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**RESEARCH ON THE CULTIVATION OF INNOVATIVE SPIRIT UNDER  
THE BACKGROUND OF BUILDING AN INNOVATIVE COUNTRY**



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**Abstract.** At present, with the increasingly fierce international competition, the development of the country increasingly depends on the power of innovation, which comes from the cultivation of innovative spirit and innovative talents. The 19th meeting of the Communist Party of China stressed accelerating the construction of an innovative country. The purpose of this study is to help understand the current situation of the cultivation of China's innovative spirit, analyze the problems existing in the process of building an innovative country, and help speed up the implementation process of the innovative country strategy. Based on the construction of an innovative country and based on the innovative practice since the 18th National Congress of the Communist Party of China, this paper analyzes the achievements of China's current innovative practice and the problems existing in the cultivation of innovative spirit, and puts forward some suggestions on strengthening the cultivation of innovative spirit. Clearly recognizing the era value of innovative spirit and accelerating the cultivation of innovative spirit play an important role in improving the achievements of

innovation transformation, cultivating innovative talents, improving innovation performance, constantly upgrading innovation strength and enhancing national competitiveness.

**Keywords:** country of innovators; Innovative spirit; Culture

## **1.Introduction**

In the new era, innovation has become a key factor in national economic development and scientific and technological competition, which determines the comprehensive national strength of each country. At present, China's international status is significantly improving, moving from a large developing country to a modern power. Innovation is a powerful driving force to promote high-quality economic development and build a modern economic system. It has an extremely important position and value of the times to pay full attention to cultivating innovative spirit, improving innovation environment, realizing innovative development and building an innovative country quickly.

## **2.Basic content and time value of innovative spirit**

### 2.1 basic contents of innovative spirit

The word "innovation" originated from Latin, meaning renewal, creation and change; The theoretical concept of innovation was first put forward by American Austrian economist J.A. Schumpeter in economic development theory in 1912 <sup>[1]</sup>. Later, this concept developed to include value creation and practical behavior such as system innovation, business innovation, technological innovation and management innovation.

The research on the innovative spirit can be traced back to the problem-solving technique by the ancient Greek mathematician pappus. Peter Drucker believes that entrepreneurship is essentially a practical spirit based on rich knowledge <sup>[2]</sup>. The spirit of innovation is a comprehensive and inclusive concept with rich connotation. The encyclopedia Dictionary of the scientific outlook on

development defines the spirit of innovation as the scientific spirit and psychological characteristics of forming new knowledge, creating new activity methods and constructing new theories on the basis of practice and development. It is man's unique ability to understand and transform the world. Including innovation consciousness, innovation interest, innovation courage, innovation determination, and related innovative thinking activities. Specifically, it refers to the thinking ability to comprehensively use existing knowledge, information, skills and methods, put forward new methods and new ideas, and the will, confidence, courage and wisdom for invention, creation, reform and innovation <sup>[3]</sup>.

For the cultivation of innovative spirit, Lu Fei (2006) believes that to fundamentally change the people's views on innovation, it is also necessary to form an innovation system <sup>[4]</sup>. In 2011, the Department for business innovation & skills, BIS UK Department of Commerce, innovation and skills proposed in innovation and research strategy for growth: "the government should play its due role and cooperate with business, academia and society to provide the best environment for training the world's best inventors and the world's best inventions."<sup>[5]</sup> Huayu (2015) believes that the direct allocation of resources by the government should be reduced and the decision-making power of resource allocation should be handed over to the market. Establish and improve the system and mechanism to encourage innovation, introduce, digest, absorb and re innovate, and improve the market-oriented mechanism of scientific and technological innovation <sup>[6]</sup>.

## 2.2 innovative spirit and value of the times

In the new era of socialism with Chinese characteristics, Xi Jinping proposed to put innovation in the core position of China's overall development. <sup>[7]</sup> deeply recognized the importance and inevitability of cultivating the spirit of innovation, and paid attention to the cultivation and development of the spirit of innovation.

First of all, cultivating innovative spirit, adhering to independent innovation and collaborative innovation are the inevitable requirements of social and economic development and participating in international competition. Secondly, only by giving full play to and carrying forward the innovative spirit can we stimulate the innovative vitality of culture and form advanced culture and innovative achievements, so as to promote the progress of social science and technology and provide intellectual support for national development; In addition, the spirit of innovation helps to promote the innovative national strategy. Under the guidance of the spirit of innovation, we aim at cutting-edge science and technology, strengthen basic research, strengthen the construction of the national innovation system, deepen the reform of the science and technology system, cultivate a creative talent team, carry forward the spirit of innovation and culture, accelerate the construction of an innovative country, and firmly implement the innovation driven development strategy, It is of great and far-reaching significance. □

### **3. Analysis on the achievements of innovative practice and the cultivation of innovative spirit in contemporary China**

Since the 18th Congress of the Communist Party of China, China's investment in research and development has increased steadily, providing a good material foundation for innovators. In 2020, China's annual research and experimental development (R & D) expenditure was 2442.6 billion yuan, an increase of 10.3% over the previous year (Figure 1), and the ratio to GDP was 2.40%, including 150.4 billion yuan for basic research, an increase of 12.6% over the previous year, maintaining a rapid growth. Investment in innovation has increased significantly, and scientific and technological strength has increased significantly. The construction of scientific and technological innovation bases has been accelerated, the comprehensive national science center has been promoted as a whole, breakthroughs have been made in the construction of large-scale scientific

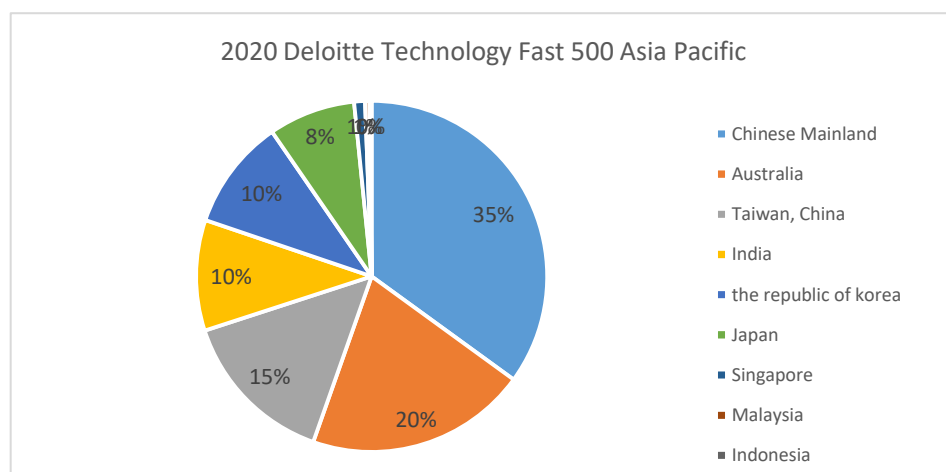
research infrastructure, and major scientific and technological achievements have been emerging.



Picture 1. **Research and experimental development (R & D) expenditure and growth rate from 2016 to 2020**  
(the chart is from the National Bureau of statistics of China)

3.1.1 the pattern of scientific and technological innovation has changed and the construction of innovation system has been steadily promoted

Innovation globalization and networking have changed the previous innovation models of countries and enterprises. Emerging economies and Asian countries have become new innovation pillars. The new global innovation pattern has brought new development opportunities to China. China has played an important role in changing the global innovation pattern. In 2021, DDT limited released the list of top 500 high tech growth companies in Asia Pacific in 2020. It shows that the top 500 Asia Pacific technology enterprises are distributed in 9 countries and regions in the Asia Pacific region. China ranks 175 in the top 175 companies in the Chinese mainland, while second in Australia and 102 in the top 102 enterprises in Taiwan.



Picture 2. **2020 Deloitte Technology Fast 500 Asia Pacific**

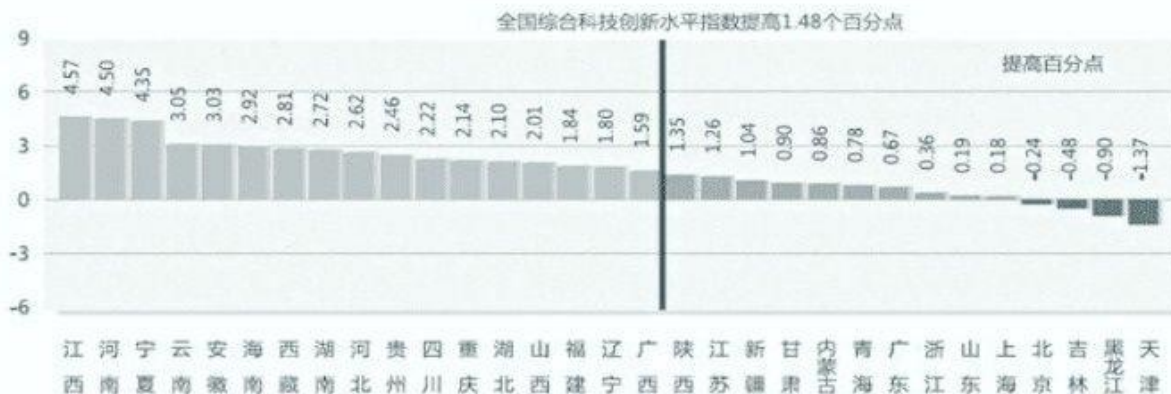
At the same time, the fierce international innovation competition also poses severe challenges to China's innovation environment and policy. Cultivating innovative spirit and improving the efficiency of innovation system is not only the need of China's economic transformation and development, but also a strategic choice to deal with the changes of world pattern and international competition.

Domestically, a distinctive pattern of regional scientific and technological innovation has been formed. According to the statistics of research and experimental development (R & D) funds in various regions of China in 2019 (Table 1), eastern coastal provinces such as Guangdong, Jiangsu, Zhejiang and Shandong and super large cities such as Beijing and Shanghai are still leading areas in innovation ability. Western regions such as Chongqing, Shaanxi, Sichuan and Guizhou are catching up rapidly and the pace of innovation is accelerating, The gap between the East and the west is narrowing. On the whole, a number of innovation agglomeration areas have been basically formed.

region	R&D expenditure (100 million yuan)	R&D Investment intensity ( % )	region	R&D expenditure (100 million yuan)	R&D Investment intensity ( % )
Nationwid	22143.6	2.23	He Nan	793.0	1.46
Bei Jing	2233.6	6.31	Hu Bei	957.9	2.09
Tian Jin	463.0	3.28	Hu Nan	787.2	1.98
He Bei	566.7	1.61	Guang Dong	3098.5	2.88
Shan Xi	191.2	1.12	Guang Xi	167.1	0.79
Nei	0.86		Hai Nan	29.9	0.56
Liao Ning	508.5	2.04	Chong Oing	469.6	1.99
Ji Lin	148.4	1.27	Si Chuan	871.0	1.87
Hei	1.08		Gui Zhou	144.7	0.86
Shan Hai	1524.6	4.00	Yun Nan	220.0	0.95
Jiang Su	2779.5	2.79	Xi Zang	4.3	0.26
Zhe Jiang	1669.8	2.68	Shan Xi	584.6	2.27
An Hui	754.0	2.03	Gan Su	110.2	1.26
Fu Jian	753.7	1.78	Oing Hai	20.6	0.69
Jiang Xi	384.3	1.55	Ning Xia	54.5	1.45
Shan Dong	1494.7	2.10	Xin Jiang	64.1	0.47

**Table 1. Research and experimental development funds in various regions in 2019 (source: Ministry of science and technology of China)**

According to China's regional scientific and technological innovation evaluation report 2020, the score of the national comprehensive scientific and technological innovation level index in that year was 72.19 points, an increase of 1.48 points over the previous year, and the overall regional scientific and technological innovation ability was improved (Figure 3).



Picture 3. **National comprehensive scientific and technological innovation level in 2020**  
 (the chart is from the National Bureau of statistics of China)

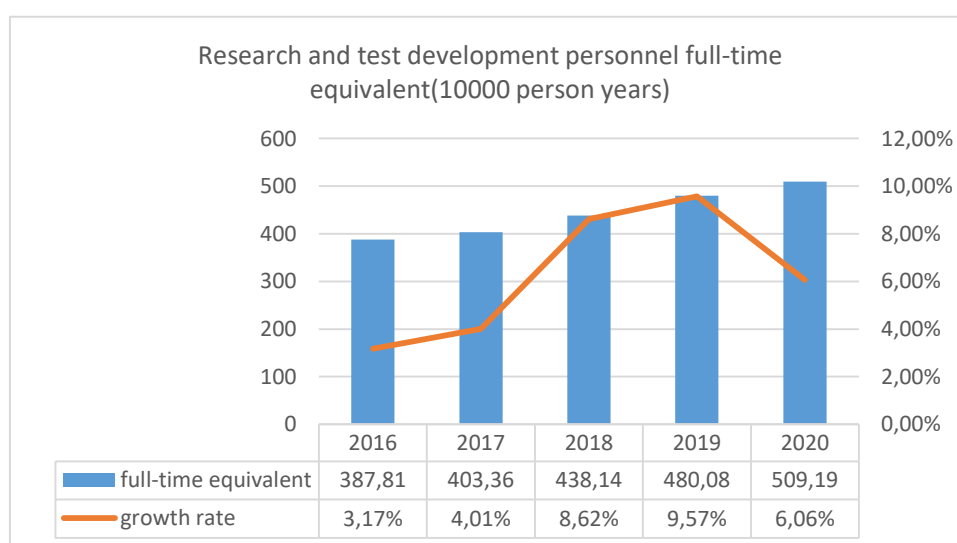
The leading role of science and technology innovation centers has become increasingly prominent. Beijing, Shanghai and Guangdong, as the three innovation centers with the highest innovation level in China, radiate and drive the further improvement of collaborative innovation capacity in Beijing Tianjin Hebei, Yangtze River Delta and Pearl River Delta; As one of the most dynamic, open and innovative regions in China's economy, the Yangtze River Delta drives the development of the Yangtze River economic belt and forms a regional cluster with high-quality development. With the release of the outline of the development plan for the Great Bay area of Guangdong, Hong Kong and Macao, Guangdong will join hands with Hong Kong and Macao to create an international scientific and technological innovation center with global influence and accelerate the construction of major scientific and technological infrastructure clusters; Jointly build a science and technology innovation corridor between Guangzhou, Shenzhen, Hong Kong and Macao, build multiple major innovation carriers with high standards, and form an innovation axis supporting the international science and technology innovation center. The scientific and technological strength of Anhui, Jiangxi, Henan, Ningxia and Guizhou in the central and western regions has been rapidly improved, and the effectiveness of regional collaborative innovation and development has been further demonstrated.



The regional pattern of China's innovation and development has undergone profound changes, the multi-level and distinctive regional innovation system has been improved, and a multi-level strategic layout of complementary advantages and high-quality development has been gradually formed, which strongly supports the construction of a national innovation oriented country.

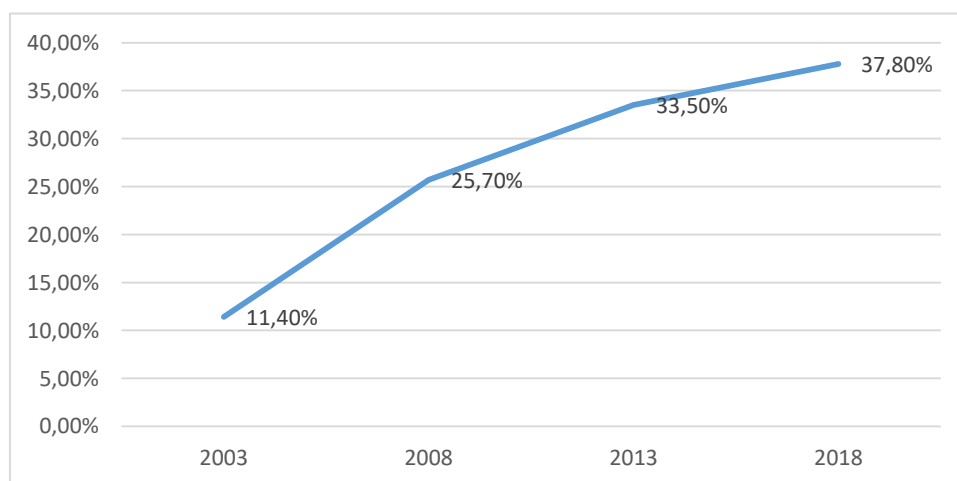
3.1.2 the innovative talent team continues to grow, the talent structure continues to be optimized, and the talent quality continues to improve.

With the implementation of the innovation driven development strategy, the state attaches great importance to the cultivation of scientific and technological innovation talents. Scientific and technological innovation talents have increased significantly and the team strength has been growing *According to the Research Report on the Development of Scientific and Technological Human Resources (2018)*(Figure 4), by the end of 2018, the total number of scientific and technological human resources in China had reached 101.545 million, and the scale continued to remain the first in the world. According to the data of the National Bureau of statistics, the full-time equivalent of R & D (Research and development) personnel increased from 3.8781 million person years in 2016 to 5.0919 million person years in 2020, an increase of 31.30%.



Picture 4. **2016-2020 Research and test development personnel full-time equivalent**

According to the fourth national survey report on the status of scientific and technological workers issued by China Association for science and technology in 2018, the average age of scientific and technological workers in China is 35.9 years old, which is lower than that in 2008 and 2013 (37.4 years old and 36.8 years old respectively); The proportion of graduate students and above increased from 25.7% in 2008 to 37.8% in 2017 (Figure 5). From 2013 to the survey period, the proportion of graduate students and above in Colleges and universities and scientific research institutes increased by 2.7% and 9.5% respectively, reaching 83.9% and 57.1% (among which the proportion of doctoral degree recipients was 50.2% and 18.1% respectively), and the characteristic of highly educated is particularly obvious. The national scientific and technological talents are gradually becoming younger, more intelligent and richer, which is not only the embodiment of educational level and educational fairness, but also the embodiment of the gradual optimization of the structure of scientific and technological talents and the gradual improvement of talent quality.



Picture 5. **Growth trend of graduate degree or above from 2003 to 2018**

3.1.3 the innovation speed is rising and the innovation achievements are remarkable

With the strong support of the national innovation strategy and policies, the innovation speed is rising. In 2018, the number of national high-tech enterprises

reached 181000, more than 6500 maker space services and 400000 entrepreneurial teams, driving more than 1.4 million people to participate in the practice of innovation and entrepreneurship. At the same time, the network coverage area and speed are increasing,

With the rapid popularization of intelligent devices, the advent of 5g era, the rapid development of AI technology, and the scene of "unmanned economy" is becoming more and more abundant. Under the guidance of Xi Jinping's new socialist ideology with Chinese characteristics, China's innovative scientific and technological achievements have achieved blowout growth. In 2020, the number of patent applications and authorizations increased steadily, while the number of valid patents increased by 25.4% (Table 2).

指标	专利数 (万件)	比上年增长 (%)
专利授权数	363.9	40.4
其中: 境内专利授权	350.4	42.6
其中: 发明专利授权	53.0	17.1
其中: 境内发明专利	43.4	22.5
年末有效专利数	1219.3	25.4
其中: 境内有效专利	1111.5	27.9
其中: 有效发明专利	305.8	14.5
其中: 境内有效发明专利	221.3	18.8

**Table 2. Patent authorization and valid patents in 2020  
 (the chart is from the National Bureau of statistics of China)**

35 space launches were successfully completed throughout the year. Chang'e-5 was successfully launched and completed lunar surface sampling and return for the first time. The first Mars exploration mission, tianwen-1, was successfully launched. The 500 meter spherical radio telescope (fast) was officially opened for operation. The beidou-3 global satellite navigation system was officially opened. The quantum computing prototype system "Chapter 9" has been successfully developed. The all sea deep manned submersible "striver" completed a 10000 meter deep dive.

On the whole, China has achieved its strategic goal of occupying a place in major scientific and technological fields and directions, laying a solid foundation for expanding the influence of national innovation.

### 3.2 unfavorable factors affecting the cultivation of innovative spirit

3.2.1 the introduction, training, incentive mechanism and management system of innovative talents are not perfect

The level and quality of national scientific and technological human resources are not high, and there is a shortage of high-tech talents who can grasp the world's scientific frontier and make major scientific and technological innovation achievements; The regional distribution of innovative human resources training and flow is unbalanced; The mechanism of attracting innovative talents is not perfect, the accuracy and coordination of talent introduction policies are not enough, and there is a situation that it can not be retained; The talent evaluation and use mechanism does not meet the needs of cultivating innovative talents. For example, the current talent evaluation does not pay enough attention to the actual performance and economic and social benefits, and pays too much attention to the number of paper achievements; The deep-seated system and mechanism problems such as scientific research fund management system and budget structure can not fully stimulate the enthusiasm and creativity of scientific researchers.

3.2.2 insufficient intellectual property protection and low transformation rate of innovative scientific and technological achievements

The lack of awareness and ability of intellectual property protection, the difficulty of intellectual property litigation, the high cost of safeguarding rights and the low cost of infringement seriously limit the commercial application and knowledge diffusion of scientific and technological innovation achievements; The insufficient collaborative innovation of knowledge and technology and the imperfect professional service system for the transformation of scientific and

technological achievements lead to the low market transformation rate of scientific and technological achievements.

3.2.3 the original innovation ability is insufficient, and the innovation ecology needs to be improved

The innovation capability of key core technology fields in many industries is obviously short, and the original innovation capability needs to be improved; The R & D activities of enterprises are not common, the average intensity of R & D expenditure is relatively low, and the innovation ability of most companies is weak; At present, the investment in science and technology depends too much on government funds, enterprises lack the ability of independent innovation, and the power to expand and strengthen enterprises and realize sustainable development is insufficient. Enterprises have not yet become the main body of national independent innovation.

#### **4. Countermeasures and suggestions for cultivating innovative spirit**

##### 4.1 improve the cultivation system of innovative spirit

First of all, improve government functions, play a supporting role in legal norms, policy formulation and public opinion construction, and form a legal environment that pays attention to the construction of innovation capacity and ensures the rights and interests of innovation leaders. In practice, we should further increase investment in basic research, improve the system and mechanism to encourage and support basic research and original innovation, increase the proportion of financial support, respect the laws of scientific research, and build a system and mechanism conducive to innovation and creation.

Secondly, further improve the system and mechanism of scientific and technological innovation, make overall arrangements in the aspects of scientific research management system mechanism, government service mechanism, assessment mechanism, incentive mechanism, industry university research mechanism, scientific and technological innovation driving mechanism, scientific

research achievement transformation mechanism and financial support mechanism, accelerate the optimization of scientific and technological resource allocation and solve practical problems in innovation practice, Promote the construction of innovation system. In practice, we should implement the policy of encouraging scientific and technological personnel to innovate and start businesses; Improve the information mechanism of talent flow, further eliminate the institutional obstacles of talent flow, and expand the space for the free development of high-tech talents. Improve the intellectual property protection system and strengthen law enforcement; Promote the reform of scientific research fund management system; Introduce innovation indicators and establish a diversified and multi-dimensional evaluation and management system for innovative talents; Innovation promotes the transformation mechanism of scientific and technological achievements, removes institutional and institutional obstacles restricting the transformation of scientific and technological achievements, and allows enterprises and the market to play a leading role in technological innovation decision-making, R & D investment, scientific research organization implementation, achievement transformation evaluation and other links.

In addition, we should pay attention to the cultivation of innovative talents, closely combine scientific research practice, and establish an independent training system of high-quality talents.

4.2 strengthen the cultivation of social innovation culture and create a good innovation environment □

The key to environmental education and the cultivation of innovative spirit lies in constructing and advocating the value system of innovative culture. Grasp the value pursuit embodied in innovation activities, vigorously carry forward the spirit of the times with reform and innovation as the core in the whole society, enhance national self-confidence and pride, strive to create a social atmosphere of equality, freedom and the courage to climb the world's scientific and technological

peak, and create a good innovation environment for daring to innovate, being able to innovate and being able to innovate, which will help to promote the cultivation of innovation spirit;

Secondly, we should vigorously carry forward the spirit of science and craftsmanship, encourage innovation from the perspective of system design and public opinion guidance, cultivate innovation awareness, form a good atmosphere of respecting knowledge, respecting creation, daring to innovate, daring to question, rational criticism and tolerating failure, pay particular attention to the cultivation of young people's practical ability and scientific spirit, and form a good atmosphere of respecting science and loving science and technology, Lay a solid ideological foundation for the construction of an innovative country.

In addition, we should improve people's innovative cultural literacy, publicize and encourage people to study in many aspects, provide places and resources conducive to learning, build public libraries and cultural centers, provide good learning opportunities for people, and then think about and explore scientific issues. At the same time, pay attention to the atmosphere and infrastructure construction of universities and scientific research institutions, so that scholars in universities and scientific research institutions have convenient scientific research conditions to carry out their work.

#### 4.3 stimulate innovation vitality and create a good innovation ecology

To achieve innovation led economic development, we not only need hardware support such as infrastructure, but also need to form a practical carrier, institutional arrangement and environmental guarantee for innovation driven development, so as to create a good innovation ecology with collaborative interaction of various innovation subjects, smooth flow of innovation elements and efficient allocation of innovation resources. First of all, stimulate the endogenous vitality of the main body of enterprises, give full play to the main role of enterprises in innovation practice, the society supports, guides and encourages local enterprises to carry out

scientific and technological R & D and innovation in a variety of ways, reduce the innovation risk of local enterprises, establish the concept of improving efficiency and winning long-term development through innovation, and promote the cooperative development and research between local enterprises and multinational enterprises, Accelerate the innovation learning process of local enterprises, establish a technological innovation system with enterprises as the main body, market-oriented and deep integration of industry, University and research, support large and medium-sized enterprises and relevant subjects to integrate innovation, give full play to the role of large and medium-sized enterprises, scientific research institutes, financial institutions, application parties and demand parties, and form their own place, mutual coordination A mutually supportive good innovation ecosystem.

## **5.Conclusion**

Innovation is the soul of a nation's progress and the inexhaustible driving force for a country's prosperity. The cultivation of innovative spirit should start from the national system level, improve the cultivation system of innovative spirit, establish a well functioning innovation mechanism system, optimize the cultivation system of innovative talents, create a good innovation atmosphere in the whole society, make social resources flow, and jointly contribute to the cultivation of innovative spirit. Facing the future, to enhance the country's capacity for independent innovation and accelerate the pace of building an innovative country, we must vigorously carry forward the spirit of the times with reform and innovation as the core, release innovation vitality through reform, actively create a good atmosphere in the whole society to encourage bold innovation, dare to innovate and tolerate innovation, and launch a new engine driven by innovation at full speed, Provide an unprecedented strong driving force for the country's economic and social development. I hope that my own views can bring some



reference to the cultivation of innovative spirit and help to deepen the process of building an innovative country.

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