

Research on Transformation Methods of Scientific and Technological Achievements from the Perspective of Innovation Ecology

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Abstract

The transformation of scientific and technological achievements has ushered in new opportunities and shown new characteristics. On the basis of analyzing the characteristics of innovation ecosystem, this paper puts forward the main mechanism of innovation ecosystem enabling the transformation of scientific and technological achievements, constructs the innovation ecological model of the transformation of scientific and technological achievements, defines the innovation subject and innovation environment of the transformation of scientific and technological achievements, and puts forward three core mechanisms of innovation ecosystem supporting the transformation of scientific and technological achievements. By constructing the colleges and universities, enterprises, science and technology intermediary, new research and development institutions, and other areas of innovation alliance, combined with the industry needs in the field of strategy will contend for layout construction of a batch of new research and development institutions, creating innovative synthesis as the core of innovation and improve cluster innovation environment, make the transformation of scientific and technological achievements from accidental sporadic events qualitative to batch convert "rainforest effect".

Keywords

Innovation Ecosystem; Transformation of Scientific and Technological Achievements; Mechanism; Valley of Death.

1. Introduction

With the reform and opening up, China has realized the accumulation of industries and rapid economic growth by following the strategy. In 2020s, China's economic growth pattern has also changed from investment-driven to innovation-driven. In the investment-driven stage, although China's industries, especially the manufacturing industry, have sustained and rapid growth, the manufacturing industry is still at the middle and low end of the global value chain, and its core technology is controlled by others. This is particularly obvious under the background of SINO-US trade friction and the us cutting off chip supply to China. In the stage of innovation-driven development, China urgently needs to build an independent and controllable modern industrial system, that is, to transform from following imitation innovation to source innovation and leading innovation, the core of which is the industrialization of basic research results. In recent years, China's scientific research into the world's second place with scientific and technological innovation ability has larger ascension, with the support of financial funds in colleges and universities scientific research output a large number of scientific and technological achievements, including a group of high level scientific and technological achievements, but the transformation of scientific and technological achievements has been the bottleneck, of innovation driven embodied in can support large effect to the national industrial and economic results is less, There are few achievements that can lead the industrial

transformation and form the core competitiveness of the industry, and a large number of "bottleneck" technical problems have not been solved. Since entering the new century, at the same time, the innovation ecosystem as a new paradigm in the global rise of the United States, Europe, Japan and other major developed countries and regions all over the world to build innovation ecosystem rose to national strategy, in order to keep the lasting ability of technological innovation and industrial competitiveness, this had to cause our attention. Therefore, it is of great theoretical and practical significance to discuss the mechanism of transformation of scientific and technological achievements from the perspective of innovation ecology.

2. Literature Review

2.1. Transformation of Scientific and Technological Achievements

The transformation of scientific and technological achievements is a proper term for the management of science and technology in China. According to the Law of the People's Republic of China on promoting the Transformation of Scientific and technological Achievements promulgated in 1996, scientific and technological achievements refer to achievements of practical value generated through scientific research and technological development. Transformation of scientific and technological achievements refers to the activities of subsequent testing, development, application and popularization of scientific and technological achievements for the purpose of raising the level of productive forces until new technologies, new processes, new materials and new products are formed and new industries are developed. The scientific and technological achievements discussed in this paper refer to the scientific and technological achievements produced by non-enterprise departments represented by universities. Due to a variety of reasons, the most excellent intellectual resources in China are mainly concentrated in universities and research institutes, and the state also provides a large number of scientific research funds to universities and research institutes every year. Chinese enterprises' research and development capability is generally weak, and the purpose of enterprise research and development is to use, generally there is no problem with the transformation of scientific and technological achievements. Based on the research theme of this paper, this paper mainly focuses on the mode, path and restricting factors of the transformation of scientific and technological achievements.

Jinxi Wu (2015) reverses company as an example, it is considered that the innovation mechanism of transplant "zone" successfully at the university of talent, knowledge resources and enterprise technology innovation system of links, strongly promote the fast efficient conversion of complex technology and continuous innovation, think transplant "zone" mechanism to construct the innovative green channel of "industry-university-institute" cooperation, A sound innovation ecosystem has been formed. Qi Yong et al. (2015) studied the transformation modes of different types of scientific and technological achievements, holding that the transformation of proprietary technological achievements controlled by independent legal entities such as universities and scientific research institutions should give full play to the leading role of the market, and relying on scientific and technological intermediaries can better promote the transformation of scientific and technological achievements. Changhong Nie and Xiangting Wu (2017) constructed a conceptual model of equity incentive to promote the transformation of scientific and technological achievements and explained the necessity of equity incentive to promote the transformation of scientific and technological achievements. Zhang Shuman (2018) studied, such as scientific research institutes to accelerate the conversion of the transformation of scientific and technological achievements of the five key elements: the transformation of scientific and technological achievements each link internal integration, each link of the vertical coordination, to establish the link between cluster and

promote synergy between multiple subjects within the cluster, each step of the implementation of equity incentive, good innovative undertaking the external environment and so on. Jian Luo et al. (2019) believe that the new policy for the transformation of scientific and technological achievements has not fundamentally improved the status quo of the transformation of scientific and technological achievements in colleges and universities. The direct reason is that the policy coordination is not strong and it is difficult to implement, and the indirect reason is that the scientific research achievements are not well connected with the market, the incentive imbalance and the lack of pilot test links. Jianying Wen (2019) believes that the prerequisite for successful transformation of scientific and technological achievements is to guarantee the free flow of talents and knowledge, and to encourage and tolerate scientists with the spirit of knowledge commercialization. Guohua Tian and Sheng Zhang (2019) argued that large-scale transformation of scientific and technological achievements need government to guide enterprise to the transformation of scientific and technological achievements and pilot platform construction to provide the results of the prototype development risk investment, research and development institutions and to provide technical support to pilot platform and improve results, test platform based on the results of the prototype optimization technique and technical services, etc.

The current achievements of transformation of scientific and technological achievements in China faces and lack of market docking, insufficient pilot inputs, staff motivation, policy support is not enough and a series of problems, to do a good job of transformation of scientific and technological achievements work need to do a good job in three levels: the macro level, the government needs to build innovative entrepreneurial and good environment, and from a policy to ensure the flow of knowledge and talent; At the middle level, it is necessary to build a good cooperation network between government, industry, universities and research institutions, and form an open and close cooperation chain for the transformation of scientific and technological achievements with capital and equity as the link. At the micro level, factors input in the pilot test should be guaranteed, and good incentives should be given to innovation and entrepreneurship personnel.

2.2. New Situation and Characteristics of the Transformation of Scientific and Technological Achievements under the Background of Innovation-Driven Development

2.2.1. The Connotation and Significance of Innovation-driven Development

Since the beginning of the 21st century, a new round of scientific and technological revolution and industrial transformation has been in the making. Global competition in science and technology has become increasingly fierce. The development and application of technologies featuring the Internet, big data and artificial intelligence are accelerating the transformation of industrial and economic development modes. In this context, the 18th CPC National Congress proposed the implementation of innovation-driven development strategy, pointing out that China's future development should be driven by scientific and technological innovation. Since the implementation of the strategy, The level of scientific and technological innovation in China has been constantly improved, the scientific and technological system and mechanism have been constantly improved, and a large number of scientific and technological achievements have been rapidly transformed into real productive forces, which have played an important role in supporting China's economic development and the improvement of its overall national strength. However, we should also be deeply aware that China's scientific and technological innovation is still facing a grim situation, especially since the china-us trade frictions have exposed the major hidden dangers of China's weak basic research and the subordination of core industrial technologies to others. Therefore, in-depth implementation of innovation-driven development strategy is the only way for China's industrial and economic development. What

paradigm does innovation follow? Since economist Schumpeter put forward the concept of innovation, the innovation paradigm has developed from the linear theory of innovation through the theory of innovation system to the theory of innovation ecosystem (Li Wan et al., 2014). Currently, international competition has shifted from a single scientific and technological innovation competition to a competition between integrated innovation capabilities based on the national innovation ecosystem (Chen Jin and Ximing Yin, 2018). Therefore, the nature of China's innovation-driven development is directly reflected in the construction and optimization of the national innovation ecosystem.

2.2.2. Innovation Ecosystem

The concept of an innovation ecosystem was presented by the Council on Competitiveness in December 2004 in innovative America: To prosper in the challenge and change the world "report clearly put forward that refers to a certain region innovation institutions, such as universities, research institutes, enterprises and government, finance, law, innovative services and innovative environment, such as the mediation between the various elements of a unified whole, thus the basic research, technology, capital and market organically unifies in together (color, 2017). Scholars at home and abroad have carried out extensive research on the connotation and composition of innovation ecosystem. Estrin (2009) believes that a sustainable innovation ecosystem mainly includes the core layer composed of research, development and application communities and the influence layer composed of culture, policy and financing elements. Dynamic balance is the key to the sustainable development of the innovation ecosystem. Jinxi Wu (2014) believes that the innovation ecosystem consists of innovation platforms and complementary modules, which cooperate professionally with each other to form symbiotic and dependent relationships. Li Wan et al. (2014) believe that innovation ecosystem refers to an open and complex system of symbiosis, competition and dynamic evolution formed between various innovation communities and with the innovation environment within an interval through the connection and conduction of material flow, information flow and energy flow. Jin Chen and Ximing Yin (2018) constructed a new national innovation ecosystem based on holistic, systematic and global thinking, which includes basic research system, enterprise innovation system, industrial innovation system and regional innovation system. Fengming Wang and Meijuan Zhu (2019) argue that the comprehensive coordinated development of value co-creation in innovation ecosystem is influenced by coordination cost, distribution of excess returns, benefits of individual cooperation strategies, benefits of deception strategies and rewards and punishments.

Combined with the above definition of innovation ecosystem, and refer to some scholars' statements on the characteristics of innovation ecosystem (Lucheng Huang, 2003; Adner, 2006; Fu Li and Guoping Zeng, 2015), this paper argues that innovation ecosystem mainly has the following four characteristics: first, multi-agent symbiosis. Innovation ecosystem is a complex innovation network composed of the government, enterprises, universities, scientific research institutions, financial institutions, science and technology intermediaries and other innovation subjects, which achieve symbiotic innovation through professional cooperation. Second, open coordination. Innovation ecosystem is an open and efficient collaborative mechanism that achieves common value creation through open and close cooperation. The third is self-organizing evolution. The innovation ecosystem was initially driven by the government and has since evolved into a self-reinforcing dynamic. Each innovation subject interacts with the innovation environment, continuously promotes the maximization of innovation value, gives full play to the decisive role of market in resource allocation, and the government's scientific and technological innovation mechanism evolves and matures. Fourth, regional characteristics. Like the natural ecosystem, innovation ecosystem is also associated with a specific regional space, is the composition of innovation subject and innovation environment in a specific space, with strong regional characteristics. It is an important feature of innovation ecosystem to form

innovation cluster and industry cluster in a certain space to consolidate and enhance innovation capability and competitive advantage.

2.2.3. The Main Mechanism of Transformation of Enabling Scientific and Technological Achievements in Innovation Ecosystem

In a good operation of regional innovation ecosystem, the innovation of the self-reinforcing ecology makes science-based industry innovation to be implemented in a relatively short time, characterized by a large number of laboratory rapid transformation of scientific and technological achievements, exponential growth in technology, derived a large number of high-tech enterprises, And under the action of the market to accelerate the survival of the fittest, accelerate the formation of industrial clusters. Compared to most of the traditional mode of transformation of scientific and technological achievements of the characteristics of the planning and purpose, innovation ecosystem under the mode of transformation of scientific and technological achievements are more randomness and adaptability, as a result, the innovation ecosystem must have realized industrialization of scientific and technological achievements, but which is specific to scientific and technological achievements, we cannot predict in advance. Scientific and technological achievements are like a seed. In the process of growing into a towering tree, in addition to its own strong vitality, the ecological environment in which it is located is also crucial. Sunlight, air, water, soil and related species are indispensable. In a well-functioning innovation ecosystem, scientific and technological achievements can constantly grow into towering trees, just like saplings in the rainforest, thanks to various factors in the ecological environment. It is precisely because of the support of the innovation ecosystem that the transformation of scientific and technological achievements has changed from occasional sporadic events to the "rainforest effect" of batch transformation.

3. The Core Mechanism of Scientific and Technological Achievements Transformation based on Innovation Ecosystem

Based on the connotation definition and characteristic analysis of the transformation of scientific and technological achievements and innovation ecosystem, this paper constructs the innovation ecological model of the transformation of scientific and technological achievements, defines the innovation subject and innovation environment of the transformation of scientific and technological achievements, and puts forward three core mechanisms of the innovation ecosystem supporting the transformation of scientific and technological achievements.

3.1. An Innovation Ecosystem for the Transformation of Scientific and Technological Achievements

From the perspective of innovation ecology, innovation subjects of transformation of scientific and technological achievements include universities, enterprises, science and technology intermediaries, new research and development institutions, and financial institutions. Innovation environment includes policy environment, market environment, and cultural environment, as shown in Figure 1. The government is the founder and regulator of the innovation ecosystem and has an impact on the transformation of scientific and technological achievements at all levels. Universities carry out scientific research activities with the support of financial funds, and produce original scientific and technological achievements such as intellectual property rights and principle prototypes, which are the source of scientific and technological achievements transformation. New research and development institutions, academic circles have not formed unified the connotation of the new research and development institutions, but the understanding of the main function of undertake the transformation of scientific and technological achievements, a new type of research and development institutions referred to in this article, the orientation between traditional scientific research institutions

and enterprises, scientific and technological achievements in the research and development of new institutions for secondary development and pilot magnification, And by the new research and development institutions to incubate a large number of high-tech companies. Scientific and technological intermediary, providing professional services, promoting the industrialization of scientific and technological achievements or the cooperation between technology suppliers and suppliers, is the bridge between scientific and technological achievements and market. Enterprises guide universities and new R&D institutions to carry out research and development activities oriented to industrial application, and provide resource support for the transformation of achievements. After achievements pass the pilot test stage, enterprises will carry out follow-up industrialization and sales services. Financial institutions shall provide financial support for all links of transformation of scientific and technological achievements. Policy environment refers to a series of policies and systems that guarantee the transformation of scientific and technological achievements; market environment refers to an open, transparent and efficient business environment with good intellectual property protection; cultural environment refers to an atmosphere of innovation and entrepreneurship that encourages innovation and tolerates failure.

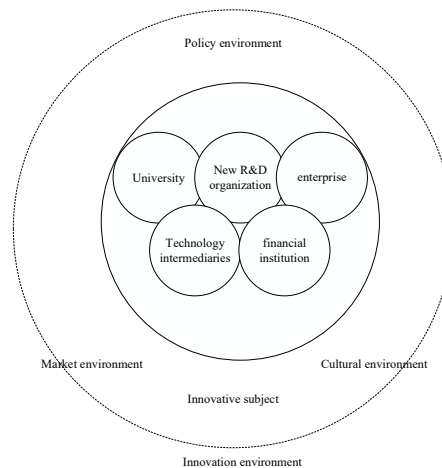


Fig 1. Innovation ecology of transformation of scientific and technological achievements

3.2. Three Core Mechanisms of Innovation Ecosystem Supporting the Transformation of Scientific and Technological Achievements

3.2.1. The Docking Mechanism between Scientific and Technological Achievements and Market

The connection between scientific and technological achievements and the market faces many difficulties. First, scientific research and market application are two completely different discourse systems, there are great differences. Scientific research is to explore the nature of objective things in a free and relaxed atmosphere, paying more attention to scientific value; Market application is the development of new products under the constraints of time and cost, in order to pursue economic benefits as the premise. Second, scientific and technological achievements are far from the market, and there is great uncertainty whether they can be industrialized. Intermediate institutions are required to carry out integrated innovation and pilot scale of scientific and technological achievements. Third, the industrialization of scientific and technological achievements is a long process, which requires all parties to establish a long-term cooperative relationship of trust and to be able to keep business secrets.

It is necessary for the government to lead the establishment of a regional innovation alliance network composed of universities, science and technology intermediaries, new research and development institutions, enterprises and other innovation subjects. Each innovation subject realizes symbiotic innovation by giving play to its unique advantages, as shown in Figure 2. In

the process of connecting scientific and technological achievements with the market, scientific and technological intermediary plays a bridge role, which is composed of technical brokers with technical background, market resources and experience in the transformation of scientific and technological achievements. We screen high-quality scientific and technological achievements for the development of forward-looking strategic industries and the needs of the transformation and upgrading of existing industries, inject market logic into the transformation of achievements, and provide professional services for the industrialization of scientific and technological achievements. Science and technology intermediary should also establish market-oriented personnel incentive mechanism to ensure the innovation vitality of technology broker team. In the face of a large number of scientific and technological achievements of innovation alliance technology and market demand, to carry out effective docking, also should be based on the Internet and big data and technical requirements of docking platform of scientific and technological achievements, on the platform gathering university research data and new research and development institutions and enterprises demand data, and establish the intelligent matching mechanism.

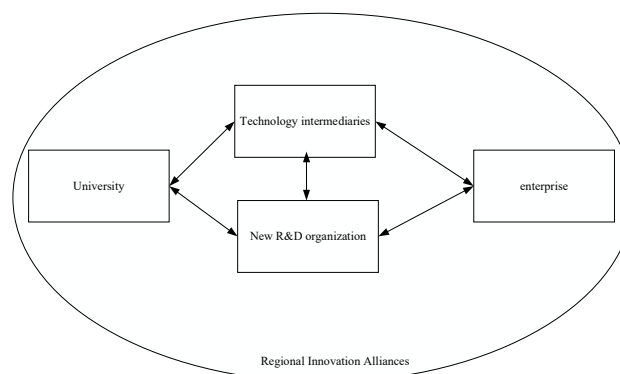


Fig 2. The docking mechanism between scientific and technological achievements and the market

At present, some provinces in China have initially established regional innovation alliance networks. For example, Jiangsu Provincial government established Jiangsu Industrial Technology Research Institute in December 2013, which aims to provide technical support for Jiangsu's industrial transformation and upgrading and future industrial development. In recent years, led by Jiangsu Academy of Industrial Technology, an innovation network consisting of professional research institutes, universities, joint innovation centers of enterprises and professional business units of Jiangsu Academy of Industrial Technology has been established. Specialized research institutes belong to the category of new R&D institutions, which are jointly built by Jiangsu Industrial Technology Research Institute, local government (park) and science and technology entrepreneur team. Industrial technology research institute of Jiangsu province to establish strategic cooperation with dozens of international and domestic first-class colleges and universities, combined with industry leading enterprises to build enterprise innovation center as a platform for refining industry generality demand, school based professional division by highly educated, with technical background and experience of transformation of scientific and technological achievements, develop the function of professional scientific and technological intermediary, Firstly, the common technical requirements of the industry are collected through the joint innovation center of enterprises, and then the requirements are sorted out and condensed by the personnel of the professional business division and transformed into scientific research topics that can be "understood" by the scientific research personnel. Finally, the scientific research projects are connected to the professional research institutes or universities in related fields or solved by the joint efforts of both parties and

multiple parties. The regional innovation alliance built with Jiangsu Academy of Industrial Technology has achieved remarkable results in promoting the docking of scientific and technological achievements with the market. It has built more than 20 professional research institutes in Jiangsu Province and established cooperative relations with dozens of first-class universities at home and abroad. It has built a joint innovation center with more than 30 leading enterprises in the industry. Although most provinces have established online platforms for technology property rights trading, their functions are still in the primitive stage, which is basically the simple online transformation of offline data, and data portrait and accurate matching mechanism have not yet been formed.

3.2.2. Guarantee Mechanism for Crossing the "Valley of Death"

In innovation ecosystem, the pilot areas of innovation main body, including the government, enterprises, colleges and universities, new research and development institutions, financial institutions, etc., is a breakthrough new research and development institutions "Valley of Death" at the core of the innovation main body, science and technology entrepreneurs team full-time join new research and development institutions and leading its operations, the government, universities, enterprises and financial institutions as the auxiliary innovation main body, as shown in figure 3. All innovation entities have given full play to their respective strengths and dedicated resources to form an open and close cooperative relationship with each other and jointly help the commercialization of scientific and technological achievements across the "Valley of Death".

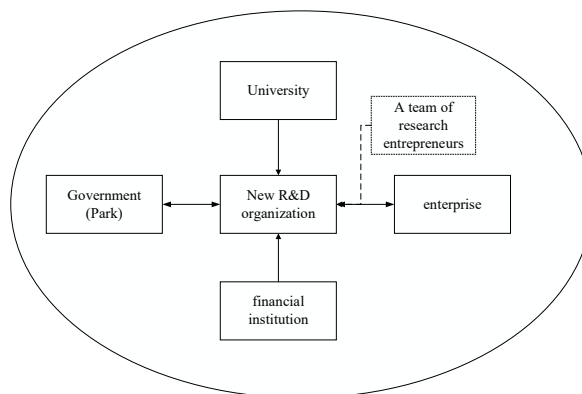


Fig 3. A safeguard mechanism across the "Valley of Death"

New research and development institutions as a core subject in pilot link, its capacity building needs large investment, in the developed provinces, for example, to conquer the industrial chain breakpoint difficulty and the pressing needs of the development of strategic emerging industry, should be led by local government, guide the industrial park, enterprises, colleges and universities, financial institutions, science and technology entrepreneurs team to participate in, Pooling resources to build a number of new research and development institutions in areas of strategic importance. At the beginning of the new research and development institutions set up by the government so as for the global first-class technology in the field of the entrepreneurs and authorize its professional technology research and development of industry and pilot team, tech entrepreneurs is skilled, has certain industry influence of talents, the team is a industry technology research and development, pilot plant and company management, and enterprise investment and comprehensive ability. The government (Park), the science and technology entrepreneur team, the enterprise and the university jointly establish a mixed-ownership operation company of the new research and development institution, and the science and technology entrepreneur team occupies a large share to dominate the operation of the new research and development institution; Colleges and universities are encouraged to participate

in the construction of new research institutions by taking stock of the operating companies and participating in the construction of new research institutions with part-time jobs or without pay. The capital required by the government (Park) to invest in the pilot site and purchase the pilot equipment shall be owned by the government (Park), which shall be leased to the operating company of the new R&D institution for free or at a favorable price, and at the same time become a shareholder of the operating company; The enterprise also becomes a shareholder of the operating company, and guides the new research and development institutions to carry out research and development of industrial core technologies and pilot tests in accordance with market demand, so as to accelerate the pace of scientific and technological achievements entering the market. Financial institutions cooperate with new R&D institutions to establish industrial funds, which focus on investing in high-tech enterprises incubated by new R&D institutions.

In this way, with equity as the link, the new research and development institutions have formed an open and close cooperative relationship between the parties involved, greatly increasing the success rate of the pilot test. "Close" means that each innovation subject on the transformation chain of scientific and technological achievements occupies a share in the operating company of the new research and development institution, realizing the bundling of interests so that each innovation subject can closely participate in the pilot test which is the key to the transformation of scientific and technological achievements. Openness means that universities, as the upstream of the pilot test, establish channels for the continuous introduction of scientific and technological achievements into new research and development institutions by taking a share in the operating company or sending part-time staff. As the pilot downstream enterprises in the operating company, on the one hand, it can guide the pilot not to deviate from the market direction. In addition, after the pilot success, it can invest or acquire high-tech companies derived from new research and development institutions in the first time, and make use of the strong resources and industrialization capacity of the enterprise, quickly industrialization of results, seize the market. Thus, through this mechanism, each innovation subject realizes the common value creation in the pilot test in an efficient and coordinated way.

Pilot tests need to carry out integrated innovation based on a variety of technologies, which has high requirements for talent teams. In the case of long-term shortage of pilot tests, it is more necessary to attract first-class science and technology entrepreneurs through good mechanisms. Therefore, on the basis of the fact that the scientific and technological entrepreneur team accounts for a large share of the operating companies of new R&D institutions, the incentive and guarantee mechanism that encourages innovation and tolerates failure should be further established. In other words, the government should cover the bottom of risks and make generous concessions in the construction and operation of new R&D institutions. The generous transfer of profits means that if the new R&D institution succeeds in operation and generates profits during a period of construction, the value-added portion of profits exceeding government input can be allocated to the scientific and technological entrepreneur team according to the equity of the operating company, so that they can enjoy most of the profits from the transformation of scientific and technological achievements. Through this combination of measures, fully stimulate the innovation vitality of the operating main body of new research and development institutions.

At present, the pilot test in China is still relatively weak on the whole, and there are many problems such as insufficient factor input, insufficient integration of industry, university and research, and lack of operation guarantee mechanism (Jing Chang and Miaomiao Wang, 2017). However, some institutions have made useful explorations. For example, Jiangsu Academy of Industrial Technology has set up dozens of professional research institutes to explore the mechanism innovation of new R&D institutions and cross the "valley of death" of pilot tests. Industrial technology research institute of Jiangsu province focus on the new material,

equipment manufacturing, electronic information, biological medicine, energy, environmental protection, and other strategic emerging industries, the field of project manager system by selecting from a global leading industry planning institute of professional talents to form a team, professional research institute undertakes the industrial technology research and development and transformation, test amplification, hatching high-tech enterprises, and other functions, Carry out market operation. By science and technology entrepreneurs team together with the industrial technology research institute of Jiangsu province, Jiangsu local park funded tech entrepreneurs team mixed ownership of large operating companies, local government park provides five years free pilot research and development, and joint industrial technology research institute of Jiangsu province to provide extra amount 1-2 million of the pilot and the research and development spending, The pilot site and equipment shall be owned by the local government park, and the team shall enjoy the right of use during the construction period. The R&D income shall belong to the operating company of the professional research institute, and the value-added income exceeding the R&D investment of the government shall be allocated to the science and technology entrepreneur team according to the equity. Collect the advantages of industrial technology research institute of Jiangsu province to explore the implementation of centralized research pilot segment of new research and development institutions operating mechanism, truly encouraging innovation and tolerance of failure, of the construction of the industrial technology research institute of Jiangsu province has dozens of professional institute, show a strong innovation vitality, a large number of achievements in professional institute quickly realized industrialization. The mechanism of Jiangsu Industrial Technology Research Institute also has some shortcomings, that is, leading enterprises and financial institutions in the industry are not included in the joint construction of professional research institutes at the very beginning, leading to insufficient market orientation and insufficient integration of technology and capital in some professional research institutes.

3.2.3. Forming a Supporting Mechanism for Innovation Clusters

The world famous high-tech industrial clusters represented by Silicon Valley all have their own unique innovation ecosystems which support the growth and expansion of high-tech industrial clusters in these regions. The formation of a fully functional innovation ecosystem and then not greasy, started by human, all is perfect in functions evolve over time, through continuous innovation ecosystem of self-reinforcing gradually have strong vitality, support community type transformation of scientific and technological achievements of the region, high business enterprise mass was born and fast-growing innovation cluster.

The innovation ecosystem with complete functions has not been formed in China, so it is urgent for the government to plan and guide the innovation ecosystem to mature. Developed regions can take the lead in exploring the creation of regional innovation ecosystem, and set up innovation complex as the pilot area and core area of innovation ecosystem, and further form innovation cluster on this basis. Innovation more complex can be set up in the university and industrial more developed regions, with hundreds of thousands of square meters of office space as a Mosaic of innovation space carrier, first in the innovation comprehensive construction of a number of new research and development institutions, and then further attract universities, enterprises, intermediary, financial institutions and other innovative main body in the innovation of science and technology integrated instruction or set up branches in the body, Through innovation complex, basic research, technology, capital and market are organically linked together. In the Innovation Complex, new R&D institutions in different fields carry out interdisciplinary exchanges and integrated innovation among themselves, as well as with universities and enterprises. Outside the innovation complex, there are a number of science and technology parks and industrial parks, which serve as the carriers for the accelerated development and industrialization of innovative enterprises incubated by new R&D institutions. Thus, innovation complex, science and technology park and industrial park, and

innovation environment together constitute a regional innovation ecosystem, as shown in Figure 4. In terms of innovation environment, we should improve a series of policies and systems to promote the transformation of scientific and technological achievements, create a fair and efficient market environment for business and intellectual property protection, introduce preferential tax policies to support innovation and entrepreneurship, and create a strong cultural atmosphere to encourage innovation and entrepreneurship. The innovation ecosystem will take the maximization of value co-creation as the evolutionary goal, and promote the cooperation mechanism among innovation subjects and even the form of innovation subjects to be more perfect. Similarly, the innovation subject will react on the innovation environment and promote the continuous optimization and improvement of the innovation environment. Therefore, under the action of innovation ecosystem, a large number of scientific and technological achievements are rapidly transformed in new research and development institutions, and a large number of high-tech companies are incubated by derivatives. With the support of large enterprises and financial institutions, industrialization and growth are rapidly realized, forming high-tech industrial clusters with strong competitiveness.

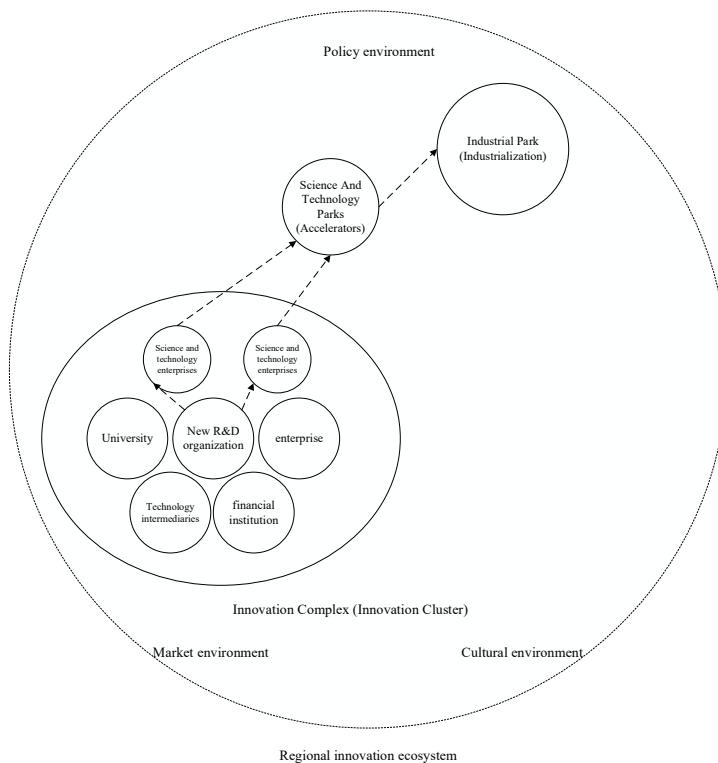


Fig 4. Forming a supporting mechanism for innovation clusters

Taking Jiangsu province as an example, it has developed economy and a complete range of manufacturing industries, and has formed an industrial cluster with strong strength, huge output value and certain influence in the world. However, Jiangsu has not yet formed an innovation cluster with strong competitiveness. The difference between industrial cluster and innovation cluster lies in the industrial cluster focuses on the mass production of established products, while the innovation cluster focuses on the formation of new products and new enterprises. Although the output value of many industries in Jiangsu is very large, the technological content and brand value of products are not high, so that the industry in Jiangsu is still at the middle and low end of the global value chain. Although there are many universities and industrial enterprises in Jiangsu province, and many scientific and technological

achievements have been produced in colleges and universities, there are still few achievements that can truly enter the market and lead the industrial development, and there are also fewer enterprises with the real vitality of scientific and technological innovation. The reason is that Jiangsu province has not formed a strong regional innovation ecosystem. The government should follow the general law of innovation ecosystem development, combine regional advantages and characteristics, guide relevant innovation factors to gather, and at the same time speed up the improvement of government governance system to create an innovation environment conducive to the growth and expansion of innovation clusters.

4. Key Measures to Build an Ecosystem of Transformation and Innovation of Scientific and Technological Achievements

The key to the construction of innovation ecology of transformation of scientific and technological achievements lies in the construction of innovation network, the breakthrough of pilot test and the creation of innovation cluster.

(1) the government should lead the construction of regional innovation alliances composed of universities, enterprises, science and technology intermediaries, and new research and development institutions to improve the innovation network connecting scientific and technological achievements with the market. Colleges and universities are the source of the transformation of scientific and technological achievements. To guide the enterprises to participate in the regional innovation alliance, the enterprise to keep it confidential or lack of innovation consciousness, the start is generally not enough motivation to join the innovation alliance, the government can transfer part of the funds used to arouse the enthusiasm of enterprises to participate in the league, such as industrial technology research institute of Jiangsu province in order to encourage enterprises to join the construction of innovation network, gives every company must have special funds allowance, It can be used to support enterprises to arrange special personnel to sort out the technical needs of enterprises and connect with the alliance, which is of great reference significance. Finally, speed up the construction of an online platform based on the Internet and big data to connect scientific and technological achievements with technological demands, and improve the data portrait generation mechanism and precise matching mechanism between the supply and demand of scientific and technological achievements.

(2) The government should take the lead and private capital should be involved in building a number of new R&D institutions in areas of strategic importance in light of the needs of local industries. The new research and development institutions are positioned to carry out forward-looking technologies and industrial core technologies and pilot scale up. The key technology research and pilot test is a long-term process, which needs the long-term and stable support of state-owned funds. The government should set up the government guiding fund to support the key technology research and pilot test continuously, and the fund operation should establish the fault tolerance mechanism and exemption mechanism that encourages innovation and tolerates failure. In the operation mechanism of new R&D institutions, innovation and failure should also be encouraged to fully mobilize the enthusiasm of talent teams. Knowledge flow, talent exchange and talent training are the key to cooperation. Therefore, a two-way suspension mechanism between universities and new-type R&D institutions and enterprises should be established and improved, and new-type R&D institutions and enterprises should be encouraged to send personnel to colleges and universities to serve as industry professors. It encourages university professors and researchers to participate in the construction of new R&D institutions and to deeply participate in the transformation of achievements. At the same time, taking the R&D tasks of new R&D institutions or enterprises as the subject, it arranges students to participate in the industrial application practice work at the front line of new R&D

institutions or enterprises, so as to cultivate talents with pilot test and industrialization engineering ability.

(3) To build an innovation cluster with innovation complex as the core and improve the innovation environment. We will plan to build a number of innovation complexes, improve their infrastructure construction, plan sufficient space for sharing and exchange, and improve supporting elements of innovation such as intellectual property rights, human resources, laws, finance and finance. Innovation ecosystem function complete is one big characteristic of science and technology enterprise incubation, therefore is of vital importance to the risk investment in innovation cluster, can focus areas focus on the development of industry, the establishment of government guiding fund participation, social capital is the dominant industry, provide strong support for high-tech enterprises growing. In terms of innovation environment, the innovation complex and its radiation areas should create a livable living environment for business, improve a series of preferential policies on talent housing and innovation and entrepreneurship, and create a fair and efficient market business environment and a cultural atmosphere that encourages innovation and entrepreneurship. We will establish and improve industrial policies to support the growth and expansion of emerging industries and the government's first-order purchase system for innovative products, and speed up the introduction of innovative products into the market. Finally, the government should carry out the evaluation of innovation cluster and cluster policy regularly, improve the cluster policy system, and guide the development of cluster system function and cluster innovation environment to a better and coordinated direction.

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