



# Research on Thoughts and Countermeasures of Deepening Structural Scientific and Technological Reform in Henan Province

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**Abstract.** To put the guiding principles of the 20th National Congress of the Communist Party of China fully into effect as well as implement the strategies featuring innovation-driven development, invigorating the province through science and education, and vitalizing the province with outstanding talents, it is urgent to further deepen structural scientific and technological reform, thereby promoting greater exploration and practice. Against this backdrop, this research investigates the structural scientific and technological reform in Henan Province from diverse aspects encompassing innovation platform, innovation subject, breakthrough of key core technologies, innovative talents, transformation of achievements, innovation layout, and innovation environment by analyzing the primary achievements, experiences, and defects exposed in the deepening of structural scientific and technological reform in Henan Province, with a view to furnishing a solid support for building a national innovative highland and an important talent center.

**Keywords:** Henan Province; Scientific and Technological Innovation; Structural Scientific and Technological Reform; Countermeasures.

## 1 Introduction

By utilizing market-oriented means to gather innovative elements, Henan Province leads the in-depth development of scientific and technological innovation with institutional mechanism innovation and key link reform [1-2]. Particularly, revolving around a plurality of aspects, such as the reconstruction and revitalization of the Henan Academy of Sciences, the reconstruction and remodeling of the provincial laboratory system, the full coverage of research and development (R&D) activities of industrial enterprises above designated size, and the reform of the organization and mechanism of scientific research projects, Henan Province has launched a host of vigorous reform measures. Through the continuous reform in recent years, the main systems and poli-

cies concerning the structural scientific and technological reform in Henan Province have been basically established [3-4], with various reform measures being refined and implemented. Moreover, the whole chain of science and technology management, which covers the allocation and utilization of resources, the evaluation and encouragement of talents [5], and the creation of innovative ecology, has ushered in brand-new institutional norms. Not only has the ability of scientific and technological innovation to support high-quality economic and social development been significantly enhanced but the overall level of scientific and technological development in the province has been continuously stimulated to steadily enhance the innovation vitality of the whole society. Simply put, along with the accelerated optimization of innovation ecology, Henan Province has created a novel development pattern of driving innovation through reform and promoting development through innovation [6].

## **2 Major Achievements and Experiences of Deepening Structural Scientific and Technological Reform in Henan Province**

### **2.1 Strengthening System Planning and Top-level Design for Scientific and Technological Innovation as Well as Institutional Innovation**

For one thing, Henan Province has improved the leading system of scientific and technological innovation. In concrete terms, adhering to the Communist Party of China (CPC)'s overall leadership over scientific and technological work, the Henan Provincial Party Committee held a high-standard conference on educational scientific and technological innovation and talent work, as well as a conference on comprehensive reform of innovation and development within the province, thereby fully deploying the scientific and technological innovation and development within the province. Moreover, 18 cities under the jurisdiction of Henan Province have successively set up science and technology innovation committees, which are responsible for coordinating and promoting the scientific and technological innovation endeavors of the whole city. For another, Henan Province formulates effective combined strategies covering policies, regulations, planning, and reform. In this regard, Henan Province has not only promulgated the Regulations on Innovation-driven High-quality Development in Henan Province and the Regulations on Development Promotion of Henan Academy of Sciences but also compiled the Ecological Construction Plan for Scientific and Technological Innovation and First-class Innovation in Henan Province during the Fourteenth Five Year Plan. Simultaneously, Henan Province formulates the Opinions on Accelerating the Construction of First-class Innovation Ecology and Building a National Innovation Highland, and the Implementation Plan of the Strategies Featuring Innovation-driven Development, Invigorating the Province through Science and Education and Vitalizing Province with Outstanding Talents, through which the major decisions of the Henan Provincial Party Committee and the provincial government have been elaborately drawn into corresponding road maps and construction draw-

ings. These efforts offer a solid institutional guarantee for the long-term development of scientific and technological innovation in Henan Province.

## **2.2 Proactively Integrating into the National Strategic Scientific and Technological Forces and Cultivating Henan Echelon**

At first, Henan Province implements the reconstruction and revitalization of the Henan Academy of Sciences. To this end, Henan Province promulgates the Regulations on Promoting the Development of the Henan Academy of Sciences, which marks the initial domestic support for the development of the Henan Academy of Sciences in the form of legislation. Furthermore, the Henan Provincial Party Committee and the provincial government issued a series of policy documents, such as Several Policies and Measures to Support the Reconstruction and Revitalization of Henan Academy of Sciences and Guiding Opinions on the Three-in-one Integration Development of Henan Academy of Sciences, Zhongyuan Science and Technology City as Well as National Technology Transfer Zhengzhou Center. Moreover, Henan Province formulates the Constitution of the Henan Academy of Sciences. Secondly, Henan Province plans and builds various innovative infrastructures. More precisely, Henan Province promulgates the Measures for the Administration of Major Scientific and Technological Infrastructures in Henan Province, with the National Supercomputing Center in Zhengzhou, the Zhongyuan Artificial Intelligence Computing Center, and the National Biological Breeding Center being completed and put into use. Meanwhile, Henan Province formulated Henan Laboratory System Construction Scheme and Henan Laboratory Construction Management Measures based on extensive investigations. As of now, Henan has planned and built a total of 26 provincial laboratories.

## **2.3 Strengthening the Position of Enterprises as the Scientific and Technological Innovation Subject and Accelerating the Transformation of Scientific and Technological Achievements**

On the one hand, Henan Province promotes the effective implementation of the “ten thousand people prospering ten thousand enterprises” campaign as well as the full coverage of R&D activities of industrial enterprises above the designated size. Under this impetus, the coverage rate of “four-haves” enterprises is as high as 70.88%, whereas the total number of innovative leading enterprises and “gazelle” enterprises reaches 454, with the total number of high-tech enterprises reaching 12,000. Particularly, a total of five companies, encompassing Hualan Biological Vaccine Inc., Zhengzhou WeiLong Food Co., Ltd., MIXUE Group, xFusion Digital Technologies Co., Ltd., and Ziel Home Furnishing Technology Co., Ltd., were included in the Hurun Global Unicorn List. Henan Province, on the other hand, proactively promotes the deep integration of technology and finance. Specifically, Henan Province deepens the reform of local policy-based science and technology innovation finance, exploring and launching a medium-and long-term loan product entitled R&D Loan for technology enterprises. Moreover, Henan Province steadily improves the efficiency and scale

of “scientific and technological loans” to strongly support the listing of enterprises on the Chinese Growth Enterprise Market and the China Beijing Equity Exchange.

#### **2.4 Promoting the Reform of Scientific and Technological Evaluation and Stimulating the Innovation Vitality of Talents**

Firstly, Henan Province deepens the reform of scientific and technological evaluation. Specifically, apart from establishing a classified evaluation system for scientific and technological projects to strengthen the performance evaluation of project acceptance, Henan Province establishes a performance evaluation system oriented to project innovation quality and contribution. In the meantime, Henan Province strengthens the dominant position of talent evaluation of employers and fully implements the autonomy of employers whilst improving the “green” channel for the positional titles appraisal and employment of personnel who are urgently needed and in short supply as well as high-level talents. Secondly, Henan Province vigorously cultivates and introduces innovative talents. In this connection, Henan Province issues the Implementation Plan on Accelerating the Construction of National Important Talent Centers, covering the “1+20” package of talent introduction policies and measures in all aspects of talent introduction. In addition, Henan Province proactively implements the “eight initiatives” advocated by the strategy of vitalizing the province with outstanding talents. Moreover, Henan Province actively cultivates local talents. For instance, Xu Weigang, a wheat breeding expert from the Henan Academy of Agricultural Sciences, was elected as an academician of the Chinese Academy of Engineering.

### **3 Defects Exposed by Henan Scientific and Technological System**

Despite the steady progress of scientific and technological system reform in Henan Province, the in-depth development trend of scientific and technological innovation, and the acceleration of industrial structure optimization and upgrading, the deep-seated systems and mechanisms that affect innovation still need to be further improved. On the same note, an innovative ecological environment still needs to be optimized. In comparison with the requirements of high-quality development, scientific and technological innovation is still a prominent shortcoming that restricts the accelerated development of Henan Province. In other terms, there is still a significant gap between Henan Province and advanced provinces in terms of scientific and technological innovation. Specifically, first of all, Henan Province presents insufficient investment in innovation. In 2022, the R&D investment of the whole society in Henan Province was RMB 104.33 billion, ranking 11th within the country, while the R&D investment intensity accounted for 1.96%, ranking 17th within the country. In 2023, the financial expenditure on scientific and technological innovation in Henan Province reached RMB 46.38 billion, accounting for only 3.86% of the general public budget expenditure, far below the level of advanced provinces and cities. Secondly, enterprises in Henan Province showcase sub-optimal innovation capabilities. Not only

is the number of innovative enterprises insufficient, but the total number of high-tech enterprises ranks only 16th in China and 4th within six provinces of central China. Among them, only 22 high-tech enterprises exceed RMB 10 billion in revenue. Furthermore, Henan Province exhibits limited leading science-and-technology enterprises. Only two enterprises in Henan Province are listed in the top 100 enterprises in terms of national R&D investment. Moreover, Henan Province possesses five national pilot innovative industrial clusters, accounting for only 3.3% of the country. Thirdly, Henan Province displays relatively few high-quality innovation platforms and carriers. In addition to the lack of high-energy-level innovation platforms, Henan Province fails to establish various national innovation platforms such as national laboratories, national technology innovation centers, and national clinical medical research centers. Furthermore, among the 38 large-scale scientific facilities that have been laid out in China, none has been deployed in Henan Province. Moreover, the number of national key laboratories in Henan Province only accounts for 3% of the whole country. Fourthly, Henan Province lacks high-level innovative leading talents. Henan Province has 28 academicians of the Chinese Academy of Sciences and Chinese Academy of Engineering as well as 28 nationally distinguished young scholars, accounting for 1% and 0.3% of the national total respectively. Meanwhile, the number of R&D personnel per 10,000 employees is only 45.54, accounting for only 59.8% of the national average. Lastly, Henan Province showcases a limited level of transformation of scientific and technological achievements. At this point, close ties have not been established among universities, research institutes, and enterprises within Henan Province. Not only is the open collaborative innovation system imperfect, but the joint research of key core technologies fails to be effectively implemented. Moreover, major universities and research institutes in Henan Province attach importance to the output of papers and monographs, which is seriously out of touch with the practical application and production process of enterprises.

## **4 Countermeasures for Deepening Structural Scientific and Technological Reform in Henan Province**

### **4.1 Striving to Build High-end Innovation Platform**

Firstly, while improving the top-level design of the provincial laboratory system, Henan Province should initially form a provincial laboratory system with national key laboratories and provincial laboratories as the core and provincial key laboratories as the support in major innovation fields. Secondly, Henan Province should work to ensure the construction and operation of provincial laboratories, promoting them to make effective development plans. Meanwhile, Henan Province should increase the introduction of innovation achievements initiated by Zhengzhou Research Institute, a first-class university and scientific research institution, thereby creating a high-level scientific and technological research and development center, an efficient achievement transformation platform, and an open space for innovation and entrepreneurship.

#### **4.2 Strengthening the Position of Enterprises as the Scientific and Technological Innovation Subject**

To begin with, Henan Province should guide and encourage innovative leading enterprises to take the lead in tackling key core technologies, thereby enhancing their core competitiveness. Secondly, Henan Province should take the rapid growth period of gazelle enterprises as an important development window to introduce financial resources such as the listing of credit funds, intending to help the development and growth of such enterprises. Simultaneously, Henan Province should continue to expand the scale of high-tech enterprises and the cultivation pool of high-tech enterprises. Furthermore, Henan Province should consistently implement the full coverage of R&D activities of industrial enterprises above the designated size, build an innovative platform for large, medium, and small enterprises, and promote the cooperation and docking of upstream and downstream enterprises within the industrial chain.

#### **4.3 Vigorously Implementing the High-level Talent Cultivation Actions**

Specifically, first of all, Henan Province should formulate a step-by-step training plan for academicians while organizing and effectively implementing the “Zhongyuan Talents Program”. In addition, Henan Province should improve the discovery, training, and incentive mechanism of young scientific and technological talents, thus increasing the support ratio of young talents in major projects. On the same note, Henan Province should explore and implement all kinds of young scientist projects, and expand the scale of youth projects in Henan Natural Science Foundation. At last, Henan Province should plan and implement the evaluation and reform pilot for scientific and technological talents, thereby building an evaluation system for scientific and technological talents oriented to innovative value, ability, and contribution [7].

#### **4.4 Enhancing the Level of Transformation and Industrialization of Scientific and Technological Achievements**

For one thing, Henan Province should strive to create a demonstration zone for the transfer of national scientific and technological achievements and lay out and build provincial demonstration zones. Concurrently, Henan Province should introduce and cultivate market-oriented and specialized technology transfer institutions, and explore a novel transformation model characterized by “the integration of colleges and universities, transformation companies, and science and technology innovation funds”. For another, Henan Province should build a number of leading pilot bases and industrial research institutes around key industries and industrial clusters to realize the organic connection of “basic research, technological breakthrough, technology application, and industrialization of achievements”, thereby contributing to the development of key industries and the cultivation of emerging industries [8].

#### 4.5 Striving to Create a First-class Innovation Environment

Firstly, Henan Province should strengthen the overall planning of major scientific and technological tasks and resource allocation around major goals, and improve the comprehensive linkage mechanism of planning, tasks, resources, and policies. Furthermore, Henan Province should not only strengthen the overall planning and implementation of the science and technology plan but also deepen the reform of the allocation and utilization mechanism of financial science and technology funds in an attempt to improve the efficiency of science and technology investment. These efforts contribute to the formation of a multi-sectoral work pattern characterized by “common summary of scientific and technological demands, common design of R&D tasks, and common organization of project implementation” [9]. Meanwhile, Henan Province should strengthen the construction of work practices and academic atmospheres, and build a comprehensive scientific research integrity system, thereby implementing more active scientific research integrity supervision measures. Last but not least, Henan Province should strengthen the construction of science popularization ability to build a large-scale science popularization pattern, thereby enhancing the scientific and cultural literacy of the entire people.

## 5 Conclusion

The reform of innovative science and technology system is a powerful guarantee to realize self-reliance in science and technology. Henan Province should further deepen the reform of science and technology system, strive to build a high-end innovation platform, strengthen the main position of enterprise science and technology innovation, vigorously implement high-level talents to lead the action, improve the transformation and industrialization level of scientific and technological achievements, and make every effort to create a first-class innovation environment to promote the development of scientific and technological innovation in Henan Province.

## References

1. Wang Z. G. Achieving Greater Self-reliance and Strength in Science and Technology. *People's Daily*, 2022-12-23(009).
2. Liu X., Yang B., & Xiao N. New Characteristics and Trend of Regional Innovation Capacity in China [J]. *Bulletin of Chinese Academy of Sciences*, 2022, 36(1):54-63.
3. Zhang M. X. Comprehensively Deepen the Reform of the Scientific and Technological System to Achieve High-level Scientific and Technological Self-reliance and Self-improvement [J]. *Scientific Management Research*, 2023, 41(3):54-60.
4. Fang X., & Liu X. L. Review and Prospect of Chinese Structural Scientific and Technological Reform [J]. *QIUSHI*, 2004(5): 3. 2004-05-015.
5. Henan Province: Speeding up the Construction of a National Innovative Highland and an Important Talent Center. *Chinese Talents*, 2023-3-6(002).

6. Qiao D., & Sun Y. Henan Province: Promoting the Integration of Education Chain, Talent Chain, and Innovation Chain. *Science and Technology Daily*, 2nd edition, January 18, 2023.
7. Yang Y., Huang Y., & Liu Y, et al. Grey Clustering Analysis of Provincial Scientific and Technological Innovation Capability Mainland [J]. *The Journal of Grey System*, 2023, 35(2), 130-148.
8. Liang K., Wu P., & Zhang R., et al. Research on the Evaluation of Regional Scientific and Technological Innovation Capabilities Driven by Big Data [J]. 2024, 16: 1379.
9. Niu Q., & Li Z. The Reform of Local Science and Technology System in The New Era: Trends, Characteristics, and Prospects [J]. *Scientific Management Research*, 2022, 40(5): 9.

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