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Current development and prospect of national science and technology innovation platform in the railway industry

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Abstract

Purpose – This study summarizes the overall situation of the resources of the national science and technology innovation platform in the railway industry, including the distribution of platform types, supporting institutions, construction sites, professional fields, etc., to provide a reference for the further improvement and optimization of the national science and technology innovation platform system in the railway industry.

Design/methodology/approach – Through literature review, field investigation, expert consultation and other methods, this paper systematically investigates and analyzes the development status of the national science and technology innovation platform in the railway industry.

Findings – Taking the national science and technology innovation platform of the railway industry as the research object, this paper investigates and analyzes the construction, development and distribution of the national science and technology innovation platform of railway industry over the years. And the National Engineering Research Center of High-speed Railway and Urban Rail Transit System Technology was taken as an example to introduce its operation effect.

Originality/value – China Railway has made great development achievements, with the construction and development of national science and technology innovation platform in the railway industry. In recent years, a large number of national science and technology innovation platforms have been built in the railway industry,

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which play an important role in railway technological innovation, standard setting and commodification, and provide strong support for railway technology development.

Keywords Railway industry, National science and technology innovation platform, Current development and prospect

Paper type General review

1. Introduction

Nowadays, the rapid development of knowledge-based economy (Smith, 2005) and the rapid advancement of economic globalization (Friedman, 1999) have had a profound impact on the scientific and technological innovation system of all countries. Major developed countries such as the United States, the United Kingdom, Germany, France and Japan attach great importance to the construction of national science and technology innovation platform and form a relatively mature national science and technology innovation platform system (Smith, 2019). For example, the United States has built the famous Los Alamos National Laboratory, Sandia National Laboratory, Brookhaven National Laboratory and Transportation Technology Center Inc (TTCI); the United Kingdom has built the National Physics Laboratory, Kadish National Laboratory, Rutherford-Apkaton National Laboratory and The UK's Transport Research Laboratory (TRL); Germany has built the Max Planck Institute and Fraunhofer Institute; France has built the National Scientific Research Center, National Institute of Health and Medicine, etc. (Li & Huang, 2009); Japan has built the Institute of Physical Chemistry and Railway Technical Research Institute, etc. (Kim, 2022). These national science and technology innovation platforms have played an important role in enhancing the overall innovation capability of the country and securing its competitive edge. With the increasingly fierce competition in the field of science and technology among countries all over the world (Robinson & Veers, 2002), China pays more and more attention to optimizing the national science and technology innovation system and enhancing the national science and technology innovation capability. It puts forward higher requirements for the science and technology innovation platform, which supports and serves the national major science and technology development strategy (Di & Zhao, 2020).

As a national strategic, leading and crucial major infrastructure, railway is the main artery of national economy, the major livelihood project and the backbone of comprehensive transportation system, and also an important support for Chinese modernization. With China's reform and opening-up since 1980s, the construction and development of China Railway have gradually accelerated and made great achievements. By the end of 2023, the operational mileage of China Railway has reached 159,000 kilometers, including 45,000 kilometers of High-Speed Railway (Chinese government network, https://www.gov.cn/yaowen/liebiao/202401/content_6925054.htm). China has built the world's largest high-speed railway network and advanced railway network, which has become one of the models of railway construction all over the world, with the characteristics of safety, speed, high efficiency, green and environmental protection. The overall technical level of China Railway has ranked the top in the world, and the technologies of high-speed railways, plateau railways, alpine railways and heavy-haul railways have reached the world's leading level (State Railway Administration, https://www.nra.gov.cn/xwzx/xwxx/xwlb/202301/t20230113_339569.shtml).

The key to the rapid development of China Railway lies in technological innovation, and its material foundation is test equipment. In 2006, the *Outline of the National Medium-and Long-Term Science and Technology Development Program (2006–2020)* was released, emphasizing the necessity to continuously improve the independent innovation capability and comprehensively promote the construction of the national innovation system with Chinese characteristics. In 2007, the *Eleventh Five-Year Plan for Building National Capacity in Independent Innovation and Basic Research* proposed to build about 30 national science and technology centers and laboratories, about 300 national key laboratories, about 100 national engineering laboratories, about 100 national engineering research centers and 300 national recognized enterprise technology centers. This plan laid an important material foundation for the comprehensive realization of the strategic objective of the science and technology planning outline and accelerated the construction of national science and technology innovation platforms. According to incomplete statistics, by the end of 2017, China had approved the construction of 503 national key laboratories, 131 national engineering research centers and 217 national engineering laboratories (National Bureau of Statistics). After nearly 40 years of exploration, China has initially formed a national science and technology innovation platform system characterized by multi-subject participation, multi-tiered construction and a high concentration of innovation resources (Han, Chen, & Ma, 2023).

2. Development, optimization and integration of national science and technology innovation platforms in the railway industry

Over the years, the railway industry has attached great importance to the construction of national science and technology innovation platforms, and has successively declared the construction of more than 40 national science and technology innovation platforms, such as the state key laboratory, the national engineering research center, the national engineering technology research center, the national engineering laboratory and the national technology innovation center. These innovative platforms have distinctive focuses within professional fields and characteristics in technological domains, each embodying its own distinctive features. They contain high-speed, plateau, alpine, heavy-duty and general-speed railways, covering the entire life cycle of railway survey and design, engineering construction, equipment manufacturing, transportation organization and maintenance, involving universities, research institutes, host enterprises, key system component suppliers and transportation enterprises. A relatively complete national science and technology innovation platform system of the railway industry has been formed.

However, due to the long span of the construction time of national science and technology innovation platforms, there are many categories of national science and technology innovation platforms built successively, such as the state key laboratory, the state engineering laboratory, the state engineering research center and the state engineering technology research center. This has caused issues such as overlapping and duplicating in the functional positioning among various platforms. In recent years, China has begun to integrate and optimize various national science and technology innovation platforms. In August 2017, the *National Science and Technology Innovation Base Optimization and Integration Plan* proposed to classify and streamline the existing national science and technology innovation platforms, according to the national strategic needs and the functional positioning of different types of scientific research bases. These platforms should be integrated into three categories for distribution and construction: scientific and engineering research, technological innovation and commodification, fundamental support and condition guarantee. The platforms for scientific and engineering research mainly include national laboratories and national key laboratories; the platforms for technological innovation and commodification mainly include state engineering research centers and state engineering technology research centers. The National Development and Reform Commission has stopped approving the establishment of new national engineering laboratories. The existing national engineering laboratories managed by the National Development and Reform Commission has been merged reasonably and brought into the management of national engineering research centers for those meeting the requirements. The Ministry of Science and Technology has no longer approved the establishment of new national engineering technology research centers and enhanced its evaluations and assessments of existing centers, while also pursuing multi-faceted optimization and integration efforts. The qualified ones has been brought into the management of the national technology innovation center. Since 2021, the National Development and Reform Commission has optimized and integrated all the established national engineering laboratories and national engineering research centers, and the Ministry of Science and Technology has optimized and reorganized all the established state key laboratories and started to optimize and integrate the national engineering technology research centers. By the end of 2023, there were 34 national science and technology innovation platforms in the railway industry (see Tables 1 and 2).

At present, among the 34 national science and technology innovation platforms in the railway sector, from the perspective of category distribution, platforms for science and engineering research account for 41% (comprising 13 national/national key laboratories and 1 national key laboratory co-constructed by provincial and ministerial authorities), platforms for technological innovation and achievement transformation account for 59% (including 6 national engineering technology research centers, 6 national engineering research centers, 1

Table 1. Statistical list of the national science and technology innovation platform for science and engineering research in the railway industry

Number	Name of the platform	Leading institute	Professional fields	Location
1	State Key Laboratory of High-Speed Railway Track System	China Academy of Railway Sciences Corporation Limited	Public works engineering	Beijing
2	State Key Laboratory of Advanced Rail Autonomous Operation	Beijing Jiaotong University	Communication signal	Beijing
3	State Key Laboratory of Rail Transit Vehicle System	Southwest Jiaotong University	Mobile equipment	Sichuan
4	State Key Laboratory of Bridge Intelligent and Green Construction	Southwest Jiaotong University	Public works engineering	Sichuan
5	State Key Laboratory of Intelligent Construction and Maintenance of Geotechnical and Tunnel Engineering in Extreme Environment	Southwest Jiaotong University	Public works engineering	Sichuan
6	State Key Laboratory of Disaster in Civil Engineering	Tongji University	Safety and security	Shanghai
7	State Key Laboratory of Power Semiconductor and Integrated Technology	CRRC Zhuzhou Electric Locomotive Co., Ltd	Mobile equipment	Hunan
8	State Key Laboratory of Heavy-duty and Express High-power Electric Locomotive	CRRC Zhuzhou Electric Locomotive Co., Ltd	Mobile equipment	Hunan
9	State Key Laboratory of EMU and Locomotive Traction and Control	China Academy of Railway Sciences Corporation Limited	Mobile equipment	Beijing
10	State Key Laboratory of Bridge Structural Health and Safety	China Railway Major Bridge Engineering Group Co., Ltd	Public works engineering	Hubei
11	State Key Laboratory of Rail Transit Infrastructure Performance Monitoring and Support	East China Jiaotong University	Public works engineering	Jiangxi
12	State Key Laboratory of Rail Transit Engineering Informatization	China Railway First Survey and Design Institute Group Co., Ltd	Information technology	Shaanxi
13	State Key Laboratory of Shield Machine and Boring Technology	China Railway Tunnel Group Co., Ltd	Public works engineering	Henan
14	The province and the ministry jointly established the State Key Laboratory of Structural Mechanics Behaviour and System Safety of Traffic Engineering	Shijiazhuang Tiedao University	Public works engineering	Hebei

Source(s): Authors' own work

Table 2. Statistical list of the national science and technology innovation platform for technological innovation and commodification in railway industry

Number	Name of the platform	Leading institute	Professional fields	Location
1	National Engineering Technology Research Centre for Rail Transit Electrification and Automation	Southwest Jiaotong University	Traction power supply	Sichuan
2	National Railway Engineering Technology Research Centre for Large-scale Road Maintenance Machinery	Kunming China Railway Large Road Maintenance Machinery Group Co., Ltd	Mobile equipment	Yunnan
3	Center of National Railway Intelligent Transportation System Engineering and Technology	China Academy of Railway Sciences Corporation Limited	Communication signal	Beijing
4	National High-speed EMU Assembly Engineering Technology Research Centre	CRRC Qingdao Sifang Co., Ltd	Mobile equipment	Shandong
5	National Engineering Research Centre for Rail Passenger Car System Integration	CRRC Qingdao Sifang Co., Ltd	Mobile equipment	Jilin
6	National Engineering Technology Research Centre for Heavy Haul Express Railway Wagons	CRRC Qiqihar Rolling Stock Co., Ltd	Mobile equipment	Heilongjiang
7	National High-Speed Train Technology Innovation Centre	CRRC Qingdao Sifang Co., Ltd	Mobile equipment	Shandong
8	National Engineering Research Centre for Rail Transit Operation Control System	Beijing Jiaotong University	Communication signal	Beijing
9	National Engineering Research Centre for Mobile Private Networks	Beijing Jiaotong University	Communication signal	Beijing
10	National Engineering Research Centre for Rail Transit Vehicle System Integration	CRRC Qiqihar Rolling Stock Co., Ltd	Mobile equipment	Beijing
11	National Engineering Research Centre for High-speed Railway and Urban Rail Transit System Technology	China Academy of Railway Sciences Corporation Limited	System technology	Beijing
12	National Engineering Research Centre for High-Speed Railway Construction Technology	Central South University	Public works engineering	Hunan
13	National Engineering Research Centre for Digital Construction and Evaluation Technology of Urban Rail Transit	China Railway Design Corporation	Public works engineering	Tianjin
14	National and Local Joint Engineering Research Centre for Rail Transit Equipment Design and Manufacturing Technology	Dalian Jiaotong University	Mobile equipment	Liaoning
15	National and Local Joint Engineering Research Centre for Rail Transit Infrastructure Operation and Maintenance Safety Assurance Technology	East China Jiaotong University	Safety and security	Jiangxi

(*continued*)

Table 2. Continued

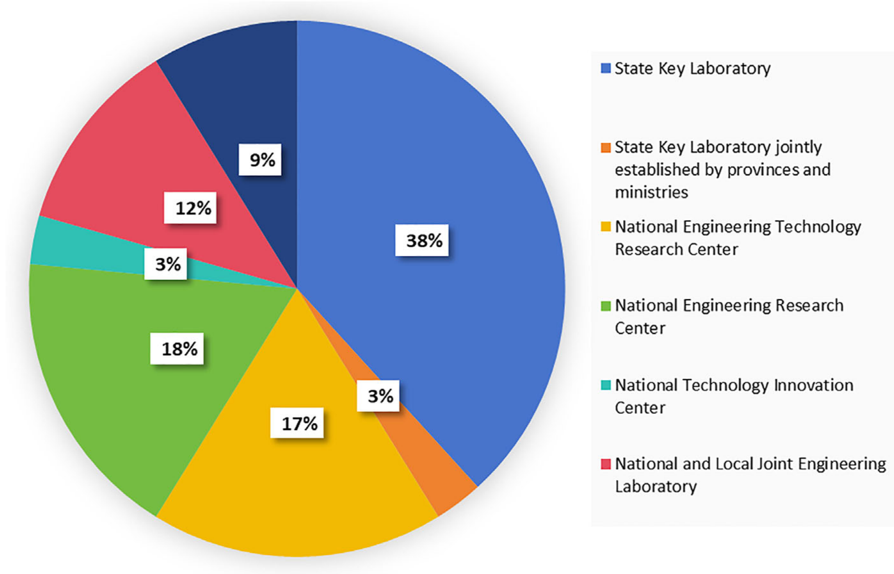
Number	Name of the platform	Leading institute	Professional fields	Location
16	National and Local Joint Engineering Research Centre for Rail Transit Train Safety Assurance Technology	Central South University	Safety and security	Hunan
17	National and Local Joint Engineering Laboratory of Disaster Prevention and Control Technology for Road and Bridge Engineering	Lanzhou Jiaotong University	Public works engineering	Gansu
18	National and Local Joint Engineering Laboratory for High-speed Railway Operation Safety Spatial Information Technology	Southwest Jiaotong University	Information technology	Sichuan
19	National and Local Joint Engineering Laboratory for Integrated Transportation Intelligence	Southwest Jiaotong University	Information technology	Sichuan
20	National and Local Joint Engineering Laboratory for Rail Transit Survey and Design	China Railway Design Corporation	Public works engineering	Tianjin

Source(s): Authors' own work

national technology innovation center, 4 national-local joint engineering laboratories and 3 national-local joint engineering research centers). Notably, there are no platforms categorized under basic support and conditional safeguards, as illustrated in Figure 1. According to the distribution of supporting institutions, 50% of railway national science and technology innovation platforms are supported by institutions of higher education (17 platforms), 38% by manufacturing enterprises (13 platforms) and 12% by scientific research institutions (4 platforms). There are no platforms supported by transportation enterprises such as railway bureau group corporations, as shown in Figure 2. In terms of geographical distribution, there are 8 platforms in Beijing, 6 in Sichuan, 4 in Hunan, 2 each in Jiangxi, Shandong and Tianjin respectively, and 1 each in Shaanxi, Henan, Gansu, Heilongjiang, Hubei, Liaoning, Yunnan and Shanghai, respectively, as shown in Figure 3; regarding professional fields, with 11 each in public works engineering and mobile equipment, 4 in communication signals, 3 each in security and information technology, 1 in system technology and 1 in traction power supply, as shown in Figure 4. Notably, public works engineering and mobile equipment account for a high proportion, each comprising 32% of the total.

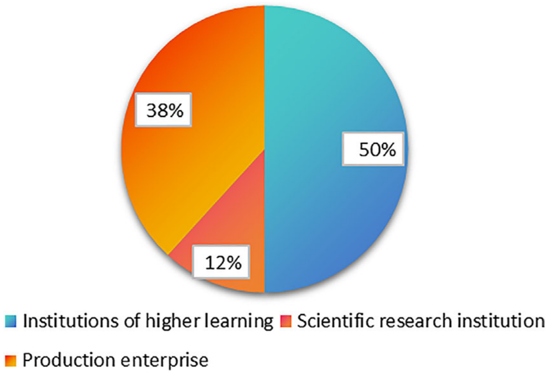
3. Operational effectiveness of national science and technology innovation platform in the railway industry

The key to the high-speed development of China Railways lies in continuous technological innovation. As a crucial part of China Railway's strategic scientific and technological strength, the National Science and Technology Innovation Platform provides robust support for the construction, development and scientific and technological progress of China Railway. These platforms have achieved numerous scientific and technological achievements around overcoming key core technologies in the industry, supporting the implementation of national strategic tasks and key projects, promoting the application of technological achievements and driving industrial development. These achievements have been transformed into series of new products, technologies and equipment, thereby establishing comprehensive technical systems covering



Source(s): Authors' own work

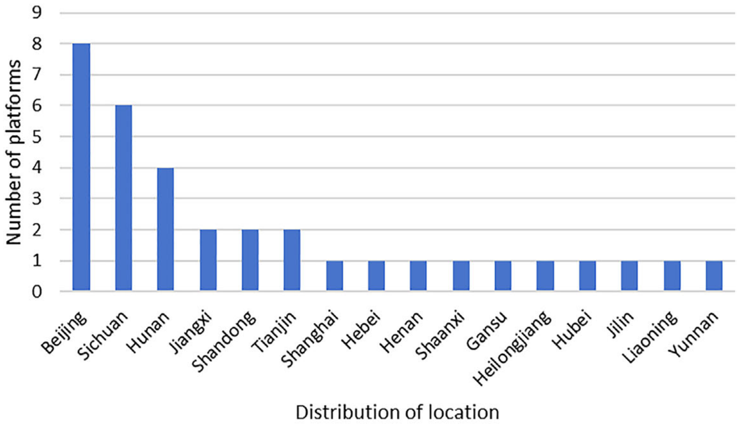
Figure 1. Distribution of types of the national science and technology innovation platform



Source(s): Authors' own work

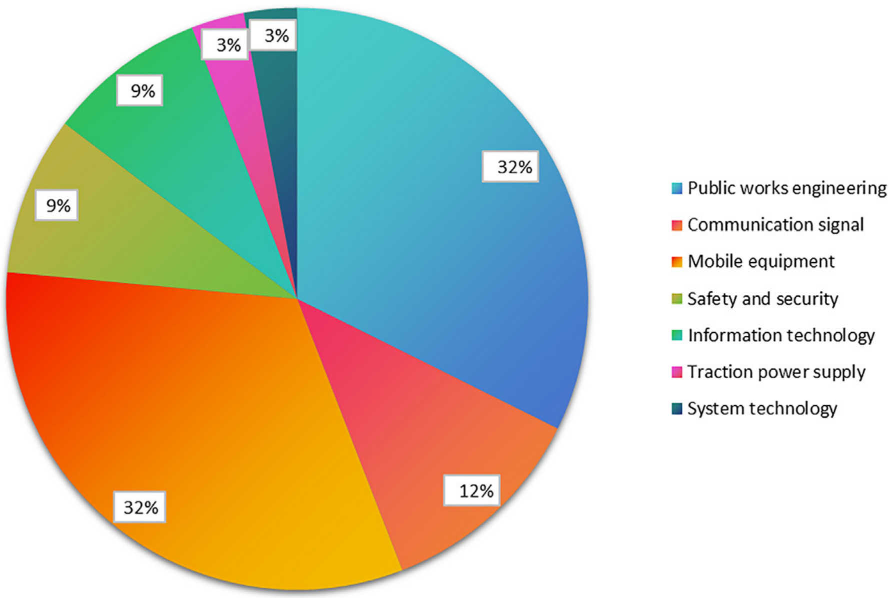
Figure 2. Distribution of leading institutes of the national science and technology innovation platform

three major areas: railway engineering construction, equipment manufacturing and operation services. In particular, these platforms have facilitated the successful development the Fuxing Chinese standard EMU with a speed of 350 km/h with completely independent intellectual property rights, setting a new benchmark for high-speed railway construction and operation worldwide. Subsequently, based on Fuxing EMU, a product pedigree platform for high-speed EMU was established, meeting the needs of different speed grades, operation environments and marshalling configurations, and realizing the "autonomy" and "standardization" of technical products. The following is an example from the National Engineering Research Center for High-speed Railway and Urban Rail Transit System Technology.



Source(s): Authors' own work

Figure 3. Distribution of location of the national science and technology innovation platform



Source(s): Authors' own work

Figure 4. Distribution of professional fields of the national science and technology innovation platform

In 2021, building upon the former three national engineering laboratories, namely, the National Engineering Laboratory for High-speed Railway System Test, the National Engineering Laboratory for Rail Transit System Test and the National Engineering Laboratory for Urban Rail Transit System Security Technology, relevant superior innovation resources were optimized, reorganized and consolidated into the National Engineering Research Center for High-speed Railway and Urban Rail Transit System Technology. The Center has 39 specialized laboratories covering railway rolling stock, public works engineering, communication and signal, transportation organization, passenger transport service, material chemistry, energy conservation and environmental protection, informationization, security and other professional areas. It is a national scientific and technological innovation platform with comprehensive specialties, advanced facilities and powerful functions in rail transit system. The Center mainly carries out research on key core technologies of high-speed railway and urban rail transit, develops research and development of test and detection technologies, conducts basic theoretical research and cutting-edge technology innovation, and undertakes major equipment research and system integration innovation. It provides high-quality technical consultation and services to the rail transit industry, promotes the transformation and application of scientific research achievements, as well as the upgrading of industrial base and the modernization of industrial chain.

The National Engineering Research Center for High-speed Railway and Urban Rail Transit System Technology has the largest circular railway test base in Asia, with a line length of 61.1 km, including a comprehensive railway test line, an urban rail test line, a heavy-duty railway test line and a calibration test line. It has the capability to carry out tests related 200 km/h speed grade railway, 140 km/h speed grade urban rail transit and heavy-duty railway with a maximum axle load of 40 tons. Additionally, it houses a batch of world-class large-scale test equipment, such as 1:1 braking power test bench with the highest test speed of 500 km/h (Figure 5), AC drive test bench for high-speed EMU (Figure 6), high-speed wheel–rail relationship test bench (Figure 7), high-speed pantograph-catenary relationship test bench (Figure 8), AC drive test bench, among others. It also has more than 10 high-speed comprehensive test trains with speeds of 250 km/h and 350 km/h, and possesses the ability to conduct real-train line operation tests at speeds of 350 km/h and above. Overall, its system testing and evaluation technologies have reached international leading standards.

Over the past three years, the Center has made significant research and development progress in core technologies, key system components, infrastructure equipment, information systems and comprehensive experiments around high-speed railway and urban rail transit systems, mainly as follows:

In the realm of applied basic theoretical research, the Center has a 1:1 full-scale wheel–rail interaction test rig with a maximum test speed of 500 km/h. It has developed an adhesion test method of high-speed wheel–rail relationship based on the full-scale high-speed wheel–rail interaction test rig and has mapped out the adhesion coefficient distribution within the speed range of 440 km/h and below, providing an important theoretical foundation for optimizing the design of high-speed EMUs.

Source(s): Authors' own work

Figure 5. 1:1 Brake power test bench

Source(s): Authors' own work

Figure 6. AC drive test bench for high speed EMU

Source(s): Authors' own work

Figure 7. High-speed wheel–rail relationship test bed

Source(s): Authors' own work

Figure 8. High-speed pantograph-catenary relationship test bench

In terms of overcoming the key core technologies of the industry, the National Engineering Research Center for High-Speed Railway and Urban Rail Transit System Technology completed the development of the core control board of the EMU and the research on the full autonomy of the core electronic system of the CRH3 EMU. Independent establishment of R&D platform, test platform, manufacturing platform and maintenance platform for eddy current braking system and carbon ceramic brake disc, and forming of the whole process system document of design, production, inspection and operation and maintenance fill the technical gap of eddy current braking system for high-speed EMUs in China. Relevant research results have been applied to high-speed comprehensive inspection test trains, and a series of main line scientific research tests have been completed in Jinan–Zhengzhou High-Speed Railway and Zhengzhou–Wanzhou High-Speed Railway. Many key technologies, such as intelligent communication platform for rail transit facing full-automatic operation, have been overcome, and the achievements have reached the international leading level after expert appraisal. They have been applied in Beijing Daxing Airport Line, Yanfang Line and other rail transit demonstration lines, effectively improving the reliability and intelligence level of communication system under the full-automatic operation scenario of rail transit in China.

In terms of supporting national strategic tasks and the implementation of key projects, the National Engineering Research Center for High-Speed Railway and Urban Rail Transit System Technology completed the compilation of technical requirements for 13 subsystems of the CR450 EMU, effectively promoting the CR450 scientific and technological innovation project. Focusing on the four major fields of intelligent construction, intelligent equipment and intelligent operation basic platform, products such as modeling software based on domestic BIM engine and intelligent train operation compilation system were developed, and experimental verification and trial were carried out to form an intelligent HSR 2.0 scientific and technological research plan for the upgrade of China's intelligent high-speed railway. Focusing on the key special application demonstration of "Science and Technology Winter Olympics", the research center developed 12,306 multilingual APP, Chinese and English ticket vending machines, and completed service robots, intelligent inquiry machines, as well as card brushing/code brushing/ticket checking/ride/face brushing contactless outbound applications. The center also developed the passenger service and production control platform, safe big data platform, and provided high-definition broadcasting of 5G events and mobile phone smart watching on high-speed trains. The development project of world's leading high-speed comprehensive inspection test train achieved a series of innovative achievements, and made innovations and breakthroughs in the research and development of many new products and technologies. On June 28, 2023, the Meizhou Bay Cross-Sea Bridge of Fuzhou-Xiamen High-Speed Railway achieved a single top speed of 453 km/h and a relative intersection top speed of 891 km/h (Chinese government network, https://www.gov.cn/yaowen/liebiao/202307/content_6889530.htm). On June 29, it operated at a single top speed of 420 km/h and a relative intersection top speed of 840 km/h in Haiwei Tunnel, creating a new record of test speed.

In terms of promoting the application of technological achievements and driving industrial development, the development of comprehensive inspection train led by the center for Jakarta-Bandung High-Speed Railway has been successfully delivered, contributing to the construction of "the Belt and Road Initiative" and further promoting the international application of China's rail transit inspection technology and equipment. The National Engineering Research Center for High-Speed Railway and Urban Rail Transit System Technology independently developed the world's leading high-speed comprehensive inspection train, GTC-80IX rail flaw detection vehicle and other equipment, and developed platforms such as operation status and emergency support system, rail transit cloud security and data security exchange system, and full-time panoramic smart station management system. All achievements have been expanded and applied in railway bureaus. From 2021 to 2022, the center presided over and participated in the formulation and publication of 23 international, national and industrial standards, such as "Railway Applications-Traction Electric Drive System-Part 2: Locomotives and Multiple Unit", and declared 543 invention patents such as "Railway Train Operation Scheduling and Train Operation Control Integrated Method, System and Application", of which 254 invention patents have been authorized and obtained "Intelligent Service System of Rail Transit Station V1.0".

The National Engineering Research Center for High-Speed Railway and Urban Rail Transit System Technology owns the CNAS Inspection Agency Accreditation Certificate, CNAS Laboratory Accreditation Certificate and National CMA Qualification Certificate. Since obtaining the certificate for the first time in 2010, it has successfully passed the re-evaluation in 2013, 2016, 2018, 2020, 2022 and 2024, respectively, as well as several item expansion and evaluation change during the period. The system runs well and has been continuously improved. At present, the National Engineering Research Center has 40 inspection capabilities and 51 testing capabilities, and embraces the ability to carry out high-speed railway system tests, integrated commissioning and tests, operation tests, professional tests and comprehensive tests. In recent years, relying on the inspection and testing capabilities recognized by CNAS, the integrated commissioning and tests of all newly built high-speed railways and passenger dedicated lines such as Beijing–Tianjin Intercity Railway (Figure 9) and Beijing–Shanghai High Speed Railway have been completed, with a cumulative mileage exceeding 46,000 kilometers. The center undertakes the daily inspection work of all railway lines in China, with an average annual inspection mileage exceeding 2 million kilometers. The integrated commissioning and test tasks of Mombasa–Nairobi Standard Gauge Railway in Kenya, Orange Line of Lahore Rail Transit in Pakistan and China–Laos Railway were successively completed, and the integrated commissioning and test project of Jakarta–Bandung High-Speed Railway was completed in 2023 (Figure 10), which played an important supporting and bridge role in ensuring the construction quality and smooth opening and operation of high-speed railway projects.

Source(s): Authors' own work

Figure 9. Integrated test and commissioning of Beijing–Tianjin intercity railway

Source(s): Authors' own work

Figure 10. Dynamic test of Jakarta–Bandung high-speed railway

4. Prospect

On the whole, the construction of national science and technology innovation platforms in the railway industry has achieved remarkable achievements, the investment in science and technology has shown continuous growth, the scientific and technological achievements have realized annual increase, the combination of production, education and research has been deepened, and the construction of the national science and technology innovation system and collaborative innovation mechanism of the railway has been increasingly optimized, making important contributions to promoting the progress of modern science and technology innovation and the development of high-tech industries. Facing the new situation and new tasks, there are still many challenges in the construction of railway national science and technology innovation platform and the development needs of science and technology innovation. It is also necessary to strengthen the top-level design and overall optimization, systematic layout and systematized construction, especially in the emerging, cross and major scientific and technological fields of railways, and give full play to the supporting capacity of national science and technology innovation platform around key core technologies. In addition, the management system and operation mechanism of the national science and technology innovation platform should further adapt to the new situation and new requirements of innovation-driven development, strengthen the overall coordination mechanism of platforms, projects, talents and investment, and strive to further promote the high-quality development of railways by building a railway science and technology innovation platform system that meets the needs of building a strong country in science and technology, and transportation.

The key to Chinese path to modernization lies in scientific and technological modernization. As an important part of the scientific and technological innovation system of railway modernization, the national scientific and technological innovation platform will fully stimulate the potential vitality of scientific and technological innovation, continuously improve the ability of railway science and technology self-reliance and self-strengthening, strive to promote the high-quality development of railways, and provide strong scientific and technological platform support for taking the lead in realizing railway modernization.

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