

Research on Difficulties and Solutions of R&D Investment Management of State-owned Enterprises

Yongjuan Zhu^{1,a}, Longfeng Wang^{1,b}, Bingshi Zhang^{1,c}, Sun Li^{2,d}

¹State Grid Energy Research Institute Co., Ltd., Beijing, China, 102209

²State Grid Shandong Electric Power Company, Shandong, China, 250001

^aadgh99@aliyun.com, ^b1532030900@qq.com, ^c352306363@qq.com, ^djuno_a@163.com

Abstract. State-owned enterprises have implemented the requirements for innovation and development, and their R&D investment has increased significantly in recent years. This study proposes measures, such as a comprehensive R&D marginal benefit and production synergy benefit to determine a reasonable investment scale, refine the R&D activities identification criteria, strengthen inter-professional collaboration, and increase digital application, to provide reference for the improvement of R&D investment management of state-owned enterprises, and to facilitate high-quality economic and social development.

Keywords: R&D activities; R&D investment management; R&D investment intensity

1. Introduction

Innovation is the source of development, and technological self-reliance has risen to the level of national development strategies. State-owned enterprises have no slack in the task of innovation as the backbone of China's economic and social development. The Central Deep Reform Commission proposed to strengthen the "five powers" of state-owned enterprises, which emphasized the need to use "innovative power" as a breakthrough to improve the quality and efficiency of the state-owned economy, so as to play a better leading role in the high-quality economic and social development in 2020[i]. China has introduced a number of measures to guide and encourage social entities including state-owned enterprises to increase investment in research and development, accelerate the industrialization of innovative achievements, and achieve high-level scientific and technological self-reliance and self-improvement since the 18th National Congress of the Communist Party of China. The analysis of external environment of the current state-owned enterprise R&D investment management is as follows.

(1) The increase in financial capital investment and preferential tax policies will help state-owned enterprises to increase R&D investment. The Ministry of Finance and the State Administration of Taxation have allowed enterprises to deduct 75% of R&D expenses, and the intangible assets are amortized at 150% of the cost since 2015, and increase the super deduction of R&D expenses for manufacturing enterprises to 100% and 200%, in order to encourage enterprises to increase investment in R&D and carry out scientific and technological innovation. Data from the National Bureau of Statistics shows that the central government's investment in basic science increased by 10.6%, and China's R&D investment in the whole society increased by 14.2% year-on-year, and the R&D investment intensity reached 2.44% in 2021. The government's R&D investment and preferential tax policies have formed a driving effect on innovation activities of the whole society's R&D investment.

(2) The management of state-owned scientific research funds and the evaluation mechanism of scientific research achievements have been continuously optimized, and the innovation environment of state-owned enterprises has become more friendly. The General Office of the State Council has issued a number of measures such as "Several Opinions on Improving the Management of Scientific Research Funds from the Central Finance" and "Guiding Opinions on Improving the Evaluation Mechanism of Scientific and Technological Achievements" in recent years. These measures have optimized the management mechanism of scientific research funds funded by the central government, expanded the autonomy of scientific research personnel in the use of funds, established

a multi-level and differentiated evaluation mechanism for the results of scientific research projects funded by the central government, and solved the "four unique" problems in scientific and technological evaluation, so as to stimulate the enthusiasm of scientific researchers to start businesses, and improve the system and mechanism to promote the transformation of scientific and technological achievements into real productive forces.

(3) China has clarified the statistical scope and statistical rules of R&D investment, providing a solid foundation for the management of R&D investment of state-owned enterprises. The National Bureau of Statistics issued the "Statistical Specifications for Research and Experimental Development (R&D) Investment (Trial)" (Guo Tong Zi [2019] No. 47) in 2019, which standardized the statistical scope and methods of R&D activities. The State-owned Assets Supervision in 2020, and Administration Commission of the State Council and the Ministry of Finance of the People's Republic of China in 2021 have added the reporting indicators of "R&D expenditure investment" for central enterprises and state-owned enterprises, respectively and the contents of the indicators are consistent with those of the National Bureau of Statistics. The introduction of the above norms indicates that the Chinese government has changed from the management of "Science and Technology Activities" referenced by UNESCO's "Statistical Manual of Scientific and Technological Activities" to the more core "R&D activities" referenced by OECD's Frascati Manual, focusing more on the core of creative activity. These norms have also promoted the improvement of the quality of domestic R&D investment statistics and further coordination and integration with international norms.

(4) State-owned asset management institutions have improved the quality assessment indicators of state-owned enterprise R&D and innovation, and encouraged state-owned enterprises to give full play to their leading role in innovation. The Party Central Committee has repeatedly emphasized the need to strengthen original and leading scientific and technological research, and constantly improve the assessment of state-owned enterprises' R&D investment[ii]. The State-owned Assets Supervision and Administration Commission has included the R&D investment intensity index as the main assessment index for the heads of state-owned enterprises. It treats R&D investment as profit, and adds it back when calculating profit-related indicators, and links R&D investment to key core technology breakthroughs and the number of authorized invention patents, encouraging state-owned enterprises to increase R&D investment while vigorously improving the quality of R&D innovation. The "Three-Year Action Plan for State-owned Enterprise Reform (2020-2022)" pointed out that, the average R&D investment intensity of general industrial enterprises will be 3%, and the average R&D investment intensity of key central enterprises will be more than 5% in 2022.

Overall, the environment for state-owned enterprises to carry out innovation activities and increase R&D investment is more favorable with the high-quality development orientation and strong support from national policies. State-owned enterprises still face some difficulties in the management of R&D investment due to the complexity of R&D activities.

2. Difficulties Existing in the R&D Investment Management of State-owned Enterprises

State-owned enterprises face the following difficulties in the process of R&D investment management.

(1) The growth of R&D investment in state-owned enterprises faces the difficulty of a reasonable scale. The economic resources held by the enterprise are limited, and it needs to allocate its own limited economic resources reasonably during the production period to obtain optimal benefits. R&D activities are the use of the current resources by the enterprise to create a competitive advantage technology in the later period, and it is a crowding out of the current resources. Too much R&D investment may affect the current production and operation benefits[iii]; superimposed on the high uncertainty of R&D investment and output, too little R&D investment is more likely to cause the loss of the company's later competitive advantage[iv]. How to balance the development

resources of the current period and the later period is the key and difficult problem to be solved in the R&D investment management of state-owned enterprises. Therefore, it is necessary to further research on the reasonable R&D investment scale of state-owned enterprises, to ensure the resources required for current production, and also to meet the resource requirements of major core technology research, so as to create a leading edge for the current stable development of the enterprise and the long-term development in the future. .

(2) The management of R&D investment in state-owned enterprises faces the requirements of further clarifying the content and scope. The management norms of R&D activities established by the National Bureau of Statistics, the Ministry of Finance, the State-owned Assets Supervision and Administration Commission and other relevant ministries and commissions are mainly at the principle and theoretical level, and there is a certain gap with the actual production management of enterprises. There are many forms and types of R&D activities of state-owned enterprises in actual implementation. It is not mentioned in the Statistical Management Specification that the activities of professional departments such as digital management and marketing management include R&D activities or not, and relevant investments should be included in R&D investment or not, in addition to the project investment of R&D activities led by the R&D technology related departments of state-owned enterprises. Some state-owned enterprises have the same understanding of R&D activities and R&D investment as "scientific and technological activities", failing to distinguish between production activities and R&D activities, and their R&D investment management is faced with the difficulty of unclear scope and content[v]. The judgment of R&D activities and the management of R&D investment require comprehensive judgment and overall coordination by grass-roots personnel and managers in combination with business norms.

(3) The management and collection of R&D investment of state-owned enterprises faces the requirements of better statistical methods and more efficiency. The National Bureau of Statistics promulgated the latest "R&D expenditure investment" statistical management method, and requires all enterprises and institutions to submit a statistical table of R&D activities, attach the list of all R&D projects in 2019. SASAC of the State Council in 2020 and the Ministry of Finance in 2021 both require state-owned enterprises to submit the "R&D investment" indicator in their final financial reports. They also subdivide the "R&D investment" indicator into three major categories: "daily R&D expenditure", "expenditure for purchasing fixed assets, new technologies, scientific research equipment, etc.", and "other expenditures", instead of "investment on R&D", "expenditure on information" and "other technology investment". The research found that the accounting methods of some state-owned enterprises are relatively simple. It is still necessary to analyze and identify each transaction according to the records of the accounting books to carry out R&D investment statistics. Accounting management and statistical data collection are less efficient, and it is difficult to guarantee the accuracy. The R&D investment management of state-owned enterprises faces more requirements for efficiency improvement.

3. Solutions to the Difficulties Faced by R&D Investment Management

This research proposed the following solutions, based on the analysis of the form and content of enterprise R&D activities for the difficulties existing in the management of R&D investment in the actual business of state-owned enterprises,

(1) Carry out the research on a reasonable scale of corporate R&D investment.

R&D investment management is a resource allocation behavior of enterprises. It is necessary to consider the marginal benefits of R&D innovation and the synergistic benefits of production assets, balance the resources of future development and the current development stage, and ultimately maximize long-term benefits. The scale of R&D investment of enterprises will inevitably increase year by year due to the demand for technological innovation, the increase in revenue, and the rise in price levels, from the perspective of the development trend of foreign enterprises. The R&D investment intensity of an enterprise should reach a long-term stable state after experiencing

medium and high-speed growth. According to EU data, the R&D investment of the top 2,500 industrial enterprises in the world is highly concentrated in 2020, and the three major industries of information and communication production and services, biomedicine, and automobiles contributed 77% of the total R&D scale, but the R&D investment intensity of the same industry has basically stabilized at a certain level for several years.

State-owned enterprises should carry out targeted research on core technologies in key areas, and arrange annual R&D investment according to factors such as the needs of scientific and technological research and corporate financial capabilities, and should not aim to increase the intensity of R&D investment. The purpose of R&D and innovation of state-owned enterprises is to meet the market demand for scientific and technological development, and to promote high-quality economic development based on the current technological status and scientific research foundation of the industry.

(2) Clarify the content and scope of statistics on R&D investment of state-owned enterprises, and refine the definition of statistical scope, by analyzing the characteristics of business activities of enterprises.

R&D activities are innovative and have five characteristics: novelty, creativity, uncertainty, systematicness, and transferability, which will bring new inventions, new technologies, new products, etc.; and if the relevant activities mainly provide services for R&D activities, the activities also belong to the scope of R&D, according to the Frascati Manual issued by the OECD and Document No. 47 of 2019 by the National Bureau of Statistics.

State-owned enterprises are production-oriented institutions, and production and innovation are closely integrated. If new discoveries, new inventions, new products or new technologies are born in the daily production of professional departments such as marketing and digitalization, they should also be classified as R&D activities. Therefore, when state-owned enterprises calculate their R&D investment, they should include the R&D related project expenditures in the daily production and operation managed by these specialized departments. The business of different industries is different. State-owned enterprises should fully understand the relevant norms, analyze all the production and operation activities of the enterprise, further refine the statistical rules for the relevant expenditures of R&D activities, and clarify the salient characteristics of the R&D activities of the enterprise, so as to accurately define the scope of R&D investment, and improve the basic level of business personnel. Judgment method of R&D activities to improve the level of lean management.

(3) Improve R&D investment management methods and increase the application of information technology, thereby promoting the improvement of management efficiency.

The National Bureau of Statistics, the Ministry of Finance, the State-owned Assets Supervision and Administration Commission and other ministries and commissions all require that the indicators of "R&D expenditures" be submitted and broken down, and it is necessary to clarify whether these expenditures are used for labor, equipment, land or other aspects. Multi-dimensional identification and query capabilities must be met in planning management and financial accounting.

State-owned enterprises should further improve the collection and method of expenditure related to research and development activities, and do a better job in the classification and labeling of information when relevant expenditures are recorded, so as to facilitate the query and analysis of research and development investment in the later stage. R&D project expenditure involves the whole process from project establishment, reserve, planning, execution and closing, as well as information systems such as financial management system, project reserve, and management platform. It is an inter-professional and inter-departmental work. It is necessary for state-owned enterprises to carry out top-level design optimization in the management of R&D investment. These expenditures need to be classified, summarized and filled in the information system, and filled in the ranks of the relevant reports, after identifying the projects that are in line with the characteristics of "R&D" activities in various businesses. It can be considered to design and develop management reports through the method of "accounting subject + management label", and implant the R&D

investment model into the information system, in terms of specific implementation, to realize intelligent analysis and improve the efficiency of identification and statistical management.

4. Conclusion

State-owned enterprises have deeply implemented the innovation-driven development strategy, and their R&D innovation has been continuously increased, under the requirements of high-quality development. Due to the relatively principled R&D activities and the close connection with the daily production activities of enterprises, the R&D investment management of state-owned enterprises faces difficulties in determining the reasonable scale of investment and improving the calculation method of investment in practice.

This research proposes the following solutions. The reasonable scale of R&D investment of state-owned enterprises should be determined based on factors such as the marginal revenue of R&D innovation, the synergistic revenue of production assets, the needs of scientific and technological research, and the level of enterprise capital. State-owned enterprises should refine the criteria for the identification of R&D activities based on the analysis of the characteristics of their business operations, and adopt top-level design, cross-discipline collaborative optimization, and digital technologies to optimize their R&D investment management methods.

Acknowledgments

This work was financially supported by the Science and Technology Project of State Grid Corporation of China, "Research on Key Technologies of R&D Investment Management and Control of Group Enterprises" (Project No.: 1400-202257239A-1-1-ZN).

References

- [1] Wang Haixia, Wang Xin. Government Subsidy and Enterprise R&D Investment: The Joint Moderating Effect of Ownership and Political Connection [J]. *Friends of Accounting*, 2019(14): 45-51.
- [2] Chen Xin, Xie En, Li Yu. Research on the Influence of State-owned Enterprise Performance Feedback on R&D Investment [J]. *East China Economic Management*, 2016, 30(10): 123-130.
- [3] Zhang Bochao. The Fairness of Income Distribution of Factors of Production in Manufacturing Enterprises and the Intensity of R&D Investment [J]. *Shanghai Economic Research*, 2019(12):68-79.DOI:10.19626/j.cnki.cn31-1163/f.2019.12. 008.
- [4] Wang Yi. Leading market strategy of disruptive innovation [J]. *Tsinghua Management Review*, 2020(Z2): 112-118.
- [5] Hao Ting, Yuan Jianan, Ma Yanshuo, Qi Lin. Research on the Economic Consequences of Economic Added Value Assessment on R&D Investment of State-owned Enterprises [J]. *Journal of Southwest University (Natural Science Edition)*, 2021,43(09):59-70.DOI :10.13718/j.cnki.xdzk.2021.09.008.