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## Research on the Roadmap and Prospect of BRICS Cooperation Mechanism from the Perspective of BRICS Committed to Innovation

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**Abstract:** On October 23, 2024, Xi Jinping, President of People's Republic of China (PRC), was present at the 16th BRICS Summit and gave a keynote address, emphasizing the need to collaborate to transform BRICS into a premier conduit for reinforcing solidarity and coordinated efforts among the Global South, and a vanguard force for propelling the reform of global governance. Through the construction of a BRICS committed to peace, BRICS committed to innovation, BRICS committed to green development, BRICS committed to justice, and BRICS committed to closer people-to-people exchanges. At present, BRICS countries are actively following the contemporary wave of technological innovation and Industrial restructuring, strengthening cooperation in innovation through science and technology. This paper, on the basis of the development trajectory of the BRICS committed to innovation, reviews the historical context and main phases of the BRICS committed to innovation, analyzes the significance of the BRICS mechanism for China, BRICS countries, and global governance, summarizes the current practical roadmap and development achievements of the cooperation, and looks forward to cooperation prospects. The research finds that BRICS countries have deepened their cooperation in innovation by focusing on a Partnership on New Industrial Revolution, research and cooperation centers, and talent development platforms. In the future, BRICS countries could focus on such areas in terms of digital economy and green technologies, to accelerate the construction of the BRICS committed to innovation.

**Keywords:** BRICS Countries; BRICS Committed to Innovation; Scientific and Technological Innovation; Digital Economy

### 1. Introduction

On October 23, 2024, Xi Jinping, President of People's Republic of China attended the 16th BRICS Summit held in Kazan, Russia. President Xi gave a vital speech and made remarks on the future development of BRICS mechanism, including building BRICS committed to peace, BRICS committed to innovation, BRICS committed to green development, BRICS committed to justice, BRICS committed to closer people-to-people exchanges, so as to unlock new frontiers in the high-quality development of

BRICS cooperation. President Xi underlines that it is imperative to synchronize with the latest technological revolution and industrial transformation, stay abreast of the times, and cultivate new quality productive forces. China has recently launched a China-BRICS Artificial Intelligence Development and Cooperation Center; is ready to establish a BRICS Deep-Sea Resources International Research Center, a China Center for Cooperation on Development of Special Economic Zones in BRICS Countries, a China Center for BRICS Industrial Competencies, and a BRICS Digital Ecosystem Cooperation Network. The path of BRICS cooperation has a long history. The concept of BRICS was first introduced by Jim O'Neill, the Chief Economist of Goldman Sachs. He combined the initial letters of the English names of the four emerging economies—Brazil, Russia, India, and China—into the acronym “BRIC”. Since it sounded similar to the English word “Brick”, it was named the “BRIC countries”, with the aim of identifying countries and regions that present lucrative investment prospects for prospective investors on a global scale. In September 2006, during the 61st United Nations General Assembly session, the foreign ministers of China, Russia, India, and Brazil held the first BRIC Foreign Ministers’ Meeting, formally establishing the BRIC cooperation mechanism. In June 2009, the leaders of the four countries convened their first summit in Yekaterinburg, Russia, upgrading the mechanism to the highest-level summit framework. In December 2010, South Africa joined the BRIC cooperation mechanism, transforming it into a five-nation framework and changing its English name to “BRICS”. In January 2024, the United Arab Emirates, Egypt, Ethiopia, Saudi Arabia, and Iran became official members of BRICS, expanding the cooperation mechanism to ten member states and ushering in the era of elevated high-quality BRICS collaboration. Emerging from the wave of collective rise of Emerging Market and Developing Countries (EMDCs) and carrying the aspirations of the Global South for peace, development, and fairness and justice, the BRICS cooperation mechanism has emerged as a pivotal platform for fostering unity and cooperation among EMDCs. The BRICS expansion aligns with the historical trend of their rise and reflects the strong demands and common voice of Global South countries to “seek solidarity, pursue development, and promote transformation”. In the face of the latest industrial revolution, BRICS countries stand at the forefront, dare to innovate, and jointly build the BRICS committed to Innovation, working hand in hand to advance the common development of the Global South.

## **2. Historical Context and Evolution of the BRICS Committed to Innovation**

At present, the world is entering a new period where turbulence and transformation are defining features. Confronted with the challenges posed by anti-globalization and de-globalization, BRICS countries coalesced around the consensus of the Global South and gathered powerful strength for development. They have implemented a lot of effective efforts in the fields of the technological and scientific breakthrough and industrial transformation, driving the in-depth innovative progression of science, technology, and industrial development both within the BRICS cooperation mechanism and among Global South countries. Looking back at the progressive stages of BRICS cooperation, the BRICS committed to innovation has continuously evolved under different historical contexts.

## 2.1 Early Achievements of BRICS Cooperation (2006-2014)

In 2006, as the “BRIC” gained popularity in the international financial markets, cooperation among BRIC countries began to take shape. Initially, BRIC cooperation was primarily driven by foreign ministers’ meetings among China, Russia, India, and Brazil, aiming to exploring the potential for a coordinated mechanism. In September 2006, the first BRICS Foreign Ministers’ Meeting was held, marking the initiation of the BRICS mechanism. During this period, global trade grew rapidly, international investment further recovered, and the global economic situation improved steadily. With the sustained economic growth of Global South countries such as China, India, and Russia, these nations’ positions in the global economy continued to rise, and the evolving dynamics of the world economic landscape became increasingly evident. However, from 2007 to 2008, the onset of the global financial crisis, spurred by the U.S. subprime crisis, marked a turning point for the global economy, shifting it from robust growth into a precipitous time. This posed significant challenges to the international financial markets and the global economic development. At this juncture, the EMDCs, represented by the BRIC nations, recognized the significance of working together to jointly withstand the risks of the crisis. Subsequently, in December 2010, South Africa joined the BRICS cooperation mechanism, becoming its fifth member. This marked the transition from BRIC to BRICS, further expanding the group’s influence and diversity. In September 2011, the first BRICS High-Level Meeting on Science, Technology, and Innovation (STI) was held in Dalian, China, in which senior officials from the science and technology departments of the five countries discussed strategies, priorities, and working mechanisms for cooperation in innovation. In March 2013, at the BRICS Summit in Durban, South Africa, the BRICS countries formally adopted the *Durban Declaration*, initiating cooperation in the fields of STI. They also signed the *BRICS Trade and Investment Cooperation Framework*, which created an environment and foundation for new cooperation in STI. During this period, the BRICS countries established cooperation frameworks in multiple areas, creating a solid groundwork for the subsequent evolution of BRICS nations pursuing innovation.

## 2.2 Deepening Cooperation in STI Development (2014-2017)

With the evolving global economic landscape and accelerated technological advancements, BRICS countries placed increasing emphasis on STI cooperation. At that time, the global economy faced numerous uncertainties, including regional crises and upheavals, which profoundly impacted the global system. Against this backdrop, BRICS countries seized opportunities for technological growth and called for jointly advancing the reform of the global governance system. In February 2014, Cape Town, South Africa, welcomed the first BRICS Science, Technology, and Innovation Ministerial Meeting., where the *Cape Town Declaration* was adopted. This event marked the formal launch of a new chapter in multilateral cooperation on STI among BRICS countries. According to the *Cape Town Declaration* and the *BRICS Science, Technology and Innovation Work Plan (2015-2018)*, each BRICS country took different parts in the development framework (see Table 1). These roles effectively accelerated the dissemination of technology and bolstered the efficacy of research systems through the BRICS

committed to innovation mechanism. The following year, during the second BRICS Science, Technology and Innovation Ministerial Meeting, the BRICS countries signed the *Memorandum of Understanding on Cooperation in Science, Technology and Innovation among BRICS Countries*, which became the guiding document for BRICS cooperation in STI. In October 2016, the fourth BRICS Science, Technology and Innovation Ministerial Meeting was held in Jaipur, India. During the meeting, participants discussed key areas for further cooperation, committed to leveraging the synergies of existing BRICS cooperation mechanism, and explored additional areas for new cooperation. The meeting issued the *Jaipur Declaration*, in which member countries agreed to strengthen STI cooperation through the “BRICS Research and Innovation Initiative”, aiming to diversify and systematize collaborative efforts. During this phase, BRICS countries have continued to deepen their development through cooperation, providing a continuous impetus for the development of Global South countries, the high-quality development within the expanded BRICS framework and the reform of the global governance system.

**Table 1:** Contact institution and areas for potential STI Cooperation Initiatives

Cooperation Area	Contact Institution, Country
Prevention and mitigation of natural disasters (monitoring & early warning)	National Center for Monitoring and Early Warning of Natural Disasters, Brazil
Water resources and pollution treatment	Technology Platform for Sustainable Ecological Development, Russia
Geospatial technology and its application for development	National Spatial Data Infrastructure, India
New and renewable energy, and energy efficiency (solid-state lighting as a sub-area SSL)	Minister of Science and Technology, China
Astronomy	National Research Foundation, South Africa

Source: *BRICS Science, Technology and Innovation Work Plan (2015-2018)*.

### 2.3 Win-Win Cooperation in the Fourth Industrial Revolution (2017-2020)

In 2017, despite a gradual recovery in the GDP growth rates of EMDCs, these rates still remained below the average levels seen between 2000 and 2015. At this time, China’s economic growth slowed, foreign direct investment and remittances declined, and capital outflows continued. Meanwhile, geopolitical tensions intensified in many countries and regions. However, the advent of the fourth Industrial Revolution, based on artificial intelligence, has blurred the physical and biological boundaries and achieved the effective integration of virtual and digital systems. Industrial Revolution 4.0 has become a vital driving force for socioeconomic growth. BRICS countries have recognized the strong vitality of the fourth Industrial Revolution. By pooling their efforts through cooperation and empowering themselves with innovation, they have revitalized their participation in the new industrial revolution and created a new pattern of partnership development. In July 2017, Hangzhou, China, welcomed the fifth BRICS Science, Technology and Innovation Ministerial Meeting, where the *BRICS*

*Science, Technology and Innovation Work Plan (2017-2018)* was adopted, marking a new phase in BRICS cooperation in STI. In September 2017, BRICS countries officially launched the BRICS Science, Technology, and Innovation Cooperation Initiative, with a total of 462 proposals submitted across six areas. According to the *Annual Report on BRICS' National Innovation Competitiveness Development (2017)*, BRICS countries constitute about 17% of global R&D funding, with high-tech product exports reaching nearly 6 trillion U.S. dollars, representing about 28% of the global total. They also publish around 590,000 scientific journal articles annually, which is about 27% of the global total. In 2018, during the 10th BRICS Summit, a significant proposal to establish the BRICS Partnership on New Industrial Revolution was put forward. This initiative is intended to realize the vision of BRICS cooperation in the second “Golden Decade” by promoting deeper cooperation among BRICS countries in digitalization, industrialization, innovation, inclusiveness, and investment. In November 2020, during the 12th BRICS Summit held via video conference, it was announced that the BRICS PartNIR Innovation Center (BPIC) would be established in Xiamen, China. With the tide of the latest round of scientific and technological revolution, BRICS countries, as representatives of developing countries, have built partnerships and pursued mutual benefits and win-win outcomes. This has become an example of the joint development of the Global South.

## 2.4 Innovative Development in the Digital Economy Era (2020-)

In the process of responding to the global public health crisis, the forms of international cooperation underwent profound changes. The economic cooperation among BRICS countries also shifted, moving from traditional trade interactions to trade and investment cooperation based on digital economy, blockchain technology, big data, and other fields. At this time, the robust development of the global digital economy provided novel impetus for economic growth for the BRICS and the Global South. Statistics from the Global Digital Economy White Paper show that in 2020, the global digital economy accounted for 43.7% of GDP, an increase of 2.5 percentage points compared to 2019. In November 2020, the BRICS countries unveiled the Strategy for BRICS Economic Partnership 2025, designating digital economy field as one of the three fundamental pillars of collaboration. In December 2021, the BRICS Academy of Skills Development and Technology Innovation was officially established in Xiamen, with main activities including technology and skills R&D, building an international platform for technical talent, incubating research results, and organizing exhibitions. In 2022, cooperation among BRICS countries in the digital economy and technological innovation deepened further. They continued to maintain strong development momentum in areas such as digital technology and cloud computing and promoted innovative development in the digital economy by continuously improving the BRICS cooperation mechanism. In 2024, the China Association of Inventions (CAI) and the China Center for International People-to-People Exchange under the Ministry of Education, jointly held the “Belt & Road and BRICS Skills Development & Technology Innovation Competition”, which became a vital platform for promoting educational collaboration, skill development, and people-to-people bonds among BRICS countries. BRICS countries have always stayed in step with the times amid the new industrial revolution. They remain committed to building a community with a shared future for STI and achieving innovative integration among BRICS countries through the BRICS committed to innovation mechanism.

### 3. Strategic Significance of the BRICS Committed to Innovation

Looking around the globe, the new round of scientific and technological revolution and industrial transformation is taking shape, offering valuable opportunities for each country to achieve leap-forward development. BRICS countries have grasped the opportunities of the times for reform and innovation, reached a broad consensus on STI cooperation, and advanced the Partnership on New Industrial Revolution, building the BRICS committed to Innovation. The founding of the BRICS committed to innovation is a vital pathway to upgrade China's discourse power and influence in the STI area, a core mechanism for promoting unity and cooperation among the Global South, and an engine in the evolution of the global governance.

#### 3.1 Enhancing China's International Influence in STI

As the largest developing country globally, China has always played a vital role in promoting BRICS cooperation and Global South collaboration. While pursuing its own development, China continuously injects new momentum into the world through its achievements. As a promoter and leader of solidarity and cooperation among the Global South, the proposal and development of the BRICS committed to innovation within the BRICS cooperation mechanism have strategic significance for China in enhancing its discourse power and influence in STI. As the BRICS committed to innovation was established, China has constantly increased its investment in STI. In 2023, China's total R&D spending broke through 3.3 trillion yuan for the first time., securing its position as the second-largest R&D spender worldwide. This has played a significant role in driving high-tech industries and promoting innovation. Based on the *National Innovation Index Report (2022-2023)* issued by the Chinese Academy of Science and Technology for Development, the global innovation landscape remains a tripartite balance among Asia, America, and Europe, with the trend of the eastward shift of STI centers becoming more pronounced. China's ranking in innovation capability has broken into the top 10 globally. In the first three quarters of 2024, China's expenditure on advanced technology sectors soared by 10% compared to the previous year, significantly outperforming the 3.6% increase in total capital investments. The role of advanced technology sectors in driving the expansion of total capital investment accounted for 27.1%. The output value of large-scale advanced manufacturing rose by 9.1% year-on-year, which was 3.3 percentage points higher than the growth rate of other large-scale industries. Meanwhile, the value added in information transmission, software, and digital services jumped by 11.3%. New industries are developing rapidly, and new business forms and models are being formed more quickly. This year, the World Intellectual Property Organization (WIPO) revealed that China's innovation ranking has advanced by one position. Under the BRICS cooperation mechanism, China has once again contributed to the construction of the BRICS committed to innovation, advancing towards the forefront of innovative countries and enhancing its position and influence in the international STI network.

### 3.2 Driving Innovation to Empower the Development of the Global South

The BRICS mechanism aligns with the trend of economic globalization and the wave of technological and industrial revolution, utilizing STI as a development vehicle. It expands and enhances BRICS cooperation, addresses the development needs and common challenges of BRICS countries through effective collaboration, and extends its benefits to other developing countries, allowing a broad range of developing nations to gain from the BRICS cooperation mechanism. The BRICS committed to innovation is not only a significant force in driving global economic growth but also an important catalyst for global scientific and technological innovation. According to statistics from the International Monetary Fund (IMF) and the World Trade Organization (WTO), in 2021, the aggregate GDP of the BRICS nations constituted 24.77% of the world economy, while their cumulative international trade turnover amounted to \$6.3 trillion.

representing 17.9% of the global total. Per the yearly Global Innovation Index (GII) published by WIPO, the standing of BRICS nations regarding STI capability is generally on an upward trend, with China and India showing particularly significant improvements (see Table 2). By continuously enhancing their positions in the global STI network, BRICS countries have greatly strengthened their international competitiveness. Meanwhile, the “BRICS+” cooperation concept and model have created cooperative platforms for more EMDCs. This helps BRICS countries become a hub for uniting and coordinating the Global South, expanding new growth points for South-South cooperation, and continuously increasing their influence and appeal among EMDCs. With the establishment and operation of cooperative entities such as the Contingent Reserve Arrangement (CRA) and the BPIC, BRICS countries have provided a positive demonstrative effect for the STI development of BRICS and Global South countries. This has also injected strong momentum into South-South coordination and the common development of BRICS and the Global South.

**Table 2:** The GII Rankings of Five BRICS Nations

Year	Brazil	Russia	India	China	South Africa
2012	58	51	64	34	54
2017	69	45	60	22	57
2022	54	47	40	11	61

Source: The GII Rankings released by WIPO.

### 3.3 Leveraging Scientific and Technological Innovation to Advance the Transformation of Global Governance System

The BRICS mechanism emerged amidst the collective rise of EMDCs, a historical tide that has shaped the transformation of the global landscape and the distribution of international influence. Through the joint efforts and impetus of China and its BRICS partners, the mechanism has continuously matured and strengthened. BRICS has become more robust, influential, and vocal, injecting powerful momentum into the realization of inclusive economic globalization and an equitable, multipolar world



order. It has also propelled the global governance system toward greater fairness and rationality. Over the 18 years since its inception, BRICS has grown in strength and influence. Its economic aggregate now exceeds one-third of the global total, and its contribution to world economic growth has surpassed 50%. BRICS has emerged as a vital platform for solidarity and cooperation among EMDC in today's world. According to the *BRICS Industry and Science, Technology, Innovation Competitiveness (2023)*, the BRICS 10 countries have outpaced the Group of Seven (G7) in terms of high-tech product exports and the number of scientific journal articles published. They have become the world's most important producers of high-tech products and originators of scientific papers (see Table 3). Between 2015 and 2020, BRICS countries also outperformed the G7 in GDP and total trade growth, establishing themselves as the most critical drivers of global economic growth (see Table 4). Nowadays, EMDCs represented by BRICS, are making increasingly significant contributions to global governance. The representativeness and voice of the Global South have been notably enhanced; the architecture of global governance narratives and the equilibrium of international influence are undergoing profound adjustments and transformations. Countries such as Venezuela, Türkiye, Malaysia, Thailand, and Ecuador have applied to join the BRICS. This reflects Global South countries' desire to strengthen their voice and influence in international affairs through BRICS and to enhance the fairness and equity of the global governance system. This is not only an achievement of the BRICS committed to innovation but also an important roadmap for the development of a BRICS committed to justice. Thanks to the joint endeavors of the BRICS countries, the "Greater BRICS Cooperation" is yielding more substantial results. It is making greater contributions to the modernization of the Global South and driving transformative changes in global governance. In addition, this robust cooperation is also propelling the progress of building a community with a shared future for mankind.

**Table 3:** Basic Situation of BRICS and G7 Countries

Group	Land Area	Population	GDP	Trade Volume	R&D Investment	Exports of High-Tech Products	Number of scientific journal articles
BRICS Five Countries	3940.90	32.50	25.90	9.14	3690.40	9866.60	99.50
BRICS Ten Countries	4269.00	35.70	27.90	11.05	3816.30	9900.90	109.70
G7	2118.10	7.70	43.70	15.63	11328.90	7276.70	98.95
Global Aggregate	14048.70	80.00	100.60	50.73	22386.70	28161.50	293.30



Proportion of BRICS Five countries	28.00%	40.80%	25.70%	18.03%	16.48%	35.04%	33.93%
Proportion of BRICS Ten countries	30.40%	44.60%	27.70%	21.78%	17.05%	35.16%	37.40%
Proportion of G7	15.00%	9.70%	43.50%	30.80%	50.61%	25.84%	33.74%

Note: The land area figures are based on data from the official websites of the Chinese government and the Ministry of Foreign Affairs. Other data are sourced from the World Bank database. The total population, GDP, and total trade volume are based on 2022 data; high-tech product exports are based on 2021 data; R&D investment and the number of scientific journal articles published are based on 2020 data. The unit of land area is ten thousand square kilometers; for total population, it is hundred million people; for GDP, it is trillion US dollars; for total trade volume, it is trillion US dollars; for R&D investment, it is billion US dollars; for high-tech product exports, it is billion US dollars; and for the number of scientific journal articles published, it is ten thousand articles.

Source: *BRICS Industry and Science, Technology, Innovation Competitiveness (2023)*

**Table 4:** The Important Growth Volume of BRICS and G7 Countries (5 Years)

Group	Population	GDP	Trade Volume	R&D Investment	Exports of High-Tech Products	Number of scientific journal articles
BRICS Five Countries	0.88	6.93	3.13	1264.80	3539.00	37.66
BRICS Ten Countries	1.19	7.62	3.86	1326.20	3561.10	42.00
G7	0.10	6.78	3.63	2785.80	97.34	5.23
Global Aggregate	3.73	19.12	14.87	6629.50	5854.50	65.73
Proportion of BRICS Five countries	23.61%	36.26%	21.02%	19.08%	60.45%	57.30%
Proportion of BRICS	31.90%	39.85%	25.96%	20.00%	60.83%	63.90%

Ten countries						
Proportion of G7	2.78%	35.47%	24.41%	42.02%	1.66%	7.96%

Note: The data sources and units in this table are the same as in Table 3. The total population, GDP, and total trade volume represent the growth amounts from 2017 to 2022. The high-tech product exports represent the growth amounts from 2016 to 2021. The R&D investment and the number of scientific journal articles published represent the growth amounts from 2015 to 2020.

Source: *BRICS Industry and Science, Technology, Innovation Competitiveness (2023)*

#### 4. Roadmap and Achievements of the BRICS Committed to Innovation

As the world embarks on a new era of turbulence and transformation, BRICS countries, standing at the forefront of the latest industrial revolution, have delved deeply into and effectively implemented a series of practical paths. This is a vivid reflection of the great theoretical practice of the BRICS spirit. On the path of building the BRICS committed to innovation, BRICS countries have jointly advanced the development and progress of global technological civilization by establishing Partnership on New Industrial Revolution, research and cooperation centers, and a talent pool for STI.

##### 4.1 Digitization and Industrialization Based on Partnership on New Industrial Revolution

In July 2018, Johannesburg, South Africa, held the BRICS Business Forum, the proposal was made to jointly build a BRICS Partnership on New Industrial Revolution. It emphasized strengthening macroeconomic policy coordination, promoting cooperation in innovation and industrialization, and jointly accelerating the transition and upgrading of economic growth drivers. In November 2020, during the 12th BRICS Summit, it was announced that the BPIC would be established in Xiamen to engage in collaboration across policy coordination, talent development, and project implementation. The 2021 BRICS Summit's *New Delhi Declaration* and the 2022 BRICS Summit's *Beijing Declaration* reached a consensus on the construction of the BPIC. Since then, the BRICS Partnership on New Industrial Revolution has continued to deepen. Adhering to the "BRICS Plus" development principle, the BRICS countries have established the Industrial Innovation Alliance of BRICS Innovation Center in New Industrial Revolution, aiming to provide high-standard services for the construction of the BPIC. Since the BPIC was launched over three years ago, it has cumulatively released five batches of 177 key task lists, held over 40 high-level international exchange activities, built eight enabling platforms in the field of new industrial revolution, and launched more than 100 BRICS demonstration projects. Under the partnership framework, BRICS countries have prioritized cooperation in STI, creating a pilot field for the BPIC. Notable advancements have been achieved in the innovation and application of digital technologies like machine learning, data analytics, and cloud services, promoting the widespread transfer and transformation of STI achievements among BRICS countries and driving their digital and

industrial transformation. Taking South Africa as an example, the Hisense-South Africa Industrial Park project has greatly propelled the re-industrialization in South Africa. In 2013, Hisense partnered with the China-Africa Development Fund to co-invest in the establishment of the Hisense-South Africa Industrial Park, which has created over 1,000 direct and 5,000 indirect job opportunities locally. It has also spurred the development of 13 local supporting enterprises, improved the industrial chains, and advanced the re-industrialization in South Africa. Currently, products from the Hisense-South Africa Industrial Park have been exported to 20 African countries, including Mozambique, Zimbabwe, and Madagascar. Taking India as another example, India has made significant progress in the digital economy. According to a report by Riedel Strategy, a research and consulting agency in India, the digital payment volume in India reached 2162 trillion rupees during the 2019-2020 fiscal year, with around 160 million people using mobile payment services. During the Covid-19 pandemic, digital payments for food and groceries in India grew by 75%. With the support of relevant policies, India's digital payment volume is projected to reach 7092 trillion rupees by 2025, with nearly 800 million people using mobile payment services. Thanks to the development of the BRICS Partnership on New Industrial Revolution, the digitalization of BRICS industries has improved in quality and efficiency. This has not only boosted industrial transformation and upgrading but also achieved significant progress in the integration of the digital economy.

#### **4.2 STI Progress and Industry Incubation Through Research and Cooperation Centers**

The BRICS countries are driving applied research and technological development by establishing scientific research centers and cooperation centers. Recently, China established the China-BRICS Artificial Intelligence Development and Cooperation Center, focusing on empowering new-type industrialization with Artificial Intelligence (AI) to accelerate the development of smart industries. This initiative aims to promote pragmatic collaboration among BRICS nations in the realm of AI. The China-BRICS Science and Innovation Incubation Park for the New Era has also been launched, with the goal of fostering cooperation among BRICS countries in cutting-edge technologies. Through the incubation park, BRICS countries can share innovative resources and promote the commercial application of AI technologies. The park has collaborated with the Xiamen Software Park to set up the Russia House (Xiamen) Collaborative Innovation Center and the Steinbeis (Xiamen) Collaborative Innovation Center. These centers not only enhance Sino-Russian cooperation in the field of STI but also provide an important platform for the incubation and transformation of scientific and technological achievements. Meanwhile, BRICS countries are strengthening scientific research cooperation among member states in specific fields by implementing joint research projects, aiming to address global or regional scientific issues. For example, in the field of public health, China, Brazil, and South Africa are actively promoting the construction of the BRICS Vaccine Research and Development Center, enhancing vaccine R&D cooperation and technology sharing, and have achieved certain results in joint research projects and vaccine production. In the field of ocean and polar science research, BRICS countries are continuously expanding the depth and breadth of cooperation through joint voyages and cooperation platforms. Since

its establishment in 2017, the BRICS Ocean and Polar Working Group has held multiple meetings to promote project cooperation, voyage sharing, base platform construction, and talent cultivation. The working group is also actively pushing for the establishment of a BRICS Coordination Centre for the UN Ocean Decade to better harmonize with the United Nations Decade of Ocean Science for Sustainable Development. Additionally, through technology transfer and industry incubation centers, BRICS countries provide necessary technical support, financial assistance, and market access opportunities to help transform scientific research achievements into practical products and services. As the first official technology transfer cooperation mechanism established by BRICS countries, the BRICS Technology Transfer Center, since its establishment in 2018, has primarily focused on international technology transfer and the trading of scientific and technological achievements, with online technology transfer matching services as its core work. The center takes a significant part in the entrepreneurial systems of BRICS nations and Global South nations, especially in promoting innovation and science-driven economic development. The construction and development of research and cooperation centers have effectively created a “two-way” channel from science and technology to industry, leveraging external resources and technologies for localized innovation, advancing the conversion and utilization of scientific and technological innovations, and realizing industry incubation through STI.

#### **4.3 STI Talent Hub Based on BRICS Talent Development Platform**

Since the establishment of the BPIC, the base has conducted over 80 online and offline talent training sessions, covering hot topics such as AI and industrial internet. These sessions have reached more than 3 million participants from over 100 countries. From leveraging big data for precise pandemic prevention to organizing BRICS Green Finance Training Series, the BPIC has dissected its course areas and used systematic courses to promote talent development among BRICS countries. The BPIC not only offers systematic and diversified training courses but also initiates vocational skills competitions among BRICS countries in new industrial revolution areas in terms of high-end manufacturing and digital economy. For example, it has hosted the 2021 BRICS Skills Development and Technology Innovation Competition, organized participation in the 2022 BRICS and Asia-Pacific Professional Teachers Distance International Competition, hosted the 2023 BRICS Artificial Intelligence and Application Competition, and hosted the 2024 Belt & Road and BRICS Skills Development and Technology Innovation Competition. These events serve as an important platform for promoting educational cooperation, skill development, and people-to-people bonds among BRICS countries. Meanwhile, BRICS countries have established an expert tank for talent development and a supply chain system for talent development resources in the new industrial revolution areas, involving multiple stakeholders. China has provided training in big data, AI, security, and cloud computing for instructors from 32 vocational and technical training colleges in South Africa. It has also established the Huawei-South Africa Innovation Center to provide the latest digital technologies and solutions in 5G, cloud computing, and AI. In addition, the BPIC will focus on the talent needs of BRICS countries in the Digital Age, integrate resources from government, industry, academia, research, and application, and

develop training plans for government officials, corporate executives, skilled talents, and innovative entrepreneurs from BRICS and other EMDCs. In October 2024, during the “BRICS Plus” Leaders’ Dialogue, it was emphasized that China will serve as a pioneer in establishing the Global South Think Tanks Alliance to promote exchange and mutual learning in governance among countries. The establishment of the alliance will add strong momentum to the reserve of and scientific technological talents and the exchange of STI civilization between BRICS countries and the Global South. Thanks to the cooperation among the BRICS, these countries share the STI achievements, cultivate innovative talents, and radiate regional development to the Global South. This provides important support for the exchange and mutual learning of international scientific and technological civilization and promotes the construction of the BRICS committed to innovation as a stronghold and reservoir for the development of international STI talents.

## **5. Prospect of the BRICS Committed to Innovation Mechanism**

Led by China, BRICS countries are closely following the latest industrial transformation. They are committed to rallying the formidable forces of the Global South and mutually promoting the building of a community with a shared future for mankind from a strategic height. In doing so, BRICS countries are contributing BRICS wisdom, BRICS solutions, and BRICS strength to the common development and prosperity of all humanity. Looking ahead, in the process of constructing the BRICS committed to innovation, it is essential not only to strengthen the overall coordination and top-level design of the cooperation mechanism but also to fully tap the potential within digital economic sectors. While focusing on the R&D of environment-friendly technologies, BRICS countries can also promote the integrated development of industry, academia, research, and application. Together, they will jointly usher into a new era of high-quality development for the “Greater BRICS Cooperation”.

### **5.1 Strengthening Coordination and Top-level Design of the Cooperation Mechanism**

In January 2024, the United Arab Emirates, Egypt, Ethiopia, Saudi Arabia, and Iran officially joined the BRICS cooperation mechanism, adding new impetus to the BRICS countries’ cooperation in STI. However, the existing development divide in STI among BRICS countries has also posed new requirements for the BRICS committed to innovation. It calls for the BRICS countries to strive for consensus while respecting divergences, to enhance the overall coordination and top-level design of the cooperation mechanism. Firstly, BRICS countries can conduct country-specific and regional studies, comparing policies, technologies, and resources across different countries and regions. This will enable them to fully leverage the comparative advantages of each BRICS country and tailor STI development plans. Secondly, the BRICS should coordinate and integrate their national STI mechanisms. By aligning the innovation situations of each country and connecting with the overall landscape of scientific R&D, they can establish a comprehensive and collaborative cooperation mechanism. Strengthening the top-level design, scientific layout, and cyclical development of this mechanism will ensure that STI cooperation is truly implemented. This will drive the formation of a BRICS community with a shared

future in STI. For instance, Brazil has significant advantages in agricultural biotechnology and natural resource management; Russia holds a leading global position in space technology and nuclear energy; China is at the forefront of high-tech manufacturing and internet technology; South Africa has unique strengths in mineral resource development and geological scientific research; and Saudi Arabia is vigorously developing AI to seamlessly integrate it into all aspects of citizens lives. Based on the role of the original BRICS five countries in STI as mentioned above, the expanded group of ten BRICS countries can fully leverage their respective advantages. By expanding the scope of cooperation and elevating the mechanism design, a new pathway for the advancement of science and technology within the “Big BRICS” framework can be established.

## 5.2 Unlocking the Full Potential of the Digital Economy

The BRICS countries possess vast potential for growth in digital economic sectors. Moreover, in terms of digital infrastructure and innovative ecosystems, they have already made certain progress in this area. However, the BRICS countries still have shortcomings and deficiencies in developing the digital economy. Currently, the BRICS countries generally lack a unified legal framework and cooperative regulations for economic digitalization, which has slowed the pace of digital economic development in these countries. This situation calls for the BRICS countries to eliminate developmental barriers and unleash greater potential for growth. First and foremost, the BRICS countries can clearly establish frameworks and regulations for emerging fields such as the digital economy to promote its development through legal governance and regulation. The Indian government has enacted and implemented laws, such as the *Digital Personal Data Protection Act* and the *Competition Act* amendments. These measures help protect consumer rights, maintain market competition, and ensure fair competition and transparency in the digital domain, thereby supporting the healthy growth of the digital economy. The BRICS countries can draw on advanced development experiences from both within and outside the cooperation mechanism to jointly regulate the innovative development of emerging fields involved digital economy. Secondly, the BRICS countries can fully leverage the dividends of the fourth Industrial Revolution and the digital economy era to vigorously develop the digital economy and maximize the advantages of the BRICS Cooperation. Currently, India is working hard to enhance its digital economy capabilities. Brazil has already surpassed some developed countries and regions in terms of investment in digital economy R&D. China is leading the development of 5G communications and e-commerce. The advantages of the BRICS in the digital economy era are fully demonstrated. Against this backdrop, the BRICS should fully leverage the opportunities of the digital age., regulate the development of emerging digital industries, increase R&D efforts in relevant fields, and unleash the greater potential for digital economy innovation.

## 5.3 Strengthening R&D of Environment-friendly Technologies

The BRICS countries attach great importance to cooperation in green technology, considering it as one of the key areas of collaboration and emphasizing the significance of strengthening such

cooperation on multiple occasions. In 2023, the BRICS countries signed the *Implementation Plan for the Memorandum of Understanding on Cooperation in Environment among BRICS Countries (2023-2027)*, further enhancing the exchange of expertise and joint R&D in environmentally friendly technologies. While pursuing economic development, the BRICS face certain pressure of increasing power consumption and rising carbon emissions. How to strike a balance between economic growth and effective reduction of carbon emissions has become a major challenge for each country. This calls for the BRICS countries to intensify the R&D of environmentally friendly technologies, and while building a BRICS committed to innovation, to also develop a BRICS committed to green development in a coordinated manner. First, the BRICS countries can increase their efforts in green technology R&D and promote eco-friendly technologies and products. They can establish platforms for environmentally friendly technologies to strengthen cooperation in green technology. By signing documents such as the *Memorandum of Understanding on Cooperation in Environment among BRICS Countries*, they can clarify priority areas and projects, and promote joint R&D and dissemination of eco-friendly technologies. Secondly, the BRICS countries should encourage the transfer of green and low-carbon technologies as well as clean technologies, and strengthen cooperation and exchanges in environmentally friendly technologies. The countries can leverage platforms to provide diversified, green, and sustainable financing to support the implementation of clean energy projects. Meanwhile, each country can capitalize on its strengths in renewable energy to conduct deeper technical exchanges and cooperation, jointly promoting the implementation of clean energy projects. For example, China has installed new solar capacity, significantly reducing carbon emissions. Brazil's biofuel industry has grown rapidly, reducing its dependence on fossil fuels. On this basis, the BRICS countries can coordinate and integrate their experiences in green technology development to jointly promote green technology innovation and link the BRICS committed to innovation with the BRICS committed to green development.

#### 5.4 Promoting Integration of Industry, Academia, Research, and Application

Currently, the BRICS nations have secured certain successes in STI cooperation in the fields of industry, academia, and research. By signing documents such as the *Memorandum of Understanding on Governmental Cooperation in Science, Technology and Innovation among the BRICS Countries*, the BRICS nations have outlined a strategic framework for collaboration in STI and identified priorities of collaborated efforts in fields such as nanotechnology, new energy, and basic research. At the same time, the BRICS countries encourage the launch of "industry-academia-research" cooperation platforms to orderly transfer and transformation of science and technology achievements among the BRICS. For instance, China has jointly established the China-BRICS Science and Innovation Incubation Park for the New Era with other BRICS countries, aiming to drive the transformation of scientific and technological achievements and industrial cooperation. Moreover, the BRICS countries place great emphasis on the exchange and cooperation of young scientists and innovative entrepreneurs. By holding events such as the Young Scientists Forum, they promote the mobility of scientific and technological



talents among the countries. However, there is still ample development room for the integrated mechanism-building of STI cooperation within the BRICS in industry, academia, research, and application. Research and development in science and technology, exchange of scientific and technological advancements, nurturing of scientific innovations, and deployment of scientific and technological expertise are all important nodes on the “industry chain” of BRICS committed to innovation. Only by leveraging the strengths of each node in a comprehensive manner can the value of BRICS STI cooperation be maximized. The BRICS countries can focus on emerging scientific and technological fields, timely transform scientific research achievements, promote the exchange and mutual learning of scientific and technological civilization, and cultivate scientific research talents. They should also pay attention to the utilization of achievements and talents, and drive the overall development of industry, academia, research, and application in the BRICS countries through a start-to-end mechanism, with the goal of establishing a BRICS community of science and technology innovation at an early date.

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### **Author Contributions**

The author confirms sole responsibility for the following: study conception and design, data collection, analysis and interpretation of results, and manuscript preparation.

### **Availability of Data and Materials**

The data and materials on which the study is based were accessed from a repository and are available for downloading through the following link.

<http://www.sirinnovation.com/NewsDetail/5044561.html>

<http://finance.people.com.cn/n1/2024/1019/c1004-40342576.html>

[https://www.szzg.gov.cn/2023/szzg/gzdt/202308/t20230831\\_4758759.htm](https://www.szzg.gov.cn/2023/szzg/gzdt/202308/t20230831_4758759.htm)

<http://politics.people.com.cn/n1/2024/1028/c1001-40348820.html>

<http://www.sirinnovation.com/NewsDetail/5044561.html>

<https://www.brics-talent-development.com/en/hzjz/cxlm/>

<http://pib.nic.in/newsite/PrintRelease.aspx?relid=151563>

[https://www.gov.cn/jrzg/2013-03/28/content\\_2364217.htm](https://www.gov.cn/jrzg/2013-03/28/content_2364217.htm)

<https://www.bricspic.org/Pages/Home/NewsDetail.aspx?rowId=515#>

[http://www.fecomee.org.cn/dwhz/qyhjzj/xmyl/202205/t20220505\\_976832.html](http://www.fecomee.org.cn/dwhz/qyhjzj/xmyl/202205/t20220505_976832.html)

<http://www.news.cn/tech/20240911/b49991d68dd5460e8456cf306ae6d128/c.html>  
<http://www.news.cn/tech/20240911/b49991d68dd5460e8456cf306ae6d128/c.html>  
<https://finance.sina.com.cn/money/fund/jjzl/2024-10-28/doc-incucfhz5418553.shtml>  
[https://www.miit.gov.cn/jgsj/gjs/hzjzlw/art/2022/art\\_9fc93e806a274a82a5cd8bf40847ef49.html](https://www.miit.gov.cn/jgsj/gjs/hzjzlw/art/2022/art_9fc93e806a274a82a5cd8bf40847ef49.html)  
<http://world.people.com.cn/n/2014/0714/c1002-25278000.html>  
<http://politics.people.com.cn/n1/2024/1023/c459572-40345255.html>  
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## Conflicts of Interest

The authors declare that they have no conflicts of interest to report regarding the present study.

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