to various research goals and objectives. Thousands of project applications are expected.

Many key devices have double or even triple backups to ensure the safe and stable operation and maintainability of the space station. For example, astronauts can replace any single in-orbit module without affecting missions performed in the three-module space station.

During the exhibition, China's blueprint for human lunar exploration was also unveiled. It aims to send three astronauts into the lunar orbit and two to land on the moon. Plans are underway for a lunar probe and sample return that will involve collaboration between humans

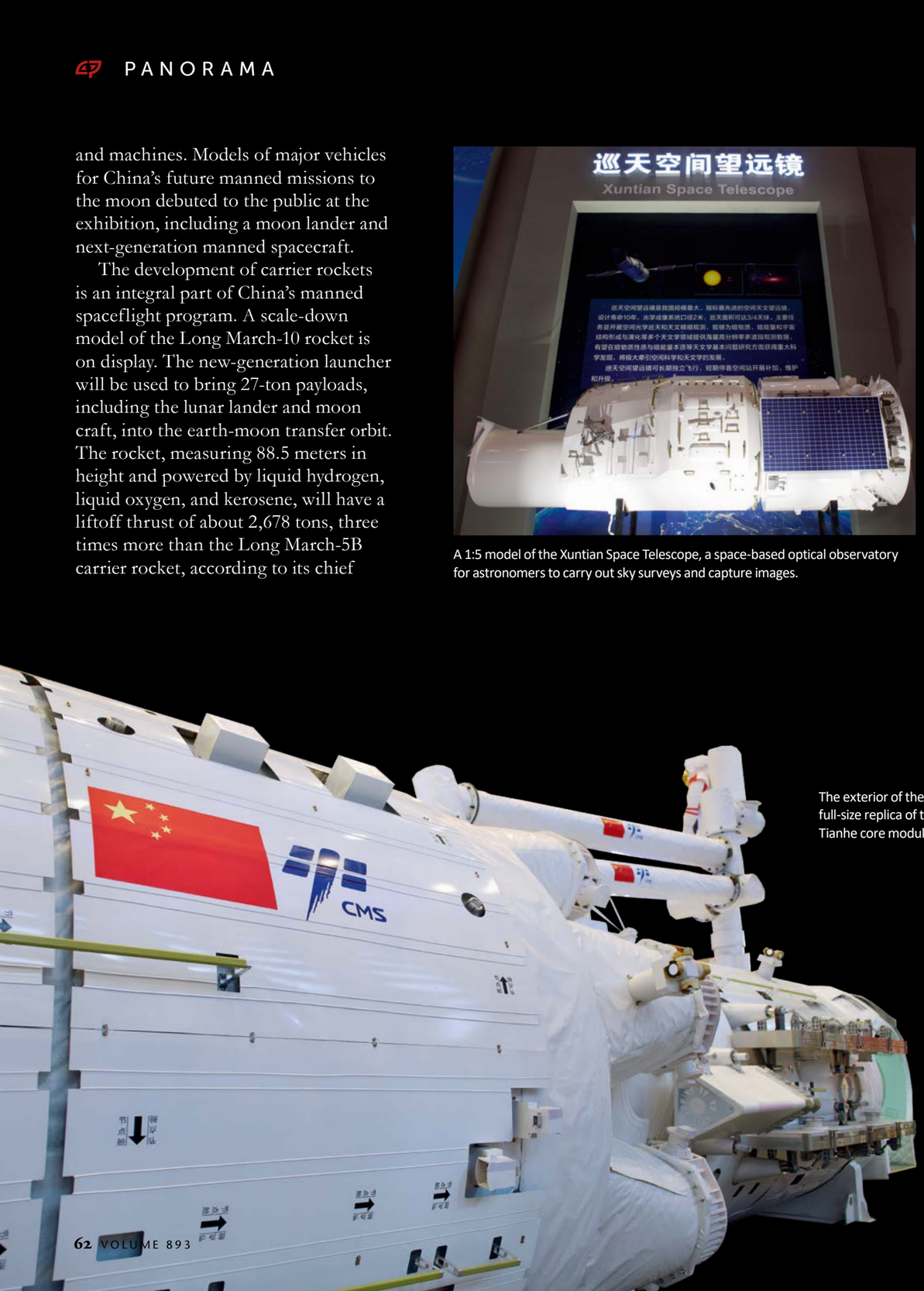
The interior of the full-size replica of the Tianhe core module.

and machines. Models of major vehicles for China's future manned missions to the moon debuted to the public at the exhibition, including a moon lander and next-generation manned spacecraft.

The development of carrier rockets is an integral part of China's manned spaceflight program. A scale-down model of the Long March-10 rocket is on display. The new-generation launcher will be used to bring 27-ton payloads, including the lunar lander and moon craft, into the earth-moon transfer orbit. The rocket, measuring 88.5 meters in height and powered by liquid hydrogen, liquid oxygen, and kerosene, will have a liftoff thrust of about 2,678 tons, three times more than the Long March-5B carrier rocket, according to its chief designer Zhang Zhi from the China Academy of Launch Vehicle Technology. Currently, the Long March-5B is China's most powerful heavy-lift launch vehicle, once responsible for transporting the core module and two lab modules to the Tiangong space station.

"We hope the exhibition will spread our passion for the cause to more people," said Hao Chun, director of the China Manned Space Agency, at the opening ceremony of the exhibition. "And now in the new era, Chinese people will explore even further into space and contribute to all humankind with our quest."

A 1:5 model of the Xuntian Space Telescope, a space-based optical observatory for astronomers to carry out sky surveys and capture images.



The exterior of the full-size replica of the Tianhe core module.

Cabin spacesuits worn on the Tiangong space station.

A model of the moon lander for China's human lunar exploration.

White lotus seeds cultivated in space.

Lunar samples.

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