

AN OVERVIEW OF CHINA'S DEVELOPMENT IN CYBERSPACE

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Abstract: Since the beginning of the 21st century, China has emerged as a major player on the global stage, significantly impacting politics, the economy, and especially cyberspace. According to the “National Cyber Power Index 2022”, China ranks second, surpassed only by the United States and followed by Russia. Its evolution in cyberspace is the result of a well-defined strategy that includes investments in infrastructure and advanced technology, as well as the adoption of innovative government policies. China’s rise in cyber power is supported by extensive international collaborations, which facilitate not only domestic technological development but also increased influence over global cyber governance. Among China’s main partners are Russia and the BRICS states, with whom Beijing cooperates to advance cybersecurity and strengthen global geopolitical influence. China’s strategic investments in various global initiatives, such as the “Digital Silk Road” and “Made in China 2025”, underscore its aspirations to reshape the global financial and technological architecture. This article aims to provide an overview of the multiple dimensions of China’s cyber development, from technological progress to internet governance policies and their domestic and international impacts.

Keywords: Cyber development, China, Artificial Intelligence (AI), Technological infrastructure, “Made in China 2025”, “Digital Silk Road”, Internet governance policies.

INTRODUCTION

Since the beginning of the 21st century, China has distinguished itself through a remarkable rise, positioning itself at the forefront of nations with significant influence on the global political and economic stage. Noteworthy is its progress in cyberspace, where, according to the National Cyber Power Index 2022, China holds the second position, just behind the United States of America and ahead of Russia. The National Cyber Power Index is based on a comparative analysis of the competencies and intentions manifested by various states in achieving specific cyber objectives. These objectives include intelligence gathering, conducting destructive cyber operations, surveillance, and influencing the establishment of international technical norms and standards. The United States dominates this index due to its extensive and diversified competencies in key areas of cyber power, such as intelligence capabilities, destructive potential, and influence over international norms. Following the US, China and Russia hold secondary positions, each excelling in strong intelligence and surveillance capabilities, as well as engaging in cyber operations with commercial or destructive intentions. For instance, Russia’s cyber activities have been significantly influenced by the context of its conflict with Ukraine. Other notable countries in the top ten include the United Kingdom, Australia, the Netherlands, South Korea, Vietnam, France, and Iran, each demonstrating advanced competencies in various aspects of cyber power, ranging from defensive capabilities

to commercial expertise and surveillance (Voo, Hemani & Cassidy, 2022). This rise of China is the result of strategic investments in infrastructure and advanced technology, alongside the adoption of innovative government policies aimed at transforming both the domestic and international cyber landscape.

Internal factors, such as government policies oriented towards developing surveillance and cybersecurity capabilities, have been supported by the dynamics of international relations, including significant collaborations with Western entities. These synergies have acted as catalysts in the technological development and global expansion of Chinese corporations. For example, bilateral agreements, such as the 2016 agreement between the US and Chinese governments, have acknowledged the importance of technological collaboration in strengthening global cybersecurity (Jong-Chen, 2017).

Moreover, China has utilised standardisation as a political tool to draft and implement major cybersecurity laws, creating a framework that profoundly influences the operations of foreign firms on its territory. Through these measures, China not only protects its own interests in critical infrastructure but also attempts to shape international norms and practices in the cyber domain (Sacks & Li, 2018).

This article aims to provide an overview of China's cyber development, examining its multiple dimensions—from cutting-edge technological infrastructure and innovations in artificial intelligence to internet governance policies and their impact on both ordinary individuals and global security. At the core of this analysis lies the intersection between national strategy and global dynamics, highlighting how Beijing has leveraged cyber technology as a tool for economic growth, ensuring domestic security, and enhancing geopolitical competitiveness. By analysing initiatives such as “Made in China 2025” (中国制造 2025, Zhōngguó zhìzào 2025) and the “Digital Silk Road” (数字丝绸之路, Shùzì sīchóu zhī lù), the paper discusses how these efforts reflect and shape China's aspirations to become a global leader in technology. Through the lens of these complex themes, the article seeks to offer an analysis of China's current level of development, the path it has taken to achieve this level and to propose future directions for China's role in shaping the global cyber landscape — an essential theme for understanding the power balances in the 21st century.

CHINA'S KEY INITIATIVES AND ITS SPECIFIC TECHNOLOGICAL PLANS

The “Made in China 2025” initiative (中国制造 2025, Zhōngguó zhìzào 2025) and the “Digital Silk Road” project (数字丝绸之路, Shùzì sīchóu zhī lù) are two fundamental pillars of China's strategy to become a global technological and economic superpower. These initiatives are interconnected and supported by massive investments in technological infrastructure, innovations in artificial intelligence (AI), and stringent Internet governance policies. As such, they can be seen as natural extensions of China's national plans for the development of 5G technologies and artificial intelligence (AI).

China's National 5G Development Plan (中国5G发展规划, Zhōngguó 5G fāzhǎn guīhuà), initiated by the Ministry of Industry and Information Technology, was launched in 2013 to promote the adoption and implementation of 5G technology at the national level. The primary

goal of this plan is to accelerate the development of 5G infrastructure, including networks and services, to support the country's technological and economic progress. The plan includes phases of development and commercial testing, aiming to facilitate a rapid transition to next-generation networks that will support the evolution of smart cities, autonomous vehicles, and other advanced technologies dependent on ultra-fast and reliable connectivity.

China's National Artificial Intelligence (AI) Development Plan (新一代人工智能发展规划, Xīn yīdài réngōng zhìnéng fāzhǎn guīhuà), launched in 2017, aims to transform the country into a global leader in AI technology by 2030. The strategy encompasses the promotion of AI research, the application of AI in key industries, and the development of a favourable, regulatory and educational environment. It targets innovation in sectors such as healthcare, autonomous vehicles, and robotics and is a central part of China's broader efforts for technological modernisation.

Launched in 2015, the "Made in China 2025" initiative is a strategy by the Chinese government aimed at transforming China into a high-tech manufacturing superpower by 2025, focusing on innovation, quality, and sustainability. The ten sectors targeted for investment and development are next-generation information technology, advanced numerical control machinery and robotics, aerospace equipment, high-tech rail transportation equipment, new energy vehicles and equipment, power equipment, agricultural equipment, new materials, biotechnology, and high-performance medical devices (The Central People's Government of the People's Republic of China, 2015). The program aims to reduce dependence on technological imports and develop domestic capabilities in critical areas such as robotics, biotechnology, electric vehicles, and, notably, artificial intelligence (AI).

The "Digital Silk Road" is an integral part of the Belt and Road Initiative ("一带一路"倡议, "Yīdài Yīlù" chàngyì) and aims to expand global digital infrastructure, promoting digital connectivity and international trade exchanges. This includes investments in communication networks, submarine fibre optic cables, data centres, and e-commerce platforms, which support the growth of China's technological and economic influence on a global scale.

The "Digital Silk Road" involves a diverse array of projects and international partners, reflecting the initiative's breadth and scope. A notable example is the "PEACE Cable" (*Pakistan and East Africa Connecting Europe*) project, which is part of the China-Pakistan Economic Corridor (CPEC) and is essential for China's aspirations to become a major provider of technological infrastructure for Europe, the Middle East, and Asia. The fibre optic cable has endpoints in Karachi and Gwadar, facilitating greater connectivity and integrating Pakistan into the global digital infrastructure (Blaubach, 2022). In Southeast Asia, Huawei has collaborated with the Thai government to test and implement 5G networks, contributing to Thailand's transformation into a regional hub for digital technology (Council on Foreign Relations). Additionally, China has partnered with Malaysia to develop 5G networks, involving major telecommunications companies such as Huawei and ZTE, thereby accelerating the country's digital transformation. In the realm of e-commerce, Alibaba's Electronic World Trade Platform (eWTP) in Malaysia facilitates cross-border trade for small and medium-sized enterprises (SMEs), providing logistics, payment, and cloud computing services. This

initiative underscores the role of digital trade within the “Digital Silk Road” (Parete, 2023). In the Philippines, Chinese technology companies, including Huawei, are working with the government to develop smart city projects, implementing advanced technologies such as IoT and AI to enhance urban management and services. Furthermore, China has assisted Kazakhstan in developing a digital hub to improve ICT infrastructure, thereby supporting the country’s digital economy and integrating it more closely into global digital networks (Parete, 2023).

Both “Made in China 2025” and “Digital Silk Road” are supported by substantial investments in technological infrastructure, which include the large-scale development and implementation of 5G networks. These networks are fundamental for AI and IoT (Internet of Things) applications, as well as national projects such as “Broadband China”, which aim to expand access to high-speed internet and reduce access costs, thereby stimulating innovation and economic development.

China has placed significant emphasis on the expansion of 5G infrastructure, with over 2.64 million 5G base stations installed by early 2023, representing the largest network of its kind globally. This expansion not only enhances internal connectivity but also supports the intelligent digital transformation of industries, such as advanced manufacturing capabilities and smart cities, which are central to the “Made in China 2025” plan (Developing Telecoms, 2023). The growth in 5G network capacity generates substantial demands for data centre infrastructure, which must handle increased data volumes and support applications requiring high bandwidth and rapid response times. China is investing in the modernisation of these facilities to support emerging technologies such as AI and cloud computing, which are essential for efficient data management and advanced analytics (Princeton Digital Group). The Chinese government has made significant progress in developing 6G networks and has already launched major initiatives in this field. Although there are no official declarations about developing 6G networks, China has started to make significant strides towards 6G. It launched the first 6G test satellite, marking a crucial step in the development of 6G technology. This satellite, in low Earth orbit, is designed to support experiments for integrated space-terrestrial communication technologies, offering advantages such as low latency and high data transfer rates compared to satellites in higher orbits (China Daily, 2024; Raj, A. 2024). Moreover, China has established the IMT-2030 (6G) Promotion Group, a reference platform for promoting 6G and international cooperation. According to a document issued by this group, 6G technology will integrate advanced computing, big data, artificial intelligence, and blockchain. It is anticipated that 6G will be commercialized around 2030 and will achieve a deep integration between physical and virtual worlds, creating intelligent global connections (China Daily, 2023).

Investments in AI and other emerging technologies, such as quantum computing and biotechnology, are closely tied to China’s ambitions of becoming a global hub of technological innovation. Through the “Digital Silk Road,” China exports these technologies, establishing new global standards and shaping the digital infrastructures of other nations, thereby expanding its geopolitical and economic influence (Gorman, 2021).

This strategic approach not only strengthens China's internal capacity for innovation and production but also serves its interests in shaping the global technological landscape according to its vision of development and cybersecurity. These efforts illustrate how China leverages its resources and technological capabilities to consolidate its position as a global power in the information age.

China has become a global leader in AI through massive investments in research and development, international partnerships, and education. "Made in China 2025" includes specific objectives for the widespread development and implementation of AI technologies, which are used to enhance industrial efficiency and economic competitiveness. At the same time, the Digital Silk Road promotes the export of AI technologies and digital infrastructure to other countries, thereby solidifying China's global influence (Dutta, 2020; Hillman, 2021)

GOVERNMENT POLICIES AND REGULATIONS IN CHINA

In the context of rapid technological expansion and innovation, China has implemented a series of stringent Internet governance policies and regulations to ensure national security and control over the flow of information. These measures reflect the country's aspiration to become a technological superpower while simultaneously safeguarding national interests and data security.

In 2016, China enacted the Cybersecurity Law (中华人民共和国网络安全法, Zhōnghuá rénmín gònghéguó wǎngluò ānquán fǎ), which mandates that companies store the personal data of Chinese citizens on local servers and grants government authorities access to this data for inspections. This law underscores China's concern with controlling and monitoring the flow of information across its digital borders. Moreover, the stringent regulations on online content and censorship reflect the government's desire to maintain social stability and prevent disseminating information deemed dangerous or unfavourable to the regime (Wagner, 2017).

The Golden Shield Project, also known as the "Great Firewall of China" ("金盾"工程, "Jīndùn" gōngchéng), is a significant initiative aimed at monitoring and controlling internet activities. Officially launched in 2000 and overseen by the Ministry of Public Security, this project employs advanced technologies such as content filtering, deep packet inspection (DPI), and IP address blocking to monitor users' online activities and regulate access to information.

The Data Security Management Law (中华人民共和国数据安全法, Zhōnghuá rénmín gònghéguó shùjù ānquán fǎ), enacted in 2021, regulates the collection, storage, use, and transfer of data within China. It mandates that companies conduct security assessments when transferring data outside the country and obtain government approvals for transfers of data deemed sensitive (Skadden Publication, 2021).

The Personal Information Protection Law (中华人民共和国个人信息保护法, Zhōnghuá rénmín gònghéguó gèrén xìnxī bǎohù fǎ), enacted in 2021, aims to safeguard the personal data of Chinese citizens. It imposes stringent requirements on the collection and storage of personal data, including obtaining user consent and implementing security measures for data protection (Skadden Publication, 2021).

Western sources also mention additional measures taken by the Chinese government in this regard. One notable example is the internet “clean-up” campaigns periodically launched by the Chinese government to eliminate content deemed subversive, vulgar, or illegal. These campaigns target both individual users and online platforms, imposing strict compliance measures and sanctions for rule violations. Another example is the implementation of a real-time internet surveillance and monitoring system, using advanced technologies such as artificial intelligence and facial recognition to detect suspicious behaviours and respond swiftly to potential national security threats. Additionally, foreign companies operating in China are required to comply with local cybersecurity and data protection regulations, including storing data on local servers and providing access to user data upon request by authorities (Kurlantzick, 2023).

REGULATIONS ON AI AND 5G INNOVATION

In the context of expanding 5G infrastructure and advancements in new technologies such as Artificial Intelligence, Chinese authorities have developed policies aimed at stimulating innovation while maintaining clearly defined boundaries. These policies are designed to promote technological development in a manner that adheres to ethical norms and protects individual rights. For example, China’s national strategy for AI development, known as the “Next Generation Artificial Intelligence Development Plan” (新一代人工智能发展规划, *Xīn yīdài réngōng zhìnéng fāzhǎn guīhuà*) from 2017, includes explicit guidelines for AI ethics to ensure that technological advancement aligns with social values and national interests.

Primarily, the strategy is driven by technology, aiming to capture global trends and promote advanced research in key areas of AI. The objectives include achieving significant progress in new theories and technologies by 2020, with even greater expansion by 2025 and 2030, as China aspires to become a global innovation hub in AI. This involves the development of autonomous technologies and artificial intelligence systems in sectors such as smart manufacturing, medicine, smart cities, and agriculture (DigiChina, 2017). The strategy also emphasizes the necessity of an open and collaborative system that integrates industry, academia, and research units. Importance is also given to harmonizing economic development with defence, promoting the bidirectional application of civilian and military technologies. This aspect highlights China’s approach to using AI not only for economic and social progress but also for enhancing its defence capabilities. Furthermore, China aims to play a leading role in establishing international norms for AI, reflecting its concern for the international security implications of the technology. This includes initiatives for international cooperation and arms control in the field of AI, underscoring the importance of a cautious and regulated global approach.

ENGAGEMENT WITH INTERNATIONAL NORMS

On the international stage, China aims to play a major role in establishing global standards for new technologies by actively participating in international forums and initiating research and development partnerships. In this context, China not only exports its technology but

also seeks to shape international regulations in its favour, a crucial aspect for ensuring and expanding its global influence. Notably, the Annual World Internet Conference in Wuzhen provides a platform for global leaders to discuss and promote Internet policies and technologies, allowing China to advance its vision of international Internet governance (ChinaFile, 2022; Klein, 2019).

Moreover, the “Belt and Road” Initiative, particularly through its “Digital Silk Road” component, focuses on developing network infrastructures and improving technological standards in participating countries. China also plays a significant role in the International Telecommunication Union (ITU), contributing to the development of global standards in telecommunications, including technologies such as 5G and potentially 6G. This involvement underscores China’s strategic efforts to influence the global governance of technology and data.

These policies and regulations are crucial for understanding how China plans to navigate the complexities of the digital age, balancing innovation with stringent control. Through these measures, China bolsters its status as a global technological leader while safeguarding its sovereignty and national security against cyber threats and international competition.

THE INTERNATIONAL AND GEOPOLITICAL IMPACT OF CHINA IN THE CYBERSPACE

Technology and cyber infrastructure constitute pillars of China’s foreign policy, amplifying international tensions, especially in its relationships with the USA and other global powers. China’s technological advancement bolsters its influence and shapes global standards of technology governance. Through initiatives like the “Digital Silk Road,” China exports its model of “cyber sovereignty” (“网络主权”, wǎngluò zhǔquán), which includes strict internet control and data localization, seeking to impose its vision of technological governance at the global level (Moynihan & Patel, 2021).

China’s strategy of using technology as a tool of both soft and hard power is also evident in how it promotes international norms that favour its interests while expanding its digital infrastructure under the “Belt and Road” initiative (He&Fay, 2024). Furthermore, China’s increasing presence in international organisations allow it to influence global discussions and regulations related to technology, which is crucial in the context of its tensions with the USA. The relationship between China and the USA is complex, with points of tension including accusations of cyber espionage and concerns over data and technology security (CFR).

Another important pillar is information control, where China, through strict cybersecurity laws, ensures that data generated domestically is stored and processed according to national standards, maintaining tight control over information that could influence or destabilise the regime. These strategies reflect the complexity of how China uses its technological capabilities to support its geopolitical aspirations and national security objectives.

In addition to strengthening digital infrastructure and cyber sovereignty, China is actively establishing global cyber partnerships beyond merely offering products, services, or

training. Through technology transfer, local production, financing, and leveraging bilateral and multilateral relationships, China promotes joint projects that contribute to building a multipolar world and forming a community with a shared future for humanity (“人类命运共同体”, *rénlèi mìngyùn gòngtóngtǐ*). These efforts are part of a broader strategy to promote a model of international digital governance that reflects its interests and values. This includes the approach of cyber sovereignty, which allows states to control internet access and impose data localization requirements, thus protecting national interests. Furthermore, China has been very active in offering its 5G technology as a low-cost model for emerging middle- and low-income countries. Beyond technological and infrastructure aspects, China actively participates in strategic and normative dialogues at the international level, promoting standards and norms that favour its uses of artificial intelligence, including in repressive surveillance, which raises concerns among liberal democracies. This complex model of technological cooperation and competition, involving collaboration, competition, and sometimes confrontation with other global powers such as the United States, underscores China's role in defining the future of global digital governance, solidifying its economic and geopolitical position through technology.

China asserts its leadership in global financial digitalisation by promoting a digital currency within the BRICS (Brazil, Russia, India, China, and South Africa), aiming to reduce dependence on the US dollar and Western financial systems. This initiative reflects China's efforts to advance the use of emerging financial technologies and influence global economic governance. The BRICS digital currency could simplify cross-border transactions, reduce costs, and stabilise currency fluctuations, fostering economic and political cohesion among member countries. However, implementing this currency faces challenges, including divergences in the economic policies of BRICS states, issues of technological interoperability, and data security concerns. This strategy underscores China's aspirations to reshape the global financial architecture through technological innovations.

To consolidate its position on the global stage and advance in the field of information and communication technologies, China has developed significant interactions in the cyber sphere with various nations, thus establishing a complex network of strategic partnerships. These relationships are essential for technological progress and cybersecurity and reflect China's increased geopolitical influence.

China's main partners in cyberspace include Russia, Pakistan, and the BRICS states—Brazil, India, and South Africa—as well as significant nations in Southeast and Central Asia. These collaborations are crucial for Beijing in developing cybersecurity capabilities and global geopolitical influence, facilitating the exchange of technological knowledge and innovations.

In particular, Russia is a key partner, with cyber cooperation reflecting the convergence of national security and technological interests. This collaboration is strengthened through bilateral agreements aimed at protecting critical infrastructure and combating cyberattacks, and is reinforced by joint technological development initiatives, such as collaborations in artificial intelligence and advanced communication technologies.

Pakistan plays a crucial role in China's cyber strategy, particularly through the China-Pakistan Economic Corridor, which includes significant telecommunications infrastructure projects and advanced technology initiatives, thereby strengthening regional connectivity and cyber security cooperation.

China also collaborates with Brazil on the development of digital infrastructure, working on broadband network projects and advanced communication technologies. In India and South Africa, China promotes cybersecurity norms and the protection of critical infrastructure, thereby strengthening partnerships within the BRICS framework.

These alliances underscore how China leverages cyber cooperation to support its geopolitical and national security aspirations, thus solidifying its position as a leader in the new global digital order.

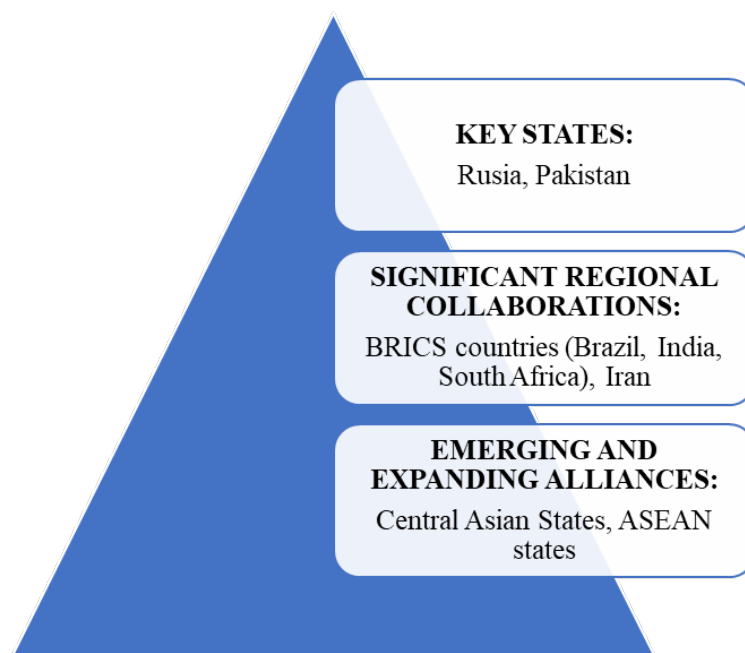


Figure 1. Hierarchy of states with which China has close interaction in the cyber domain (source: created by the author based on the articles reviewed)

In conclusion, technology and cyber infrastructure not only support China's economic growth but also serve as strategic tools in navigating the complexities of foreign policy, including managing international tensions and competition. This approach reflects China's ambition to be a dominant player on the global stage, as well as the challenges that accompany this ascent.

THE FUTURE OF CHINA'S CYBER DEVELOPMENT. CONCLUSIONS

China's cyber expansion has brought numerous benefits to the country's technological and economic development, but it has also generated significant concerns related to ethics, security, and privacy, both domestically and internationally. At the heart of these debates are the extensive surveillance and information control practices exercised by the Chinese government,

which include internet censorship and the monitoring of citizens' online activities, as discussed in previous subchapters. While the government justifies these measures as necessary for national security, they are seen as violations of human rights, particularly regarding freedom of expression and the right to privacy.

Internationally, China's technological expansion and the export of surveillance technologies, such as surveillance cameras and facial recognition software, have raised concerns about China's influence and control over other nations under the guise of technological cooperation. For example, through the "Digital Silk Road" projects and partnerships in various countries, China is extending its model of "cyber sovereignty," which includes strict data and internet control practices.

Given the increasing international scrutiny and geopolitical pressures, China is expected to continue its expansion in critical technological sectors such as artificial intelligence and 5G technology. In this context, new government policies might be initiated to reconcile innovation with strict regulations, aiming to mitigate criticisms both domestically and internationally and to improve the global perception of China. This strategy could help balance technological progress with the need for compliance and international acceptance.

Although China may be a leader in technological innovation, the manner in which it employs its cyber technologies continues to pose significant ethical and security challenges. The future of its development directions will largely depend on China's ability to navigate these challenges, balancing technological growth with adherence to international ethical and legal norms.

It is equally important to highlight that China's cyber expansion has brought several global benefits. Firstly, China has been a driving force in fostering innovation in the technology sector, advancing the development of emerging technologies such as artificial intelligence (AI), 5G networks, and digital infrastructure. It has stimulated global competition and accelerated the adoption of these technologies worldwide, providing a significant boost to the technology industry. Additionally, through initiatives like the "Digital Silk Road", part of the broader "Belt and Road Initiative" (BRI), China has contributed to improving telecommunications infrastructure in many developing countries. This has facilitated access to more advanced communication technologies and reduced the digital divide in regions that were previously technologically disadvantaged. Furthermore, Chinese companies have become global leaders in the production of telecommunications and technology equipment, offering affordable and innovative products that are widely used around the world. This has enabled a faster and more efficient integration of new technologies into global markets, positively impacting consumers and economies worldwide.

The originality of this article lies in the fact that the author has used source materials in the Chinese language in the development of this research, as opposed to others who use translated materials.

In conclusion, while there are security and ethical concerns associated with China's cyber expansion, its contributions to promoting technological innovation and improving access to technology are undeniable and have had significant beneficial effects.

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