

Country has leapt ahead in electric vehicles, aerospace and other areas.
Fan Feifei reports

China intensified efforts to bolster the integration of scientific and technological and industrial innovation, with notable strides made in key and core technologies, as part of its broader push to drive the development of new quality productive forces during the 14th Five-Year Plan (2021-25).

Experts said the country has sent a clear signal that it is dedicated to implementing the innovation-driven development strategy to achieve greater self-reliance and strength in science and technology, boosting its core competitiveness globally and injecting strong momentum into high-quality economic growth amid external uncertainties. Over the past five years, China's innovation capacity has steadily improved, and its foundation for becoming a technological powerhouse has been continuously strengthened.

The country's investment in science and technology has continued to rise, with its research and development spending exceeding 3.6 trillion yuan (\$505 billion) in the past five years, a 48 percent increase over the period, Minister of Science and Technology Yin Hejun said.

R&D intensity reached 2.68 percent, surpassing the average level of European Union countries, while the total number of people engaged in R&D ranked first in the world, Yin said, adding that China's spending on basic research was 250.09 billion yuan last year, a rise of more than 70 percent over five years.

China has achieved significant breakthroughs in innovation, including in quantum science, life sciences, material science and space science, he said. It has topped the world in the number of high-level international journal papers and the volume of global patent applications five years in a row.

The ranking of the country's comprehensive innovation capability rose from 14th in 2020 to 10th in 2024, Yin said. China has established the strategic goal of building a strong country in science and technology by 2035, and accelerated the realization of high-level self-reliance in science and technology.

The integration of China's scientific and technological innovation with industrial innovation gathered pace during the 14th Five-Year Plan period (2021-25). The National Bureau of Statistics said that the value-added output of high-tech manufacturing companies, each with an annual main business revenue of at least 20 million yuan, rose 42 percent compared with the end of the 13th Five-Year Plan period (2016-20).

The added value of new industries, new business formats and new business models, dubbed the three new economies, accounted for 18 percent of the country's GDP



Leju's KUAVO humanoid robots in operation at Chinese carmaker Hongqi's factory in Changchun, Jilin province, in April. PROVIDED TO CHINA DAILY

Innovation speeds industrial journey



The key to developing new quality productive forces lies in achieving high-level self-reliance and strength in science and technology...

Deng Zhonghan, academicien of the Chinese Academy of Engineering

A worker debugs industrial robots in an intelligent equipment technology company in Ganzhou, Jiangxi province. ZHU HAIPENG/FOR CHINA DAILY

last year. Technology frontiers such as artificial intelligence and biotechnology are emerging as new drivers for economic growth.

The innovation capabilities of Chinese companies have been significantly elevated over the past five years. Last year 524 Chinese mainland companies ranked among the world's top 2,000 industrial companies in terms of R&D investment, accounting for 26.2 percent of the total, representing an increase of 4.8 percentage points from 2020.

The number of high-tech companies exceeded 500,000 last year, an 83 percent rise on 2020.

China has accelerated steps to achieve breakthroughs in key technologies in areas including high-end equipment and advanced manufacturing, and promoted the transformation of traditional industries to higher-end, smarter, and greener ones to build a modern industrial system and nurture new quality productive forces.

It has also made great efforts to boost the development of emerg-

ing industries and future-oriented industries, such as new-generation information technology, new energy, artificial intelligence and brain-computer interface technology to gain a competitive edge and build up new growth drivers amid fierce international competition.

For example, in the rapidly advancing field of AI China has developed a number of general large language models that have reached an advanced international level, creating more than 100 exemplary

application scenarios, Yin said.

Technological breakthroughs in humanoid robots have sped up their applications in automobile manufacturing, logistics and power inspection, laying a solid foundation for the development of a trillion-yuan industry, he said.

The Minister of Industry and Information Technology, Li Lecheng, said China has quickened the pace of the industrial upgrade, with the added value of equipment manufacturing and high-tech manufacturing sectors rising at an average annual rate of 7.9 percent and 8.7 percent, respectively, from 2020 to 2024.

Last year the country produced more than 13 million new energy vehicles and has maintained its position as the world's largest maker and seller of such vehicles 10 years in a row, Li said, highlighting that the production of photovoltaic and wind power equipment also ranked among the top in the world.

China has also achieved significant progress in the major technical equipment sector.

The domestically developed C919 aircraft has entered commercial service. China's first domestically built cruise ship is now in operation, and the CR450 high-speed train has rolled off the production line.

During the 14th Five-Year Plan (2021-25), the real economy accelerated integration with the digital economy, and Li said China has built the world's largest and most extensive network infrastructure, with 4.598 million 5G base stations in operation.

The 5G technology has been deployed across various fields such as mining, ports, and factories, while the number of connected devices on major industrial internet platforms exceeds 100 million units, Li said. The country has established more than 60 national advanced manufacturing clusters in emerging industries and 23 national innovation demonstration zones.

It is noteworthy that the number of AI enterprises and the scale of the AI industry in China have continued to grow over the past five years. Domestic large models such as DeepSeek and Alibaba's Qwen take the lead in the global open-source innovation ecosystem.

Huang Hanquan, head of the Chinese Academy of Macroeconomic Research, said China's emphasis on nurturing new quality productive forces and its significant achievements in scientific and technological innovation are conducive to speeding up the establishment of a modern industrial system, enhancing the stability and resilience of industrial and supply chains, and strengthening the capacity to buffer against external shocks and challenges.

"The key to developing new quality productive forces lies in achieving high-level self-reliance and strength in science and technology, reinforcing original and disruptive technology innovations, and giving birth to new industries and new growth momentum," said Deng Zhonghan, an academicien of the Chinese Academy of Engineering.

China is now key hub for two-way investment

By LI JING

As global supply chains undergo transformation and investment patterns shift, China has taken on a dual role in the world economy — as both a magnet for foreign companies and an increasingly influential outbound investor, experts and executives say.

This signals continuity in the country's opening-up that China is no longer just a participant in global growth, and that it is becoming a co-architect of such growth, they said.

What draws foreign companies today is not the promise of low costs, but the chance to innovate, to test ideas in a vast and demanding market, and to use China as a springboard into global competition.

"China remains the top target market for companies expanding their global trade layout, with 44 percent of global companies choosing China as their first choice for expansion," said David Liao, co-chief executive for Asia and the Middle East at HSBC.

Citing survey data, he said that 40 percent of global firms are either already increasing their manufacturing presence in China over the next two years or are planning to do so. "These findings highlight that China remains a hot spot for international investment and occupies a central position in the global trade landscape."

That reality is reflected in the way executives describe the market, many calling it a touchstone for development.

Morten Wierod, chief executive of the Swedish-Swiss industrial group ABB, said China is the cornerstone of the company's business, with Xiamen, Fujian province, becoming its largest global manufacturing base and innovation center.

The same pattern plays out in life sciences and healthcare. Anita Wei, vice-president of external affairs at the life sciences and technology company Danaher China, said her company's "double innovation engine" strategy is built on deep localization.

"We aim to achieve 80 percent of sales revenue from localized production and 80 percent of raw material sourcing from the Chinese market. This allows our research and development teams to respond directly to clinical needs in China and then promote those solutions globally."

These strategies have been underpinned by policy.

China has steadily opened doors wider, reducing national and free trade zone negative lists for foreign investment to 29 and 27 items, respectively. Restrictions on manufacturing investment have been removed, and pilot programs in cloud computing, biotechnology and wholly foreign-owned hospitals are underway.

If inbound investment illustrates how China strengthens multinationals, outbound investment shows how Chinese firms are reshaping international markets. Last year outward direct investment was worth \$192 billion, bringing cumulative stock above \$3.14 trillion. For the 13th year in a row, China ranked among the world's top three investors, according to the 2024 statistical bulletin of outward foreign direct investment.

In total, by the end of last year 34,000 Chinese investors had established 52,000 overseas companies in 190 countries and regions, including 19,000 in countries involved in the Belt and Road Initiative.

Hungary illustrates China's new depth of global collaboration, particularly with countries involved in the BRI. From 2014 to 2024 Chinese companies invested nearly \$20 billion in Hungary, creating more than 30,000 local jobs in fields such as automotive batteries and intelligent logistics.

Tuba's perfect notes in a tune of harmony

By ZHANG YU

In a workshop, Munn Zee-woong, a South Korean music technologist, carefully adjusts the pitch of a tuba. His regular visits to the Chinese instrument manufacturing center of Wuqiang county, Hengshui, Hebei province, bring what local workers describe as "a fresh wave of energy" to Zheng Ou Musical Instruments Co.

His visit at the end of September continued an eight-year collaboration with the company, focusing on enhancing resin wind instruments.

Munn, 42, an accomplished musician holding a doctorate in tuba performance, first connected with Zheng Ou in 2017 when its general manager, Shen Jiace, was seeking international expertise to elevate the company's technological capabilities.

Their initial meeting at an industry exchange event led to Munn's first factory visit in 2019, which left a profound impression.

"The factory was surrounded by vast fields, with a distinct rural atmosphere," Munn said. "It was quite different from the modern manufacturing base I had imagined. But the company's vision, development philosophy and deep respect for artists showed me its potential."

Seeing something special beyond technical capability, a genuine passion for music persuaded him to

embark on this cross-border partnership, he said.

Zheng Ou, founded 10 years ago, is a modern comprehensive musical instrument manufacturer that integrates design, research, manufacturing, sales and logistics.

"We recruited Munn as a technical adviser mainly because of his expertise in instrument manufacturing, maintenance, quality management and performance," Shen said.

Since 2020 their collaboration has deepened significantly, though the path has not always been smooth.

Munn remembers one particularly tense meeting in which his innovative instrument design, influenced by his Korean industry practices, clashed with the more conservative approach of the company's R&D team.

"We had different perspectives," Munn said.

"I focused on creating revolutionary products that would quickly capture market attention, while the Chinese team was more concerned about established consumer preferences."

Finally, through passionate, but patient, discussion, they merged their ideas into a successful new product that became a market hit, building mutual respect through the process.

Beyond the workshop, Munn has found a second home in Wuqiang.

This small county, boasting

rich musical heritage and renown as China's hometown of stringed instruments, has welcomed him warmly.

He spends seven days each month there, often strolling through streets filled with music from numerous instrument shops and factories.

His Chinese colleagues have introduced him to various Chinese cuisines, with hot pot becoming his favorite.

"Gathering around a bubbling pot, sharing food and stories, I feel a warmth that transcends being just business partners," Munn said.

"These moments have transformed our professional relationship into something deeper. We've become like family."

This strong personal bond has fueled remarkable technical innovations.

Munn takes particular pride in the development of their new resin euphonium, a project that initially faced significant skepticism. "The challenge was enormous. We needed to balance resin's lightweight durability with the pure sound quality of traditional brass."

The team endured numerous failed experiments and frustrating prototypes before achieving its breakthrough.

"When we finally produced an instrument meeting our acoustic standards, hearing those first pure notes confirmed we had created



South Korean music technologist Munn Zee-woong (right) discusses instrument technology improvement plans with a colleague.

WANG TIANXIANG/FOR CHINA DAILY

something truly special," Munn said.

Under guidance from him and other international experts, Zheng Ou has achieved remarkable results in technological innovation.

The company now holds 35 patents and 10 trademarks, having launched a complete line of resin instruments that established it as the only global manufacturer offering a full series of these innovative products, Shen said.

"These instruments are lighter, more durable and maintain excellent sound quality."

The company now exports about half of its products to multiple countries and regions such as

South Korea, Japan, Europe and the United States.

In recognition of his contributions to local development, in September Munn received the 2024 Yan-Zhao Friendship Award, the highest honor bestowed by the Hebei provincial government upon foreign experts.

"This experience in Hebei has deepened my understanding that 'music has no borders'," Munn said. "We've built bridges that connect not just different manufacturing approaches, but different cultures and hearts."

Wang Tianxiang contributed to the story.