

Research on the Influencing Factors and Countermeasures of Innovation Capability of High-tech Enterprise

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Abstract: As one of the most important main bodies of national industrial innovation and scientific and technological innovation, the development of high-tech enterprises' innovation capability has a significant impact on the industry and even the national economic development. Currently, the majority of high-tech enterprises in China face a series of issues. This paper begins by exploring the innovation capability, resource input, and performance of enterprises. Through a review of domestic and foreign research, it can be deduced that: (1) enhancing enterprise strategic management can help enhance innovation capability; (2) increasing resource input positively influences the innovative capability of high-tech enterprises; (3) the development of core technologies and innovation by high-tech enterprises has a significant influence on enhancing innovation capability. The article analyses that favorable national policies are likely to have a positive impact on innovation capability in China. Lastly, the author concludes and suggests countermeasures for the main problems of Chinese enterprises in innovation and development, based on the existing literature and research results at home and abroad.

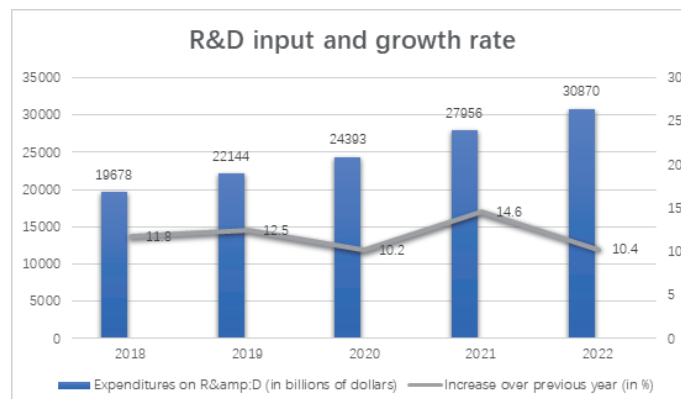
Keywords: innovation capability, resource input, innovation performance, countermeasures.

1. Introduction

Innovation capability is the key to leading the development of high-tech enterprises which not only provides strategic support for promoting their high-quality development and enhancing their core competitiveness but also serves as one of the foundations for building an innovative country. High-tech enterprises can promote sustainable development in national or regional economies and facilitate industrial structural transition. In the era of globalization, countries worldwide have a keen interest in improving the innovation capabilities and performance of high-tech enterprises.

First of all, innovation capability has been steadily improving. According to the Global Innovation Index Report 2022 released by the World Intellectual Property Organization, China's ranking in the innovation index has steadily improved every year, and it has made significant achievements in both innovation input and output.

Secondly, there has been a continuous increase in innovation input. In 2022, China's R&D expenditures reached 3,087 billion yuan, which is a 10.4 percent increase from the previous year, accounting for 2.55 percent of the gross domestic product (GDP) (Figure 1). China has become one of the world's leading countries in terms of resource input, number of papers published, and patent applications due to economic development. However, it still lags behind many developed countries in several crucial technologies and products, and the situation is becoming increasingly serious. Furthermore, China's high-tech enterprises mainly face the general problems of a low conversion rate of innovation results, insufficient input in basic research, lack of original independent innovation, low capability for independent innovation, and a poor overall innovation environment. As international competition in the field of high-tech innovation becomes more intense, the capability for independent innovation plays an increasingly critical part in the core competitiveness of high-tech enterprises.



Source: National Statistical Office

Figure 1 R&D expenditure and its growth rate, 2018-2022

Thirdly, innovative resources are gradually focused and the use efficiency is increasing. The main competitive advantage of the enterprise is to firmly develop its core technologies and adapt to the changing times. With the entry into the “14th Five-Year Plan” development period, China’s high-tech enterprises’ innovation capability has been rapidly improved and resource input has been continuously strengthened. China’s R&D input by enterprises has grown at an average annual rate of 11.3%. And the innovation environment for enterprises has been continuously improved which provides solid support for the advancement of innovation performance

What is the role of enterprises’ innovation capabilities in examining the link between resource inputs and innovation performance? This paper aims to examine the factors that influence the innovation capability of high-tech enterprises and to propose strategies that encourage innovation in such enterprises.

2. Theory Review and Prospect

This paper further investigates the factors that influence innovation capability based on existing research. Knoke B. (2017) argues that science and technology-based enterprises’ innovation capability is shown in acquiring resources across organizational boundaries, considering the restrictions on available resources. Song Hua (2019) argues that businesses can innovate to draw external resources. Enhancing the innovation capability of enterprises can advance the upgrading of the industrial structure and labor productivity (Duan Haiyan 2021). However, China’s scholar Lv Wei (2023) pointed out that the innovation of China’s high-tech enterprises has reached a new period, showing the characteristics of diversification of technological innovation and increased input in innovation.

2.1 Research on the impact of resource input on innovation capabilities

Gu, Xiaming, et al. (2018) highlight that the high-tech industry is characterized by high knowledge density, intense competition, and high returns, which contribute to the importance of high-tech firms having strong innovation capabilities. Nevertheless, it is uncertain whether increasing resource inputs can continuously boost the innovation capability of businesses and current researchers have failed to agree on a convincing and united standpoint.

Currently, Xie Huiqiang et al. (2018) have identified three main methods to enhance the innovation capability of high-tech enterprises, namely technology introduction, imitation innovation, and independent research and development. However, some scholars combined data results to analyze that investing in enterprise resources significantly impacts innovation capability positively(Pu Jing ,2023). While Zhang Jie et al. (2020) found a positive relationship between the external introduction of resources and independent innovation and they also observed a lag period along with certain limitations. Furthermore, according to some foreign scholars, the innovation capability of enterprises is associated with the level of governance of their resource inputs (Roychoudhury, 2018).

2.2 Research on the impact of innovation performance on innovation capability

The primary aim of any business operation is generating revenue profit but Enterprise innovation effectively boosts the enterprise’s innovative production technology while reducing costs and enhance its innovation performance. According to Leng Nemin et al. (2018), an enterprise’s innovation performance improves with the earning of higher profit, and the enterprise possesses a stronger willingness to increase R&D input. According to some scholars,enhancing an enterprise’s innovation capability can increase its competitiveness, enabling it to secure more funding in the market which reflecting an enhancement in the innovation performance of the enterprise. Studying the correlation between innovation capability and performance, Jung (2018) found that firms’ innovation performance is enhanced through innovative R&D, after accumulating sufficient knowledge stock.

2.3 Research on the impact of resource input on innovation performance

This paper will summarize the generalization and investigate the relationships based on existing research findings. Zhou Daishu and Zhu Mingliang (2017)considered innovation performance can be influenced by several factors such as input in scientific and technological human resources, financial input, and innovation environment. Foreign researchers have demonstrated through big data analyses that there is a significant positive correlation between the input of scientific and technological human resources and innovation results (Giovannetti E, 2017). Furthermore, Wang Hanyu and Zhu Heping (2018) observed that there is a delay in the impact of scientific and technological human resources input on innovation performance. High-tech enterprises should focus on properly allocating resources and using their own resources and state subsidies wisely.

2.4 Review

The research above shows that in the early stages of the study, researchers tend to focus on one or two factors that affect the capability to innovate for analysis. Thus, building on existing scholarly research, this paper aims to expand on the said research and examine the factors that influence innovation capability, as well as the relationship between innovation capability, resource allocation, and innovation performance from a multi-dimensional and holistic perspective.

Firstly, input in resources is an indispensable cornerstone for enhancing innovation capability. Innovating and breakthroughs in core technology can assist enterprises in overcoming the challenges caused by changing situations.

Secondly, enhancing innovation performance has a feedback regulation effect on the progress of innovation capability.

Thirdly, by increasing resource inputs appropriately, there is an evident positive impact on enhancing innovation performance.

From this, it can be seen that to mitigate risk and enhance innovation capability, enterprises should break down the management of traditional resource allocation. To enhance the innovation capability and form an excellent closed loop of development, high-tech enterprises must prioritize the growth of innovation performance by allocating more resources towards the research and development of core technologies. In the long term through this way, the development of innovation capability and core competitiveness of enterprises is an inevitable phenomenon.

3. Status and typical problems of innovation in Chinese high-tech enterprises

Presently, China's innovation capability to improve significantly has entered the ranks of innovative countries and steadily improved the status of innovation .

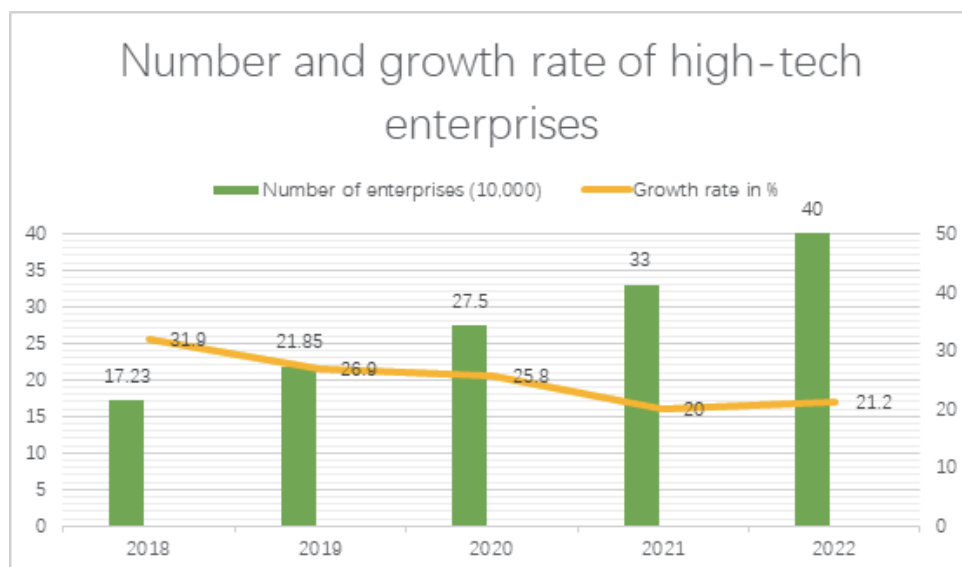
3.1 China's high-tech enterprise innovation status

First, the number of high-tech enterprises and their R&D input have increased. As per data from the Ministry of Science and Technology (Figure 2), high-tech enterprises in China have been increasing since 2018, and the annual growth rate has remained above 20%.

Source: Ministry of Science and Technology, National Bureau of Statistics

Figure 2 Number and growth rate of high-tech enterprises in China, 2018-2022

Second, the number of patent applications. In recent years, China's high-tech enterprises have responded to national policies focusing on innovation, and the number of patent applications has increased year by year since 2019 (Figure 3). Moreover, the China Patent Survey Report 2022 by the State Intellectual Property Office indicates that the industrialization rate of invention patents owned by Chinese enterprises has been consistently rising in the last five years.



Source: State Intellectual Property Office

Figure 3 Number of Patent Applications for Inventions in China, 2019-2022

Thirdly, the diversified dynamics of innovation in high-tech enterprises. High-tech enterprises often face fierce market competition, and they need to develop unique and innovative products or services to meet consumer demand and continuously enhance their market competitiveness. In recent years, China has continuously introduced favorable policies to support enterprise R&D and innovation, such as input in scientific research funds, preferential tax policies, intellectual property rights protection, etc., which effectively reduces the risk and

cost of enterprise innovation, and motivates enterprises to invest more resources and energy in innovation.

Thus, the driving forces behind business innovation are the combined effects of market competition, technological progress, and government support. Businesses must sustain their focus on these dynamics and continually adjust and optimize their innovation strategies to maintain their competitive edge and achieve sustainable development.

3.2 China's high-tech enterprise Innovation problem analysis

First, the number of patents and patent efficiency is insufficient. In 2019 and 2020, China maintained the momentum of high growth in applying for and obtaining patents in the U.S. becoming the fastest-growing economy in terms of the number of U.S. patents obtained for two consecutive years. Nevertheless, there is still a significant gap between China and developed countries and Western powers in the number of patents obtained which is still a need for improved patent efficiency.

Secondly, the innovation drive is not synergistic and insufficient. The limited economic benefits of innovation hamper the drive to pursue innovation. According to the National Bureau of Statistics (NBS), China's above-scale industrial enterprises will have a profit margin of merely 6.09% in 2022, while innovative companies will only have a margin a few percentage points higher than non-innovative ones which means innovative corporations do not experience noticeable value addition in profits and impede their motivation to innovate.

Currently, China has gradually emphasized innovative enterprises and given policies to benefit them, among which tax incentives and financial subsidies are two common ways for the government to intervene in the R&D activities of enterprises (Shao Jiaojiao, 2023). State support reduces the burden of innovation for enterprises, but it is still insufficient. There is a certain lack of synergy between the internal driving force of enterprise innovation and the external driving force of state support, resulting in the uneven development of enterprise innovation, with greater room for improvement.

Thirdly, the protection of intellectual property rights requires strengthening. As innovative products continue to emerge, Chinese enterprises are increasingly focused on maintaining and developing their inventions. However, the existing measures to protect business innovation and creation are relatively limited and ineffective, which undermines the subjective drive of scientific and technological innovators and business innovation. Furthermore, Shen Guobing (2023) has highlighted the necessity of reinforcing intellectual property rights protection to encourage independent innovation by businesses.

4. Factors affecting the innovation capability of high-tech enterprises

Currently, high-tech enterprises are experiencing intense market competition. Enterprise's capability to innovate is the main driving force behind progress and innovating is the main way in which firms can improve their competitiveness. This paper considers that the primary factors influencing the enhancement of the innovation capability of an enterprise are as follows:

Firstly, to develop high-tech enterprise innovation capability, enterprise management requires a long-term strategic vision to formulate innovation plans, attract talented employees. Good management can also promote enterprise innovation performance, and some scholars have pointed out that managers with innovation experience generally have the willingness to carry out innovative activities, which is conducive to improving the innovation output of the enterprise (ZHOU, 2021). Foreign scholars have suggested that enterprise innovation capability is related to its governance level (Roychoudhury, 2018). Moreover, enterprises should provide incentives to innovative researchers and strengthen welfare benefits to further stimulate their innovation potential and accelerate enterprise innovation (LI, 2021). Thus, each enterprise should have its unique incentive mechanism to maximize employee motivation and bring greater value gains to the enterprises.

Secondly, the development of the innovation capability of high-tech enterprises cannot be separated from resource input and product profitability. Increased profitability of high-tech enterprises selling products can drive their input in innovation (Zhou Chao, 2019). The profits increase when products are sold successfully which outcome triggers a cycle of innovation, research, and development, leading to increased revenue generation, thereby paving the path to the success of the business. The Chinese government's current implementation of enterprise-friendly policies of tax incentives and government subsidies has played a positive role in promoting enterprise resource input (Pu Jing, 2023). The core competitiveness of high-tech enterprises is the continuous innovation and iteration of products, and the intensity of R&D funding is the most important.

Thirdly, research and development of technological innovation. Giving due importance to technological innovation in enterprises can enhance the level of their technological innovation (He Dexu, 2019). Enterprises should focus on conducting research on core technology,

due to current turbulent multilateral sanctions that can hinder their stable development and impede their growth prospects. Furthermore, upgrading the related infrastructure facilities is crucial for technological innovation.

Fourthly, the national policy environment. According to Zhou Chao (2019), government innovation expenditure has an external impact on corporate input in innovation. Favorable national policies and a comprehensive legal system play a leading and guiding role in enhancing the innovation capability of high-tech enterprises (Zhou Xiaohui,2022). Innovation capability cannot be achieved by solely relying on Western knowledge and methods but requires significant input in resources, which is a challenge faced by most small and medium-sized high-tech enterprises. In China, where high-tech enterprises are largely composed of small and medium-sized enterprises. Therefore, the support of state policies has become a crucial factor in the development of high-tech enterprises in China.

In summary, the author argues that high-tech enterprises' innovation capability is principally influenced by four key factors: environmental, technological, and resource factors, as well as management factors.

5. Strategies to Enhance the Innovation Capability of High-Tech Enterprises

To address the issues and challenges faced by Chinese high-tech enterprises in developing their innovation capability, the Chinese government should enact policies that foster innovation and attract high-end talent. Simultaneously, it should enhance the system and mechanism for intellectual property rights protection, fortify judicial protection measures, and provide institutional support to assist enterprises of diverse kinds in improving their technological innovation capability. Moreover, it is necessary to strengthen cooperation with other countries and regions, particularly about emerging technology standards and innovation ecosystems, to create a more favorable domestic and international environment for the innovation activities of enterprises. Concurrently, enterprises themselves need to take appropriate countermeasures.

First, enterprises should have in-depth cooperation with universities and research institutes. On the one hand, they ought to align basic research, technology development, and applications of science and technology more closely. On the other hand, high-tech enterprises could participate in talent cultivation initiatives to enhance the alignment between higher education institutions' talent cultivation and enterprises' needs. This will satisfy the demands of enterprises for relevant scientific and technological innovation talent. Research institutes possess a considerable number of innovative talents, and enterprises may organize regular training events for their in-house talents to improve their core competencies and skills.

Second, high-end innovative talents should be introduced and incentive mechanisms should be formulated. An innovation atmosphere that is conducive to the gathering and growth of scientific and technological talents should be created so that they can wholeheartedly devote themselves to research and contribute to enhancing the enterprise's innovation capability and innovation performance.

Third, enhance resource input and optimize resource utilization. Firms must examine whether investing additional resources in multi-product research and development is worthwhile based on the product's benefit, ensuring a reasonable utilization of resources and yielding cost savings with increased economic efficiency.

Fourth, the development and mastery of crucial technologies should be accelerated. China's high-tech enterprises must align with international high R&D enterprises. They should study their excellent innovation models and R&D efficiency to form a unique innovation model for promoting core technology R&D. China's high-tech enterprises have long been positioned in the middle and lower reaches in the industry chain which is bad for development.

The progress of high-tech enterprises' innovation capability should be influenced both by the external environment and internal changes. Improving a firm's ability to innovate requires supportive government policies, adapting to changing customer and market demands, efficient allocation of resources, and enhanced innovation capabilities. Ultimately, it is crucial to seize core technologies to achieve high-quality competitiveness, make substantial leaps in innovation ability, and establish distinctive and unique innovative characteristics.

6. Conclusions and Recommendations

This paper analyses the current situation and bottlenecks of the development of the innovation capability of high-tech enterprises in China and examines the factors affecting their innovation capability, including the relationship of enterprise innovation capability, resource input, and innovation performance. Based on this analysis and relevant literature and data, this paper presents conclusions and countermeasure suggestions to improve enterprise innovation capability.

Firstly, increased input in resources has a positive impact on the innovation capability of high-tech enterprises. Currently, the shortage of innovative scientific and technological talent is a significant factor hindering the improvement of the innovation capability of Chinese high-tech enterprises which is a prevalent challenge for high-tech enterprises of various sizes. Therefore enterprise needs to improve the resource input mechanism to enhance the innovation capability of enterprises. Enterprises should consider varying resource inputs for different R&D projects, taking into account the associated risks, and appropriately increase the input in research related to the core competitiveness of the enterprise which will enhance the innovation capability of enterprises.

Secondly, enhancing enterprise strategic management and using scientific and technological talent rationally can help to improve innovation capability. The management should comprehensively consider enterprise development and establish strategic cooperation with universities and research institutes to develop and attract suitable talent, which would lead to high-efficiency innovation and ultimately promote innovation capability improvement. Therefore, enterprises should reinforce their employment strategy and enhance the system for introducing, training, and incentivizing scientific and technological innovation professionals. Enterprises should give sufficient attention to the career planning of innovative professionals, according to the reality of each employee. Furthermore, enterprises need to further motivate their employees by providing appropriate incentives to increase their sense of belonging and capability to enhance the business's innovative capabilities.

Thirdly, the research and development, as well as the innovation of crucial technologies at high-tech enterprises, have a significant impact on enhancing innovation capability. Therefore, In today's dynamic business landscape, it is crucial for enterprises to constantly adapt and enhance the core competitiveness of crucial technology research and development, aiming to continuously improve the capability of independent innovation which ensure their capability to remain invincible in the rapidly evolving world of business.

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