

Research on the transformation strategy of scientific and technological achievements of Suzhou's new R&D institutions based on SWOT analysis

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Abstract

The transformation of scientific and technological achievements is a key path to accelerating the cultivation and development of new productivity and a crucial link in the integration of science, technology, and the economy. This article, using a SWOT analysis, comprehensively analyzes the strengths, weaknesses, opportunities, and threats of scientific and technological achievement transformation in Suzhou's new R&D institutions. It also offers strategic recommendations for innovating systems and mechanisms, optimizing talent recruitment and training, strengthening industry-university-research collaboration, and enhancing the ability to transform scientific and technological achievements.

Keywords

New R&D institution; technology transformation; Suzhou

1. Introduction

The report of the 20th CPC National Congress emphasized: "Accelerate the implementation of the innovation-driven development strategy. Accelerate the realization of high-level scientific and technological self-reliance. Guided by national strategic needs, gather forces to carry out original and leading scientific and technological research, and resolutely win the battle for key core technologies." [1] This provides a clear policy orientation and broad development space for the transformation of scientific and technological achievements. New R&D institutions are an important carrier for promoting the deep integration of scientific and technological innovation and economic and social development [2]. Suzhou has always attached great importance to the construction of industrial innovation clusters and new R&D institutions, and has unique advantages in undertaking the transformation and implemen-

tation of advanced scientific and technological achievements. To accelerate the transformation from "Suzhou Manufacturing" to "Suzhou Intelligent Manufacturing", it is necessary to focus on promoting the deep integration of scientific and technological innovation and industrial innovation. Through the transformation of scientific and technological achievements, new R&D institutions can promote scientific and technological achievements from laboratories to production lines, shorten the industrialization cycle, and increase the success rate. This will help Suzhou build a transmission system that deeply integrates the innovation chain and the industrial chain, and accelerate the realization of the goal of "Suzhou Intelligent Manufacturing". The transformation of scientific and technological achievements of Suzhou's new R&D institutions is of great significance in promoting scientific and technological innovation and industrial upgrading, enhancing urban competitiveness, optimizing the innovation environment, promoting economic and social development, and accelerating the realization of "Suzhou Intelligent Manufacturing".

2. Current status of scientific and technological achievements transformation in Suzhou's new R&D institutions

2.1. Increased policy support

In recent years, the Suzhou Municipal Government has issued a series of policies and documents aimed at promoting the commercialization of scientific and technological achievements. These policies, including the establishment of a scientific and technological achievement commercialization fund, the optimization of scientific and technological achievement evaluation and commercialization processes, and the strengthening of intellectual property protection, have provided strong support for the commercialization of scientific and technological achievements. For example, the introduction of policies such as the Suzhou Municipal Implementation Rules for the Commercialization of Scientific and Technological Achievements and the Management Measures for Jointly Established R&D Institutions have further guided universities and research institutes to accelerate reforms in systems such as the distribution of benefits from the commercialization of scientific and technological achievements and personnel management, thereby enhancing the level of technology diffusion and transfer.

2.2. Industry-university-research cooperation continues to deepen

Suzhou's new R&D institutions are actively engaging in industry-university-research collaborations with businesses, universities, and research institutes to jointly promote the commercialization of scientific and technological achievements. By sharing R&D resources and conducting joint R&D, they help businesses improve their R&D capabilities and drive breakthroughs in key common, cutting-edge, and disruptive technologies. For example, Suzhou Industrial Park is deepening the integration of industry and education, actively attracting innovative resources, and strongly sup-

porting in-depth collaboration and resource complementarity between businesses, universities, and research institutes, promoting collaborative innovation between industry, academia, and research, and the commercialization of scientific and technological achievements.

2.3. Innovation in the model of transformation of scientific and technological achievements

Suzhou's emerging R&D institutions are constantly exploring innovative models for the transformation of scientific and technological achievements, such as equity investment, mergers and acquisitions, and entrepreneurial incubation. These innovative models help better integrate scientific and technological achievements with market demand, improving the efficiency and success rate of transformation. At the same time, diversified financing channels such as government-guided funds, social capital, and venture capital are gradually emerging, providing financial support for the transformation of scientific and technological achievements.

2.4. Significant results in the transformation of scientific and technological achievements

Suzhou's new R&D institutions have achieved remarkable success in commercializing scientific and technological achievements. They have launched a number of competitive new products, processes, and materials, effectively enhancing the core competitiveness of enterprises. For example, the Oxford Institute for Advanced Study (Suzhou) has undertaken and participated in 38 national, provincial, and municipal research projects, receiving nearly 24 million yuan in project funding, applying for 54 intellectual property rights, and obtaining authorization for five. By commercializing scientific and technological achievements, these institutions have not only generated substantial economic benefits for enterprises but also promoted the rapid development of related industries. These institutions have launched a number of competitive new products, processes, and materials, effectively enhancing the core competitiveness and market share of enterprises.

3. SWOT analysis of the transformation of scientific and technological achievements of new R&D institutions in Suzhou

3.1. Advantage Analysis

Suzhou, a major economic hub on China's eastern coastal region, boasts a prime geographical location, abundant industrial resources, and strong scientific and educational capabilities, demonstrating unique advantages in the commercialization of scientific and technological achievements. The Suzhou Municipal Government prioritizes scientific and technological innovation and commercialization, introducing a series of preferential policies and support measures, including tax exemptions, financial support, and talent recruitment. For example, the "Suzhou Regulations on

Promoting the Commercialization of Scientific and Technological Achievements" provide financial, tax, and talent support, providing strong policy support for the commercialization of scientific and technological achievements by emerging R&D institutions. Suzhou boasts numerous emerging R&D institutions, such as the Suzhou Institute of Nano-Tech and Nano-Bionics of the Chinese Academy of Sciences and the Suzhou Institute of Environmental Innovation at Tsinghua University, which have developed strong R&D capabilities. These emerging R&D institutions have established close partnerships with universities and businesses, forming an integrated innovation system integrating industry, academia, and research, accelerating the commercialization of scientific and technological achievements. Through policies such as the "Suzhou Talent Plan," Suzhou has attracted a large number of high-level talent, providing intellectual support for emerging R&D institutions. Furthermore, Suzhou has established numerous technology incubators and accelerators, providing office space, financial support, and entrepreneurial mentoring for startups, promoting the rapid commercialization of scientific and technological achievements. The above advantages provide strong guarantees and support for the transformation of scientific and technological achievements of new R&D institutions, and promote the rapid development of scientific and technological innovation and industrial upgrading in Suzhou.

3.2. Disadvantage Analysis

Despite Suzhou's abundant industrial, scientific, and educational resources, the process of transforming scientific and technological achievements may still face disadvantages such as inadequate top-level design, insufficient support conditions for transformation, a shortage of high-level talent, insufficient market-oriented operating mechanisms, and weak sustainable development capabilities. These disadvantages are specifically manifested as follows: First, the positioning of new R&D institutions within Suzhou's innovation system is unclear, lacking systematic top-level design and strategic planning. This leads to ambiguity in their functional positioning and development direction, making it difficult to form a unified strategic orientation and synergy. Some new R&D institutions fluctuate between laboratory research, research transformation, and business incubation, resulting in misallocation and waste of financial resources. This inaccurate functional positioning hinders the efficiency and effectiveness of scientific and technological achievement transformation. Second, while the research and development results of some new R&D institutions are innovative, they lack the testing and verification required through pilot production. This exposes these results to technical and market risks during industrialization, hindering the success rate of transformation. New R&D institutions often lack sufficient venture capital support during the transformation process. This inadequate venture capital restricts the subsequent development and market promotion of these results, affecting the speed and scale of transformation. Third,

new R&D institutions generally perform poorly in attracting and retaining strategic scientists. This shortage of strategic scientists has impacted their research and innovation capabilities and their ability to commercialize scientific research results. Some new R&D institutions are still constrained by the traditional public institution system in their personnel recruitment mechanisms. This leads to insufficient unleashing of talent vitality, hampering the efficiency and effectiveness of scientific and technological achievement commercialization. Fourth, new R&D institutions generally have a low degree of enterprise-like operation and are not closely integrated with the market. This limits their market development capabilities and profitability during the commercialization process.

3.3. Opportunity Analysis

As a densely populated and economically prosperous region, Suzhou has strong market demand, providing a broad market space for the transformation of scientific and technological achievements. Suzhou has many high-tech enterprises and R&D institutions, and has achieved fruitful results in scientific and technological innovation, providing rich technical reserves and cooperation opportunities for the transformation of scientific and technological achievements. As the country pays more and more attention to scientific and technological innovation and transformation of achievements, the Suzhou Municipal Government will further increase its support for new R&D institutions and provide more policy and financial support. The country attaches great importance to scientific and technological innovation and transformation of achievements, and has introduced a series of supporting policies, such as the "National Innovation-Driven Development Strategy Outline" and the "14th Five-Year Plan for Scientific and Technological Innovation", which provide policy dividends for Suzhou's new R&D institutions [3]. The Suzhou local government has also introduced a series of policies to support the transformation of scientific and technological achievements, such as the "Suzhou Municipal Regulations on Promoting the Transformation of Scientific and Technological Achievements", which provide support in many aspects such as funds, taxes, and talents. The rapid development of emerging technologies such as artificial intelligence, big data, blockchain, and 5G has provided new research directions and application fields for Suzhou's new R&D institutions. The integration of technologies from different fields has provided new possibilities for innovation, such as the combination of nanotechnology and biomedicine, which has promoted the development of new drugs and the advancement of medical technology. Several high-tech industrial clusters have formed in areas such as Suzhou Industrial Park and Suzhou High-tech Zone, attracting a large number of related enterprises and providing a favorable industrial environment for the transformation of scientific and technological achievements. These clusters encompass not only R&D institutions but also production, sales, and service, forming a complete industrial chain and accelerating the market application of sci-

entific and technological achievements. Suzhou's new R&D institutions face multiple opportunities in the transformation of scientific and technological achievements. These opportunities offer broad prospects for Suzhou's scientific and technological innovation and economic development. Suzhou should fully utilize these opportunities to further improve the efficiency and effectiveness of scientific and technological achievement transformation, promote the rapid development of high-tech industries, and enhance Suzhou's scientific and technological innovation capabilities and economic competitiveness.

3.4. Real challenges

While Suzhou has achieved remarkable success in commercializing scientific and technological achievements through its new R&D institutions, it still faces several practical challenges. These include challenges such as commercialization efficiency, insufficient funding, marketability, talent shortages, policies and regulations, regional imbalances, technological risks, and international collaboration. These challenges may impact the efficiency and effectiveness of scientific and technological achievement commercialization and require attention and appropriate measures to address. The following is an analysis of specific challenges: First, some scientific and technological achievements perform well in the laboratory but encounter difficulties in market application, resulting in low commercialization efficiency. Some technologies are not yet fully mature, making them difficult to directly apply to the market and requiring further research and development and improvement. Second, some R&D institutions face funding shortages during the commercialization process, hindering the continued progress of projects. Despite receiving special government funding, some projects at new R&D institutions still struggle to obtain sufficient funding through market financing. The funding shortages and limited financing channels faced by Suzhou's new R&D institutions in commercializing scientific and technological achievements persist. Third, some new R&D institutions lack experience in market-oriented operations and a deep understanding of market demand, resulting in a low success rate in commercializing scientific and technological achievements. Some scientific and technological achievements lack clear business models, making it difficult to attract investors and partners. Fourth, high-level talent mobility is high, and Suzhou faces the risk of brain drain, which may impact the sustainable innovation capabilities of R&D institutions. Some new R&D institutions have an unbalanced talent structure, lacking interdisciplinary and multidisciplinary talent, which hinders the efficiency of scientific and technological achievement transformation. Fifth, the transformation of scientific and technological achievements is uneven across Suzhou's regions, and infrastructure and supporting services in some areas still need improvement. Uneven resource allocation has led to some regions lagging behind in scientific and technological achievement transformation, impacting overall development. To address these challenges, Suzhou should

adopt appropriate strategies to further improve the efficiency and effectiveness of scientific and technological achievement transformation, promote the rapid development of high-tech industries, and enhance Suzhou's scientific and technological innovation capabilities and economic competitiveness.

4. Strategic recommendations for promoting the transformation of scientific and technological achievements of new R&D institutions in Suzhou

4.1. Deepen top-level design and innovate the system and mechanism for transformation of scientific and technological achievements

In light of Suzhou's industrial development characteristics and future trends, a long-term strategic plan for the transformation of scientific and technological achievements by new R&D institutions should be formulated, clarifying development goals, key tasks, and supporting measures. Furthermore, Suzhou's government departments should introduce a series of targeted and responsive policies and measures, such as tax incentives, financial support, and talent recruitment, to provide strong support for the transformation of scientific and technological achievements by these institutions. Cooperation and exchange between the government, enterprises, universities, and research institutions should be strengthened, and a collaborative mechanism for the transformation of scientific and technological achievements should be established to foster an innovation system that closely integrates industry, academia, research, and application. An evaluation system focused on the effectiveness of scientific and technological achievement transformation should be improved, with quantitative assessments of the transformation results of new R&D institutions and incentives and penalties based on the evaluation results. New R&D institutions should be encouraged to adopt market-oriented operating methods, attract social capital and venture capital, and promote the market-oriented transformation and application of scientific and technological achievements. Support should be provided to new R&D institutions in establishing transformation platforms, such as proof-of-concept centers and pilot engineering service platforms, to bridge the "first mile" and "last mile" of scientific and technological achievement transformation. Increase investment in funding, talent, and equipment for new R&D institutions, optimize resource allocation, and enhance their ability to transform scientific and technological achievements. Strengthen the development of strategic scientific and technological forces, comprehensively promote the construction of scientific and technological innovation platforms, and enhance the sustainable development capabilities of scientific and technological innovation platforms. Optimize the scientific research organization system, establish an application-oriented basic research mechanism, improve the mechanism for promoting major technological breakthroughs, and promote the deep integration of the innovation chain and the industrial chain. Stimulate the independent innovation vi-

tality of enterprises, improve the systems and mechanisms to support enterprise scientific and technological innovation, establish a mechanism for cultivating leading scientific and technological enterprises, and promote enterprises to become the main players in the transformation of scientific and technological achievements. Establish and improve the intellectual property protection system, increase the crackdown on intellectual property infringement, and provide strong legal guarantees for the transformation of scientific and technological achievements. Create an open, inclusive, collaborative, and win-win innovation ecosystem, and promote cooperation and exchanges between new R&D institutions and well-known domestic and foreign universities, research institutions, and enterprises.

4.2. Optimize talent introduction and training to support the transformation and innovative development of scientific and technological achievements

First, optimize strategies for attracting talent to support the transformation of scientific and technological achievements. Based on the research directions and transformation needs of Suzhou's new R&D institutions, precisely identify the professional fields and skill requirements of the talent needed. Through industry analysis and talent market research, understand the distribution and mobility trends of talent in related fields both domestically and internationally, providing a scientific basis for talent recruitment. Strengthen collaboration with renowned domestic and international universities and research institutes, establish a talent recommendation mechanism, and attract high-level talent to work in Suzhou. Leverage various platforms such as job fairs and talent exchange events to disseminate talent needs and broaden talent recruitment channels. Encourage enterprises to adopt flexible recruitment methods, such as project collaboration and technical consulting, to attract outstanding domestic and international talent to provide intellectual support for Suzhou's new R&D institutions. Develop attractive talent policies, such as generous salaries, housing subsidies, and child education guarantees, to reduce the cost of living for talent. Improve talent evaluation and incentive mechanisms, establish a talent evaluation system centered on innovation capabilities and transformational achievements, and stimulate the innovative vitality of talent.

Second, focus on strengthening the talent training system. Based on the research directions and transformation needs of Suzhou's new R&D institutions, establish a multi-level talent training system encompassing undergraduate, graduate, and postdoctoral students. Strengthen cooperation with universities and research institutes to jointly cultivate high-quality talent with an innovative spirit and practical skills. Encourage and support talent to participate in research projects, research results transformation, and other practical activities to improve their practical and innovative capabilities. Establish platforms such as innovation funds and entrepreneurial incubators to provide talent with resources and support for innovation and entrepreneurship. Regularly organize talent exchange meetings and academic sem-

inars to promote communication and cooperation among talent. Encourage talent to participate in international exchanges and cooperation to broaden their international perspectives and enhance their international competitiveness.

Third, vigorously optimize the talent training environment for the transformation of scientific and technological achievements. Further improve the policy system for the transformation of scientific and technological achievements, clarifying the processes and requirements for the transformation of scientific and technological achievements. The government, enterprises, and new R&D institutions will jointly establish special funds for the transformation of scientific and technological achievements to provide financial support for the transformation of scientific and technological achievements. Encourage new R&D institutions to establish close industry-university-research partnerships with universities, research institutes, and enterprises. Promote the implementation of industry-university-research cooperation projects and promote the industrialization and application of scientific and technological achievements. Strengthen the development of innovation infrastructure, such as laboratories and pilot plants, to provide the necessary hardware support for the transformation of scientific and technological achievements. Foster an open and inclusive innovation atmosphere to encourage talent to be innovative and daring to experiment.

4.3. Strengthen industry-university-research cooperation and improve the ability to transform scientific and technological achievements

Industry-university-research collaboration is a key path to improving the ability to commercialize scientific and technological achievements. Strengthening cooperation between universities, research institutes, and enterprises can effectively integrate resources and accelerate the commercialization of scientific and technological achievements. To strengthen industry-university-research collaboration and enhance the commercialization capabilities of Suzhou's emerging R&D institutions, the following approaches can be taken:

First, encourage Suzhou's emerging R&D institutions to establish long-term, stable partnerships with domestic and international universities and research institutes to jointly carry out scientific and technological research, talent development, and commercialization. Through signing cooperation agreements and establishing joint laboratories, clarify cooperative goals and responsibilities to ensure the smooth implementation of collaborative projects. Integrate resources from all parties, including scientific research equipment, research talent, and technological achievements, to achieve resource sharing and complementary advantages. Encourage technical exchanges and collaboration between enterprises, universities, and research institutes to jointly solve technical challenges and promote scientific and technological innovation.

Second, recruit and cultivate a group of R&D personnel with innovative spirit and

professional skills to form a high-quality R&D team. Encourage R&D personnel to engage in cross-disciplinary and cross-field collaboration to enhance R&D capabilities and standards. Increase investment in emerging R&D institutions, improve R&D facilities and conditions, and enhance R&D efficiency and quality. Introduce advanced scientific research equipment and instruments to provide strong support for R&D work. Establish a comprehensive management system for scientific and technological achievements, clarifying the processes and responsibilities for their commercialization. Strengthen cooperation with businesses to promote the industrialization and application of scientific and technological achievements, achieving a win-win situation for both economic and social benefits.

Third, formulate and improve relevant policies to provide support and guarantees for industry-university-research collaboration and the commercialization of scientific and technological achievements. Increase financial investment and tax incentives for new R&D institutions to encourage them to engage in scientific and technological innovation and commercialization. Establish a scientific and technological achievement commercialization service platform to provide comprehensive services such as technology transfer, financing support, and market promotion to new R&D institutions and enterprises. Strengthen cooperation with financial institutions to provide financial support for the commercialization of scientific and technological achievements. Organize forums and seminars on industry-university-research collaboration to strengthen exchanges and cooperation and create a favorable atmosphere for innovation. Strengthen publicity and promotion of scientific and technological innovation to enhance innovation awareness and participation across society. Furthermore, Suzhou can draw on the successful experiences of other cities in industry-university-research collaboration and the commercialization of scientific and technological achievements, such as Shenzhen's science and technology innovation system and Shanghai's Zhangjiang Science City. Through learning and exchange, we can continuously improve the commercialization capabilities of Suzhou's new R&D institutions.

Through the implementation of the above strategic recommendations, Suzhou's new R&D institutions can further enhance their ability to transform scientific and technological achievements, inject new vitality into scientific and technological innovation and industrial upgrading, and provide important forces for promoting high-quality economic and social development in Suzhou.

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