Metaverse with Chinese Characteristics

How are regulatory policies shaping up the metaverse ecosystem in China completely distinct from the West?

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Abstract

Metaverse as a concept elicits images of expansive, immersive environments where individuals can interact with each other and digital assets in a seamless manner, akin to a 3D version of the internet. However, its emergence presents a complex landscape for law enforcement, introducing a myriad of challenges that necessitate urgent attention. Law enforcement agencies face difficulties in establishing clear jurisdiction for crimes committed in these borderless spaces, where traditional legal concepts often become ineffective. Currently there are divergent approaches taken by the countries in the West (notably the US and those within the EU), and the countries in the East (viz., China, Japan and South Korea) for regulating metaverse applications.

This Paper deals with this emerging metaverse regulatory landscape in China, assessing how distinct it is from the regulatory and policy approaches governing the metaverse in the West. It argues that China's metaverse strategy reflects a state-centric model of digital governance that prioritizes sovereignty, security, and ideological alignment, in contrast to the more decentralized and market-driven approaches prevalent in the West. As metaverse technologies evolve, these competing governance paradigms are likely to shape the future architecture of virtual worlds, influencing innovation, regulation, and broader societal outcomes.

Keywords: Metaverse Governance, Cyber Sovereignty, Digital Regulation, Artificial Intelligence Governance, Blockchain Technology, China's Digital Economy

JEL Classification: F52, G28, K24, **L86**, O33, P36

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1. Introduction

The metaverse can be defined as a "*massively scaled and interoperable network of real-time rendered 3D virtual worlds*" that can be experienced synchronously by an effectively unlimited number of users, ensuring continuity of data such as identity and history (Ball 2024). The term elicits images of expansive, immersive environments where individuals can interact with each other and digital assets in a seamless manner, akin to a 3D version of the internet.

The emergence of the metaverse presents a complex landscape for law enforcement, introducing a myriad of challenges that necessitate urgent attention. As virtual environments continue to expand, backed by technological advancements such as blockchain and artificial intelligence, the anonymity provided by avatars can facilitate criminal activities ranging from fraud to harassment, necessitating innovative solutions for accountability and user protection. However, law enforcement agencies face difficulties in establishing clear jurisdiction for crimes committed in these borderless spaces, where traditional legal concepts often become ineffective.

As governments grapple with the challenges globally, the need for a robust regulatory framework governing development of metaverse applications is becoming increasingly evident. However, currently there are divergent approaches taken by the countries in the West (notably the US and those within the EU), and the countries in the East (viz., China, Japan and South Korea) for regulating metaverse applications. This Paper deals with this emerging metaverse regulatory landscape in China, assessing how distinct it is from the regulatory and policy approaches governing the metaverse in the West.

The Paper is organized as follows. **Section 2** begins with the definition and evolution of metaverse, presenting policy arguments for regulating metaverse applications. **Section 3** outlines the overview of the emerging metaverse industry in China. The national action plan encouraging metaverse innovation, and the regulatory approaches governing such innovation in China, are covered in **Section 4** and **Section 5,** respectively. **Section 6** demonstrates how this unique regulatory approach is resulting in a "Metaverse with Chinese Characteristics", in contrast to the metaverse applications being developed elsewhere in the West. **Section 7** concludes the Paper.

2. Metaverse: Definition, Evolution, and Policy Case for regulation

The concept of the metaverse is not new; it has evolved over the years, gaining visibility from early depictions in science fiction literature, particularly Neal Stephenson's "Snow Crash" (Stephenson 1992). However, its current iteration began to crystallize in the early 2020s when advancements in technology made it increasingly feasible. Significant breakthroughs in computing power, graphics rendering, and internet infrastructure have enabled the creation of rich, immersive experiences that were previously unattainable.

In recent years, interest in the metaverse has further surged due to several interlinked technologies. Foremost among these are virtual reality (VR), augmented reality (AR), powered by artificial intelligence (AI), and platform economies powered by blockchain technology applications. These elements are pivotal in making the metaverse not just a conceptual space, but a dynamic and interactive environment. AI enhances user interaction and personalization within these digital domains, empowering users to experience layered realities (VR / AR) that blend the physical and digital worlds. Additionally, blockchain technology provides secure methods for transactions and ownership within the metaverse, facilitating the emergence of virtual economies. Thus, the synergistic effect of these technologies is driving substantial interest and investment in the metaverse landscape (Yogesh, Laurie et al., 2022).

Powered by these technological advancements, the metaverse is set to revolutionize various industries. In gaming and entertainment, it enables users to interact in shared virtual environments, creating unique and engaging experiences. In education, virtual classrooms and simulations provide personalized learning opportunities (Camilleri 2023). Healthcare leverages the metaverse for remote surgeries and virtual therapy sessions (Nitin, Saurabh & Jayesh 2023), while retail and e-commerce use it to offer virtual showrooms and augmented shopping experiences (Tavman 2024). Industries like real estate and manufacturing benefit from digital twins, enabling precise modeling and optimization.

Policy arguments for regulating Metaverse

Despite these advancements, however, the metaverse's rapid development raises critical policy and regulatory challenges. Law enforcement agencies must adapt to combat virtual crimes like fraud, harassment, and intellectual property theft within this expansive digital domain. Customer disputes, particularly over digital assets and virtual property, require robust legal frameworks to ensure accountability and fairness. National security concerns may arise from data breaches, misinformation campaigns, and the misuse of virtual platforms by malicious actors. Therefore, regulation must nurture responsible innovation by fostering creativity while preventing unethical practices and ensuring equitable access. Policymakers may have to thus navigate these considerations while maintaining the delicate balance between innovation and control (INTERPOL 2024).

Within the overall regulatory framework, three areas warrant critical attention: digital identification, blockchain platforms, and AI algorithms. These technologies underpin the metaverse's functionality, enabling secure access, trusted transactions, and personalized experiences. However, each area presents significant challenges, and requires a tailored approach to address its unique implications for privacy, security, and fairness.

Digital identification serves as the gateway between the physical and virtual worlds, enabling users to securely access metaverse platforms. These systems authenticate identities, prevent fraud, and facilitate seamless interactions. However, the reliance on digital IDs also raises concerns about privacy, security, and interoperability. Policymakers must ensure that digital ID systems are secure, equitable, and compatible across platforms (WEF 2024). Yet, regulating digital ID is practically challenging due to jurisdictional differences, decentralized data management, and the risk of excluding marginalized groups. Striking a balance between safeguarding privacy and enabling innovation remains a critical hurdle.

Blockchain technology powers the metaverse by enabling decentralized ownership, transparent transactions, and secure asset management. It underpins virtual economies through non-fungible tokens (NFTs) and smart contracts, ensuring trust and efficiency. However, blockchain's anonymity and decentralization complicate regulation. Addressing issues like fraud, money laundering, and intellectual property theft requires innovative policy solutions that do not stifle blockchain's potential. Additionally, the global and decentralized nature of blockchain makes enforcement across jurisdictions challenging, necessitating international cooperation and harmonized legal frameworks (Gadekallu, Huynh & Wang et al., 2022)

AI algorithms enhance the metaverse by enabling personalized experiences, intelligent virtual agents and / or non-player characters (NPCs), and dynamic content creation. They analyse user behavior, adapt virtual environments, and automate tasks to enhance engagement. However, AI raises significant policy concerns, including privacy violations, algorithmic bias, and accountability for autonomous decisions. Regulating AI in the metaverse requires addressing these risks while fostering innovation. Practical challenges include the "black box" nature of AI systems, the rapid pace of technological advancement, and the lack of global consensus on ethical AI standards (Mona, Eman, & Ashraf 2024). Policymakers must create adaptive and transparent regulations to ensure AI's responsible use in the metaverse.

The metaverse thus not only presents unprecedented opportunities across industries but also demands robust regulatory frameworks to ensure its ethical and equitable development. Collaboration between governments, industry, and civil society is essential to create a metaverse that aligns with societal values and priorities, balancing technological advancement with accountability and fairness.

3. Metaverse in China: An overview

In line with the global trends, China's metaverse market is also witnessing an impressive trajectory, with projections indicating a valuation of around USD 8.6 bn as of 2024. This figure places it on a competitive footing with western markets, where the metaverse is also burgeoning. The projected growth rate for the metaverse market in China is notable, with analysts forecasting a CAGR of approximately 32.88% from 2024 to 2030 (Statista Market Forecast).

The rise of AI and block chain technologies in China is integral to creating immersive virtual worlds that align with global metaverse trends. Key players in the Chinese metaverse ecosystem, including tech giants like Tencent, Alibaba, and Baidu, are leveraging these technologies to design and enhance user experiences (De Masi et al 2025). Tencent, for instance, has made substantial investments in gaming and social interaction platforms, creating ecosystems that blend gaming with interactive user engagement, thus paving the way for more sophisticated metaverse experiences. The company's ability to publish and control a significant portion of virtual content in China positions it uniquely to shape the metaverse landscape. In addition, Alibaba is exploring applications that range from virtual retail experiences to online social gatherings, while Baidu has initiated projects focused on creating a nationally cohesive digital space.

While major tech companies like Tencent, Alibaba, and Baidu dominate the Chinese metaverse narrative, numerous smaller players are emerging and adding diversity to the landscape. Companies such as Nreal, specializing in augmented reality glasses (Arjun 2023),

and WIMI Hologram Cloud, known for holographic technology, are actively developing solutions that cater to metaverse applications (PR Newswire 2025). Furthermore, start-ups like MiHoYo are creating immersive environments for social interactions and entertainment, contributing to the overall growth of the ecosystem (Chang Che 2022). These players enhance competition, drive innovation, and widen the virtual experience offerings available to the consumer base.

The development of these metaverse applications in China is however underpinned by heavy state intervention from time to time. The intervention - both from a national action plan perspective and from the perspective of regulatory oversight - is further outlined below.

4. National action plan for the innovative development of the metaverse industry

The Chinese government has taken a structured and cautious approach to developing the metaverse, recognizing its potential as a driver of technological and economic innovation while ensuring it aligns with the broader goals of national stability and governance. The **Three-Year Action Plan for the Innovative Development of the Metaverse Industry (2023-2025)** highlights this dual commitment to leveraging metaverse technologies for practical applications and maintaining the ideological framework of the Chinese Communist Party (Giulia, 2023).

Unlike the global trend of positioning the metaverse as an *alternate* virtual reality for immersive social and economic activities, China's national action plan frames the metaverse as a *supplement* to real-world applications. The action plan stresses the importance of integrating metaverse technologies into practical domains, such as industrial digitalization, cultural heritage preservation, and smart city development. For instance, virtual reality applications are being encouraged in medical training and industrial design, where they can enhance real-world efficiency and innovation rather than replace existing systems or merely provide alternate technology-enabled environments. This practical orientation ensures that the metaverse remains a tool for productivity and national development, rather than a digital channel for escapism.

The CCP's stance on the metaverse is further shaped by a strong emphasis on safeguarding state legitimacy and ensuring that new technologies uphold the ideological principles of the *party*. The action plan explicitly calls for the metaverse to adhere to core socialist values and avoid applications that could undermine national security. Platforms must comply with strict content moderation policies, and all data generated within the metaverse must adhere to data localization requirements to ensure regulatory oversight. This ideological framing reflects a broader concern that the metaverse should not become a platform for narratives or activities that could destabilize social harmony.

The government's action plan is further supplemented by a more detailed Virtual Reality and Industry Application Integration Development Action Plan (2022-2026) released on November 2, 2022 by the Ministry of Industry and Information Technology (MIIT) along with four other government departments. This plan further emphasizes that the metaverse is not just a technology trend but a key enabler of the country's broader strategy to enhance its global competitiveness in high-tech industries (Huld 2022). Local governments, including in provinces like Zhejiang and city municipalities like Shanghai, have announced significant investments and policy incentives to foster metaverse-related research and development,

aiming to integrate it into sectors such as manufacturing, healthcare, education, and entertainment. Beijing's Tongzhou district, designated as a sub-center, aims to attract more than 100 metaverse-related companies by the end of the year.

Guided by the National Action Plan, the metaverse industry in China has emerged as a concept deeply integrated with its booming digital economy. China's immense youth population, known for its gaming enthusiasm, serves as a key driver for the growth of the metaverse. Players have historically engaged with virtual currencies, such as QQ coins and WeChat points, to exchange for virtual goods, indicating a solid foundation for virtual economies within these platforms (Li 2023). The Chinese youth's penchant for gaming, coupled with extensive infiltration of digital culture into their daily lives, cultivates an environment ripe for the metaverse applications to flourish. Three following examples outline the manner in which the industry players are developing metaverse applications in line with the national action plan formulated by the State.

Baidu's XiRang is a virtual space designed to integrate elements of traditional Chinese culture, allowing users to immerse themselves in environments that blend historical significance with futuristic innovation. One feature is its sci-fi interpretation of the ancient Shaolin Temple, which invites users to explore a reimagined version of this iconic cultural site, creatively merging centuries-old heritage with contemporary technology (Yifan Lu 2022). Beyond the Shaolin Temple, XiRang also hosts virtual festivals celebrating important Chinese cultural events, offering users the opportunity to partake in time-honoured traditions and communal experiences from anywhere in the world. By seamlessly weaving together history, innovation, and community-building, XiRang exemplifies how metaverse is nurtured by the service providers as a vibrant canvas for cultural expression, fostering a shared sense of belonging and identity that resonates deeply within Chinese society and aligns with the national action plan.

Tencent's WeCity is a smart city platform widely used by municipal governments, urban planners, and public service agencies across China. Its primary users are local governments and private-sector entities involved in urban development and management. The platform leverages digital twin technology to create virtual replicas of urban environments, enabling real-time monitoring and simulation of city systems. Tencent's WeCity aligns with the national action plan by integrating metaverse technologies into real-world urban management, emphasizing practical applications over virtual escapism. The platform promotes technological innovation while adhering to state priorities, including data localization and ideological compliance. By doing so, WeCity exemplifies how private enterprises can drive innovation within the framework of national goals (Lu Hongyan 2020).

Alibaba's Cloudverse provides businesses with tools to design and manage customized virtual spaces, focusing on practical applications that enhance real-world experiences rather than creating alternate realities. It supports industries such as retail, healthcare, and cultural preservation, offering solutions that align with national priorities to integrate metaverse technologies into real-world applications. Some of its applications include: (i) *Virtual Shopping Experiences*: During events like Singles' Day, Alibaba utilized Cloudverse to create virtual shopping environments where consumers could interact with products in a 3D space, enhancing engagement and providing a novel shopping experience, (ii) *Healthcare Simulations*: The platform supports the creation of virtual clinics and simulation-based training environments, allowing healthcare professionals to conduct surgical simulations and therapy

sessions, thereby improving training outcomes and patient care, and (iii) *Cultural Preservation Initiatives*: Cloudverse facilitates the development of virtual replicas of historical sites and artefacts, promoting cultural tourism and heritage preservation by making cultural assets accessible in an interactive format (Rupal 2024).

The efforts by the individual players are further being standardized through the **Metaverse Standardization Working Group**, established by China's Ministry of Industry and Information Technology (MIIT). The Working Group comprises 60 experts from leading technology firms, academic institutions, and government agencies (Goschenko 2024). Notable members include representatives from Huawei, Tencent, NetEase, Baidu, Ant Group, and Lenovo, alongside researchers from Peking University and Fudan University. This diverse assembly is actively formulating and promoting industry standards for the metaverse, ensuring alignment with the national action plan. The group supports pilot projects and regional metaverse initiatives to test the applicability of its standards. For example, in cities like Beijing and Shanghai, local metaverse ecosystems are developed using the group's guidelines, allowing for iterative improvements and showcasing best practices (Cromley 2024). These guidelines are thereafter fine-tuned to ensure that the commercially launched metaverse platforms maintain interoperability, adhere to state-approved content guidelines, and comply with strict data privacy and security regulations.

5. Regulatory oversight for Metaverse Industry in China

The Cyberspace Administration of China (CAC) is the apex regulatory body responsible for overseeing and enforcing China's cyberspace governance policies. Established in 2014, it operates under the dual framework of the CCP and the state, reflecting its unique status as both an administrative agency and a party institution. The CAC plays a central role in shaping China's digital landscape by regulating online content, ensuring cybersecurity, and enforcing data protection laws. With its far-reaching authority, the CAC has become instrumental in advancing the CCP's vision of a "cyber superpower," balancing technological development with national security and ideological control.

The CAC's origins can be traced back to the State Internet Information Office (SIIO), created in 2011 under the State Council to oversee internet content and online propaganda. In 2014, the establishment of the Central Leading Group for Cyberspace Affairs, chaired by President Xi Jinping, marked a turning point in China's approach to cyberspace governance. This group elevated the importance of cybersecurity and digital governance, with the CAC serving as its executive office. In 2018, the group was upgraded to the Central Cyberspace Affairs Commission (CCAC), further institutionalizing the CAC's role as a key regulatory and policy-making body. Over the years, the CAC's responsibilities have expanded from content regulation to include cybersecurity, data protection, and personal information governance. Its evolution reflects the CCP's growing recognition of cyberspace as a critical domain for economic, social, and political stability (Lee 2022).

The CAC's mandate requires extensive collaboration with various domestic and international entities. Domestically, it works with ministries like the Ministry of Industry and Information Technology (MIIT) and the Ministry of Public Security (MPS) to enforce cybersecurity laws and manage critical information infrastructure. Quasi-state institutions such as the Cybersecurity Association of China also support the CAC's efforts by promoting compliance and facilitating industry-government coordination. Internationally, the CAC

projects China's vision of "internet sovereignty," advocating for state-controlled digital domains (Zeng et al 2017). It participates in forums like the World Internet Conference, where it promotes regulatory models emphasizing government control over cyberspace. By engaging with global stakeholders, the CAC seeks to influence international norms and establish China as a leader in cyberspace governance.

Several landmark policies issued by the CAC directly impact the governance of metaverse applications. The **Cybersecurity Law (2016)** established foundational rules for protecting critical information infrastructure and regulating cross-border data transfers, ensuring security in digital ecosystems. Further reinforcing this, the **Data Security Law (2021)** and the **Personal Information Protection Law (2021)** introduced stringent regulations on data handling and personal information safeguards (www.chinalawtranslate.com). These measures influence how metaverse platforms manage user data, particularly in collaboration with foreign entities, by emphasizing data sovereignty and compliance with Chinese standards.

Additionally, the CAC's emphasis on ideological control could shape the design and functionality of virtual spaces, ensuring they align with Chinese cultural and political values. As the metaverse continues to evolve, the CAC's policies will be instrumental in determining its trajectory within China's highly regulated digital environment. This is achieved through CAC's focused regulatory attention on three key pillars underpinning the metaverse: digital identity, blockchain platforms, and AI algorithms. The following sections delve into these policies in greater detail.

Regulatory policies for real-name identity verification

The metaverse offers unprecedented opportunities for interaction and innovation, but the anonymity inherent in its back-end platforms poses significant challenges for law enforcement. Users often interact through avatars or pseudonyms, making it difficult to link virtual activities to real-world identities. This anonymity is facilitating illegal activities, such as fraud, identity theft, cyber harassment, and intellectual property violations. Additionally, the absence of robust identity verification mechanisms enables money laundering, the spread of misinformation, and even cyberterrorism. As the metaverse expands, law enforcement faces increasing pressure to combat these issues while balancing the protection of user privacy and freedom of expression (INTERPOL 2024).

To mitigate these challenges, China's regulatory framework mandates real-name identification across metaverse platforms through both blockchain-specific and algorithmic regulations. The **Provisions on the Administration of Blockchain-Based Information Services (2019)** require blockchain platform users to authenticate their identities with government-issued credentials, such as national ID cards or phone numbers. Similarly, the **Administrative Provisions on Algorithm Recommendation Services (2022)** compel platforms using algorithms for content personalization or user engagement to implement real-name verification systems. In 2023, the CAC extended these requirements to metaverse platforms, mandating real-name authentication for accessing virtual environments, conducting financial transactions, and managing virtual assets. Together, these regulations aim to ensure accountability, enhance security, combat fraud, and uphold ideological compliance within the metaverse (www.chinalawtranslate.com).

China operationalizes this regulatory framework through its **Real-Name Decentralized Identity (Real DID)** system, introduced in 2023, which integrates blockchain technology with centralized state oversight to manage digital identities in the metaverse. Developed under the guidance of the CAC, Real DID merges a blockchain-based framework with centralized control and links users to national identity databases, ensuring traceability and accountability across both virtual and physical realms. Anicert, a subsidiary of the Ministry of Public Security's First Research Institute, spearheads the issuance, management, and verification of user identities through its Cyber Trusted Identity (CTID) system, already in use for verifying Chinese identities across various institutions (Red Date Technology 2025).

The system's design, supported by major players like Alibaba, Tencent, and Baidu, alongside state-backed blockchain initiatives, incorporates tamper-proof identity verification via distributed ledgers while maintaining government oversight through state-authorized nodes. This verification involves a "three-factor process" including government ID, legal name, and facial recognition (Jing et al 2021). Once verified, users can create multiple public-private key pairs for use across different platforms, allowing for login with an anonymized DID address. This model strikes a balance between blockchain decentralization and regulatory control. The main goal of this ground-breaking system is to eventually include all of China's 1.4 billion citizens. While the expansion will occur gradually, the initial phase targets the issuance of 5 million RealDIDs, facilitated through carefully selected pilot programs.

For metaverse companies, compliance with CAC regulations necessitates adopting Real DID for secure user verification, content moderation, and adherence to financial and regulatory standards. Platforms must authenticate users during registration, connect their activities to verified identities, and ensure transactions comply with anti-money laundering (AML) and other legal requirements (China Meta Guide 2026). These measures enable effective law enforcement and regulatory oversight, fostering a secure user environment, underscoring China's focus on ensuring state control over metaverse development.

Regulatory policies for blockchain services

Blockchain technology is foundational to the metaverse, offering essential features such as security, interoperability, and trust (Ball 2024). It ensures data integrity through immutable ledgers, protecting transactions and virtual assets from fraud. Blockchain facilitates interoperability by enabling seamless interaction across multiple platforms, ensuring users can carry digital assets and identities across virtual worlds. Moreover, blockchain enhances trust by providing transparency and decentralization, allowing participants to independently verify transactions and ownership. These features are critical for the metaverse's growth, supporting virtual economies, governance structures, and user interactions.

China's approach to blockchain has been profoundly shaped by the 2018 announcement by Xi Jinping, which identified blockchain as a critical innovation for national development and economic transformation. In response, the CAC issued the Blockchain **Information Service Management Regulations** in **2018**, which became the foundation of blockchain governance in China. These regulations mandate that all blockchain service providers: (i) Register their platforms with the CAC and undergo security assessments to ensure compliance, (ii) Implement real-name authentication for users to enhance traceability and accountability, (iii) Monitor and remove illegal content, ensuring that blockchain systems do

not propagate politically sensitive or unlawful information, and (iv) Maintain data storage and management practices that comply with China's data localization requirements, ensuring that data generated within China remains within its borders. These measures ensure that blockchain technology contributes to China's digital ecosystem without compromising national security or societal stability (www.chinalawtranslate.com).

In addition, the CAC has been instrumental in nurturing the **Blockchain Service Network (BSN)** as a foundational platform for blockchain applications in China (BSN 2020). Launched in 2020, BSN is a state-backed initiative developed in collaboration with entities like China Mobile, China UnionPay, and Red Date Technology. It aims to provide an interoperable, cost-effective infrastructure for blockchain developers, reducing barriers to entry and fostering innovation (Alan 2020). BSN further balances blockchain decentralization with centralized oversight through two versions: BSN Domestic and BSN International. *BSN Domestic* operates as a fully permissioned network under China's regulatory framework, with nodes managed by government-approved entities and integration with national digital infrastructure. *BSN International,* designed for global businesses, supports permission-less blockchain frameworks but excludes cryptocurrency functionalities, aligning with Chinese regulatory norms. This dual structure enables China to foster domestic innovation while strategically engaging with global markets (Mikk 2021).

A key component in BSN's implementation is the promotion of digital collectibles considering the restrictive stance of the state on cryptocurrencies. Digital collectibles in BSN, akin to NFTs, represent ownership of virtual assets such as digital art, cultural artefacts, or in-game items. These collectibles are stripped of speculative features and cannot be traded on secondary markets for financial gain. This approach aligns with China's broader crackdown on cryptocurrency speculation and its emphasis on using blockchain for productive and non-speculative purposes (Zeyi 2022, Tong 2022).

Several Chinese metaverse companies are leveraging BSN to align with regulatory requirements while innovating within the blockchain space. Three examples can be cited to illustrate this point. (i) AntChain, the blockchain subsidiary of **Ant Group**, has strategically aligned with China's BSN to advance blockchain interoperability and foster the development of Web3 technologies. This collaboration is exemplified by the open-sourcing of AntChain Bridge, a cross-chain protocol developed in partnership with the China Academy of Information and Communications Technology (CAICT) and the BSN's Spark Chain Network. AntChain Bridge facilitates secure and efficient communication between heterogeneous blockchain networks, thereby enhancing the interconnectedness of diverse blockchain ecosystems (Yang and Jain 2023). (ii) At the Baidu Create 2022 AI Developer Conference, **Baidu** hosted the event virtually within its metaverse platform, XiRang, marking a significant step in immersive digital experiences. This virtual environment was powered by Baidu's proprietary blockchain, XuperChain, which is integrated into BSN. This integration facilitated secure and efficient data management, ensuring compliance with national regulations. By leveraging the BSN's standardized infrastructure, Baidu facilitated secure access and credential verification for users, ensuring the integrity of the virtual environment (Gong and Qiu 2024). (iii) In 2022, **Tencent** discontinued its Huanhe digital collectibles platform due to mounting regulatory scrutiny in China, which imposed strict controls on speculative activities and banned secondary trading of digital collectibles. In alignment with government policies and self-regulatory commitments signed by Tencent and other tech companies, the company halted new releases to avoid potential regulatory

risks (Su et al 2026). Subsequently, Tencent shifted its focus to integrating with the state-backed BSN, enabling it to explore blockchain applications and digital collectibles within a compliant and controlled framework.

Regulatory policies for AI algorithms

AI algorithms are central to creating an immersive, dynamic, and interactive metaverse experience. They enhance virtual environments by enabling real-time rendering, intelligent virtual agents, and personalized interactions. The rapid advancement of AI in the metaverse is driven by innovations in machine learning (ML), natural language processing (NLP), and generative AI. NLP powers voice-enabled interactions, while generative AI creates virtual assets like avatars and environments autonomously (Ball 2024). However, these advancements raise concerns about bias, privacy, and accountability. For instance, biased algorithms can perpetuate stereotypes, and generative AI might produce harmful or inappropriate content (Basyoni and Qadir 2023). Privacy risks arise from the extensive data collection required to train AI, while the opaque nature of AI decision-making (the "black box" problem) complicates accountability for errors or unethical outcomes.

In China, the CAC issued the **Administrative Provisions on Algorithm Recommendation Services** in 2022 to regulate AI in digital platforms, including metaverse applications. These regulations require: (i) *Algorithm Registration*: Companies must register their AI algorithms with the CAC, including detailed descriptions of their purpose and operational logic, (ii) *Content Control:* Algorithms must align with state-approved content guidelines, ensuring the prevention of illegal or politically sensitive material, (iii) *Transparency and Explainability*: Platforms must disclose how their algorithms function to users and regulators, and (iv) *User Rights*: Users must have the option to disable algorithm-driven recommendations. These provisions prioritize state oversight, ensuring that AI technologies align with national priorities like social stability and content moderation (www.chinalawtranslate.com).

China subsequently extended this registry-based approach to newer forms of artificial intelligence. The **Provisions on the Administration of Deep Synthesis Internet Information Services** issued by the CAC in November 2022 introduced obligations relating to synthetic content, including the identification and management of deepfakes. This was followed by the **Interim Measures for the Management of Generative Artificial Intelligence Services**, jointly issued by the CAC and six other government agencies in July 2023, which established governance requirements for generative AI systems. While these regulations address different technological contexts, they retain the same underlying principles evident in the algorithm recommendation framework - mandatory registration, content accountability, transparency obligations, and state oversight aimed at ensuring that AI development aligns with public order, social stability, and national policy objectives (www.chinalawtranslate.com).

Chinese metaverse companies have made specific adaptations to comply with CAC's regulations. **Tencent** has restructured its AI algorithms for platforms like QQ Metaverse, ensuring they are registered with the CAC and align with state content guidelines (Warner 2022). Tencent also introduced real-time monitoring systems to prevent the dissemination of unapproved content and added features to disclose algorithmic functions to users. **ByteDance**, known for its AI-driven platforms, has adapted its metaverse applications by

introducing stricter controls over personalized recommendations. For example, its virtual interaction tools now limit recommendations to content vetted for compliance with Chinese standards. ByteDance has also improved transparency by providing users with detailed information about how its algorithms determine content and offering an option to opt out of algorithmic personalization. Despite the measures taken, in April 2026, CAC ordered ByteDance apps Jianying, Maoxiang and website Jimeng AI to fix failures to label AI-generated content, citing breaches of cybersecurity and AI labelling rules (Reuters 2026).

To facilitate the implementation of these requirements, the government is actively promoting the establishment of algorithm registration centers across the country. These centers serve as hubs for registering algorithms, monitoring their use, and ensuring alignment with national standards (Matt and Sharon 2022). The **Beijing Algorithm Registration Center**, launched in July 2024, exemplifies this effort. Located in Mentougou District, the center leverages significant computing resources from the Western Beijing AI Valley AI Computing Center and is supported by major stakeholders, including the Zhongguancun Development Group and Huawei's Ascend AI Computing Center. Its responsibilities include registering algorithmic models, aggregating transactions, providing industry-specific technical support, and enforcing data property regulations in collaboration with entities like the Beijing Municipal Intellectual Property Office and the Beijing International Data Exchange. Similar centers are planned to be established nationwide in the coming years to expand regulatory oversight and facilitate innovation within a framework of compliance (Sheehan 2023).

6. Distinguishing the Metaverse with Chinese Characteristics (Yuanverse) from the metaverse applications in the West

This Section distinguishes the regulatory and policy frameworks underpinning both in China and in the West and argues that the Chinese approach to metaverse regulation results in a Metaverse with Chinese Characteristics (Yuanverse to be precise) starkly distinct from the West. These characteristics are often summarized in mainstream media as – ***Clean, Censored, Compliant, and Crypto-less.*** These are further explained in the following paragraphs.

Yuanverse promoting Digital Sovereignty in China vs. call for Digital Freedom in the West

China's digital sovereignty approach can mitigate risks associated with misinformation, external interference, and cybersecurity breaches. However, this control comes at the cost of individual autonomy and limits opportunities for global collaboration. Conversely, the Western focus on digital freedom promotes innovation and personal choice but struggles to address issues like fragmented regulations, cross-border enforcement, and the potential misuse of decentralized platforms for illicit purposes.

China's regulatory framework for the metaverse emphasizes **digital sovereignty**, a principle deeply embedded in its governance philosophy. Digital sovereignty entails full state control over the generation, flow, and storage of data within its jurisdiction. Under the guidance from the national action plan and through the CAC regulatory oversight, all user data and platform operations are mandated to reside on servers within China, ensuring state access and oversight. In addition, the regulatory frameworks aim to prioritize national security, enforce protection against foreign influence, mitigate cybersecurity risks, and reinforce the State's control over information ecosystems.

This insistence on digital sovereignty sharply contrasts with the **digital freedom** ethos that underpins metaverse development in the West. Western nations are advocating for decentralized data systems where users and private platforms retain significant control over their digital assets and information. Initiatives such as the General Data Protection Regime (GDPR) in the EU and the U.S. emphasis on free-market innovation focus on empowering individuals and businesses with control over data ownership, fostering international data flows, and reducing government intervention. Platforms operating in Western metaverses prioritize user autonomy, enabling seamless cross-border interactions and global connectivity. While this approach fosters innovation and inclusivity, it also introduces challenges such as regulatory fragmentation, vulnerabilities to cyberattacks, and difficulties in holding platforms accountable for harmful activities (Quent 2025).

Yuanverse Digital Sovereign ID vs. Western Self-Sovereign ID Systems

The digital sovereign identity system of the Yuanverse emphasizes national security, regulatory compliance, and social stability, ensuring the metaverse remains a tool for enhancing state oversight. However, this approach raises concerns about privacy and freedom of expression due to its heavy reliance on centralized control and potential for surveillance. By contrast, the Western model, grounded in WEF principles, promotes individual empowerment and cross-border interoperability, and offers greater privacy protections. However, the decentralized nature of these systems presents enforcement challenges. For instance, while anonymity is preserved, it may limit law enforcement's ability to trace bad actors or investigate cybercrimes effectively.

A defining feature of China's Yuanverse is its commitment to a **digital sovereign identity system**, aligning with the state's priorities of security, stability, and centralized governance. This system integrates with China's real-name authentication framework, requiring users to link their metaverse presence to government-issued identification, such as the Resident Identity Card. Utilizing blockchain technology through platforms like the BSN, the system ensures tamper-proof identity verification while operating in a permissioned architecture. All nodes are managed by state-approved entities, guaranteeing government oversight and control over digital identities. This approach enforces accountability and traceability, which are essential for preventing fraud, money laundering, and politically sensitive discourse while reinforcing state legitimacy.

In contrast, Western metaverse applications embrace **self-sovereign identity (SSI)** principles, as outlined by the World Economic Forum (WEF) in its guidelines for digital identity in the metaverse. The WEF emphasizes a user-centric approach to digital identity, advocating for decentralized technologies that enable individuals to control and manage their personal data without relying on centralized authorities. Technologies like decentralized identifiers (DIDs) and zero-knowledge proofs (ZKPs) allow users to selectively share information while safeguarding privacy and autonomy (WEF 2024). For instance, platforms like Decentraland and The Sandbox implement these principles, enabling users to verify their identity and participate in metaverse activities without exposing unnecessary personal information. This model prioritizes user privacy, interoperability, and inclusivity, fostering a more open and participatory digital environment.

Yuanverse on a permissioned, centralized, and token-less blockchain platform vs. permission-less, decentralized and cryptocurrency-driven blockchain platforms in West

China's token-less, permissioned approach reflects its emphasis on control, stability, and aligning blockchain with national priorities. This model avoids the financial risks associated with speculative cryptocurrencies but may limit the innovation and economic vibrancy seen in Western systems. Conversely, the Western reliance on permission-less blockchains and cryptocurrency-driven economies fosters creativity and user empowerment but faces challenges such as regulatory complexity, market volatility, and the potential for misuse in illicit activities.

China's blockchain regulations have shaped the Yuanverse into a **permissioned, centralized, and token-less ecosystem**, standing in stark contrast to the permission-less, decentralized, and cryptocurrency-driven platforms that dominate the Western metaverse landscape. Blockchain platforms in China are designed to ensure strict state oversight. Access to these networks is regulated through permissioned blockchains, where only state-authorized nodes can participate in validating transactions, ensuring compliance with laws such as the Data Security Law 2021. Additionally, China prohibits cryptocurrencies as speculative financial instruments, promoting digital collectibles instead. For instance, as mentioned elsewhere in this Paper, Tencent's Huanhe platform emphasizes token-less digital assets focused on cultural and educational value, aligning blockchain applications with non-speculative and socially beneficial use cases.

In contrast, Western metaverse platforms thrive on **permission-less blockchains** like Ethereum and Solana, which **prioritize decentralization and open access**. These platforms allow any participant to join the network and validate transactions without centralized control. Cryptocurrencies like Ether (ETH) and Solana (SOL) are integral to their ecosystems, enabling financial transactions and driving virtual economies. For example, Decentraland, built on Ethereum, allows users to buy and sell virtual real estate as NFTs using ETH, creating a dynamic and user-driven economy. Similarly, Star Atlas, a metaverse platform on Solana, uses SOL and in-game tokens to facilitate space exploration gameplay, allowing participants to own virtual assets and engage in decentralized commerce. These platforms reflect the Western focus on innovation, user autonomy, and financial integration within the metaverse (Ghosh 2024).

Yuanverse on blockchain-as-a-service (BaaS) by state-led BSN vs. Metaverse in west on private block-chains

China's BSN exemplifies a controlled, state-aligned model for blockchain as a digital public infrastructure, emphasizing stability, security, and alignment with national objectives. Western blockchains, characterized by private innovation and open protocols, prioritize decentralization, user empowerment, and global integration. While both models have their merits and challenges, they highlight the broader ideological divide between centralized state governance and market-driven decentralization, shaping the future of blockchain applications and their integration into the metaverse.

China's Blockchain Service Network (BSN) represents a centralized, government-endorsed digital public infrastructure designed to provide blockchain as a service. In contrast, the West predominantly relies on private blockchain innovations and open protocols to foster decentralized and user-driven ecosystems. These differing models reflect the ideological and

operational divides between China's state-controlled governance and the West's market-driven innovation.

The BSN offers a permissioned network where nodes are operated by government-approved entities. It is designed as a **BaaS platform**, providing pre-configured templates and infrastructure for businesses to build blockchain applications without significant investment. It integrates with government systems, such as national identity databases, enabling seamless verification and oversight. The BSN also includes an international version that adapts open blockchain frameworks like Ethereum and Polkadot but removes functionalities related to cryptocurrencies to comply with Chinese regulations. The advantages of BSN include cost efficiency, interoperability within a controlled environment, and alignment with state priorities. However, its centralized nature may stifle innovation and limit global integration, as its applications are tailored to align with the CCP's governance model and regulatory constraints.

In contrast, blockchain development in the West is driven by private initiatives and open protocols. Platforms like Ethereum, Solana, and Polkadot operate as permission-less networks, allowing anyone to build and deploy **decentralized applications (dApps) without centralized oversight**. These ecosystems emphasize decentralization, transparency, and user autonomy, fostering innovation through diverse contributions from developers, enterprises, and individuals. Western blockchain innovations rely on market-driven competition to improve scalability, interoperability, and user experiences. Open protocols enable seamless integration of blockchain solutions across platforms and industries, promoting a vibrant ecosystem where developers and enterprises freely experiment with applications such as decentralized finance (DeFi), non-fungible tokens (NFTs), and metaverse projects. Cryptocurrencies like Ether (ETH) and Solana (SOL) underpin these systems, driving virtual economies and enabling financial inclusion. The decentralized nature of Western blockchains empowers users and promotes global connectivity. However, this approach also poses challenges, including regulatory complexity, security vulnerabilities, and fragmentation, as different jurisdictions adopt varying governance frameworks (Akkus et al 2022).

Yuanverse algorithm registration vs. Metaverse algorithm regulation in West

Algorithm registration ensures compliance with ideological and security priorities, allowing China to tightly manage content, user behavior, and interactions within the Yuanverse. In contrast, the Western metaverse, governed by the EU AI Act, operates with greater flexibility and autonomy, fostering innovation and diversity but facing challenges in uniform governance and centralized oversight.

Algorithm regulations in both China and the West, particularly under the EU AI Act, aim to ensure transparency, accountability, and ethical use of artificial intelligence (AI). Both frameworks address risks such as algorithmic bias, data misuse, and lack of transparency, while fostering innovation and safeguarding public interests. Transparency measures, such as documentation of algorithmic operations and user notifications about AI interactions, form the core of both regulatory systems. Accountability mechanisms like audits and compliance reporting further strengthen these shared objectives.

Metaverse companies in both China and the West are adapting their operations to comply with respective AI regulations. In China, platforms like Tencent and Alibaba have integrated

real-name verification systems and algorithm registration into their services to align with CAC mandates. For instance, Tencent's QQ Metaverse incorporates tools to disclose the behavioral characteristics of non-player characters (NPCs) powered by algorithms, ensuring their behavior complies with state-approved guidelines for user interactions and content moderation. Similarly, Alibaba integrates algorithm registration to manage virtual economic activities securely and ensure algorithmic recommendations remain transparent and aligned with regulations.

In the West, companies such as Meta and Improbable are adjusting to the EU AI Act by enhancing algorithm documentation, conducting fairness audits, and disclosing the decision-making frameworks of AI-driven NPCs and virtual agents. This transparency ensures that NPC behavior in metaverse environments is unbiased and adheres to ethical standards, fostering user trust (Hine 2025). These adaptations, while addressing compliance requirements, pose challenges such as increased operational costs in the West and reduced platform flexibility in China. Despite these contrasts, companies in both regions prioritize ethical AI deployment and NPC accountability, balancing regulatory adherence with maintaining platform functionality and user engagement.

However, China's regulations introduce a distinctive feature: *mandatory algorithm registration.* Under the regulations issued by the CAC, companies must register their algorithms with centralized authorities, such as the Beijing Algorithm Registration Center. These centers collect detailed information on algorithm functionality and operations, enabling direct regulatory oversight. This centralized registry goes beyond the EU AI Act, which relies on organizational-level transparency and compliance but does not require a centralized repository for monitoring algorithms. This additional layer of control shapes the Yuanverse into a highly regulated and state-aligned metaverse.

Metaverse Standardization Working Group in China vs. Meta Standards Forum of West

China's Metaverse Standardization Working Group and the U.S.-led Metaverse Standards Forum represent two distinct approaches to shaping the future of metaverse technology, reflecting the broader geopolitical competition for technological supremacy. The Chinese working group, driven by state oversight under the CAC, emphasizes centralized control, national security, and alignment with government policies. In contrast, the U.S.-based Metaverse Standards Forum - supported by companies like Meta, Microsoft, and Nvidia - fosters diverse stakeholder collaboration without centralized oversight, reflecting the West's emphasis on user autonomy and market-driven evolution.

China's Metaverse Standardization Group, operating under the oversight of the CAC, and the Ministry of Industry and Information Technology (MIIT), plays a strategic role in promoting Yuanverse standards globally. This group brings together state agencies, academic institutions, and leading technology companies, including Tencent, Huawei, and Baidu, to establish comprehensive guidelines for metaverse technologies. By setting technical, operational, and ethical standards, the group ensures that the Yuanverse aligns with China's regulatory and ideological priorities, such as data localization, real-name identification, and content moderation. Globally, the **Metaverse Standardization Group** aims to influence international norms by positioning Yuanverse standards as a model for secure and interoperable metaverse ecosystems. It actively participates in international standard-setting bodies like the ISO and collaborates with organizations such as the International Telecommunication Union (ITU) to embed its frameworks into global

guidelines. This strategy reflects China's broader geopolitical ambition to project its governance model onto emerging technologies, framing the Yuanverse as a blueprint for regulated and state-aligned metaverse development.

In the West, metaverse standards evolve through decentralized and industry-driven initiatives. Organizations such as the **Metaverse Standards Forum**, supported by companies like Meta, Nvidia, and Epic Games, prioritize interoperability, user autonomy, and open-source protocols. These efforts aim to create a collaborative framework that fosters innovation while maintaining a flexible regulatory environment. Unlike the Yuanverse, Western standards are not centrally imposed but shaped through consensus among diverse stakeholders, emphasizing individual rights, privacy, and global integration (Hemphill 2023, Küsters 2024).

China's centralized approach ensures regulatory compliance, security, and alignment with national objectives, but risks being perceived as overly prescriptive, limiting cross-border adoption. The Western model, by contrast, encourages inclusivity and innovation but struggles with fragmented governance and weaker enforcement mechanisms. These contrasting approaches reflect broader ideological divides, with China advocating for state-centric control and the West championing decentralized and user-driven ecosystems. These differences in ideologies promote intense competition between China and the West for shaping global metaverse standards highlighting the geopolitical stakes of emerging technologies.

7. Conclusion

The metaverse is emerging as a critical frontier for technological, economic, and ideological development, with starkly contrasting approaches taken by China and the West. China's Yuanverse, driven by the Three-Year Action Plan for the Innovative Development of the Metaverse Industry (2023-2025) and regulatory oversight from the CAC emphasizes digital sovereignty, security, and ideological alignment. In contrast, the Western metaverse prioritizes decentralization, user autonomy, and innovation through private blockchain platforms, self-sovereign identity principles, and industry-driven standards. However, this decentralized approach faces challenges such as fragmented regulations, market volatility, and difficulties in enforcing accountability. These differences highlight the broader ideological divide: China's focus on state control and collective welfare contrasts with the West's commitment to individual freedoms and market-driven innovation. As the metaverse evolves globally, these distinct models will shape its trajectory, reflecting the competing visions of governance, innovation, and societal impact.

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