

# Research on Enterprise G's Green Innovation Performance Evaluation

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**Abstract.** Current research on green innovation performance evaluation primarily focuses on four levels: national, regional, industrial, and corporate. While studies at the national, regional, and industrial levels are relatively comprehensive, evaluation systems specifically at the corporate level remain underdeveloped. Building upon existing theoretical foundations and literature, this study selects Enterprise G within the photovoltaic equipment industry as a case study. An evaluation indicator system for green innovation performance is constructed based on an input-output perspective, incorporating the enterprise's green innovation management. This system comprises three dimensions: green innovation resource input, green innovation management support, and green innovation output benefits. Subsequently, the Analytic Hierarchy Process (AHP) is employed to determine the indicator weights for Enterprise G's green innovation performance evaluation system. The TOPSIS model is then applied to evaluate and analyze Enterprise G's green innovation performance, identifying existing problems. Based on the findings, targeted recommendations are proposed for Enterprise G's green innovation initiatives to facilitate its further development.

**Keywords:** Green innovation performance evaluation; AHP-TOPSIS method.

## 1. Introduction

Against the backdrop of increasingly evident adverse impacts of global climate change, promoting green and low-carbon development as well as facilitating a green economic and social transition have become a consensus among a growing number of countries. As the world's largest developing economy, China is a dedicated proponent of green and sustainable development, striving to peak carbon dioxide emissions before 2030 and achieve carbon neutrality before 2060. With the establishment and improvement of China's green, low-carbon, and circular economic system, green innovation is increasingly becoming a vital driver for achieving sustainable green development. Currently, approximately 73% of global carbon dioxide emissions originate from the energy sector, making the new energy industry a primary arena for advancing green and low-carbon development. The new energy sector offers distinct advantages: it reduces both energy consumption and ecological damage in economic operations, thereby decoupling economic growth from dependence on traditional energy sources such as coal. Meanwhile, many new energy enterprises are proactively integrating green innovation into their production processes and strategic planning. This approach not only helps protect the environment and conserve resources but also generates economic and social benefits, fostering coordinated development across all three dimensions. As one of China's strategic emerging industries, the new energy sector has become a key agent in advancing the country's green economy and green technology innovation. Green innovation within new energy enterprises is increasingly central to national green economic development and plays an ever more critical role in driving energy upgrading and ecological sustainability. However, existing research on green innovation performance evaluation has mainly focused on four levels: national, regional, industrial, and corporate. While studies at the national, regional, and industrial levels are relatively comprehensive, evaluation systems at the corporate level remain underdeveloped. Therefore, this study selects representative firms from China's new energy equipment manufacturing sector as case studies, with the aim of constructing a corporate-level green innovation performance evaluation framework. Such a framework is essential for assessing the green innovation performance of these

enterprises, identifying shortcomings in their development trajectory, and supporting the sustainable growth of China's new energy equipment industry.

## 2. Literature review

From a performance-based measurement perspective, innovation performance can be divided into efficiency performance and outcome performance (Guan and Chen, 2009)[1]. This classification logic is equally applicable to green innovation performance. A review of the existing literature reveals that efficiency performance refers to the evaluation of green innovation transformation efficiency from an input-output perspective, also termed green innovation efficiency. It reflects the contribution per unit of green innovation input to green innovation output (Zhang et al., 2020; Lin et al., 2023; Fan and Jia, 2024)[2,3,4]. Outcome performance typically employs either a single output indicator or a multi-level, comprehensive evaluation index system to assess the output benefits of green innovation outcomes, thereby revealing an enterprise's green innovation capability and its degree of environmental sustainability.

First, studies based on innovation elements often employ scales to evaluate components such as green product, management, and process innovation. For instance, Chen (2006) proposed a measurement scale with two dimensions—green product innovation and green process innovation—comprising four measurement items[5]. Subsequently, Sarkis et al. (2010) added a third dimension, green management innovation, to the existing scale[6]. Xu (2020) measured corporate green innovation performance using scales across three aspects: green product innovation, green process innovation, and green management innovation[7]. Xie and Zhu (2021) applied content analysis to quantitatively assess green product innovation and green process innovation[8]. Second, research based on the innovation process, often grounded in the theory of whole-process innovation and lifecycle theory, aims to measure performance levels across all stages from R&D to product commercialization. For example, Bi et al. (2015) categorized green innovation performance into green R&D performance, green manufacturing performance, and green marketing performance, employing the RAGA-PPE evaluation model for assessment[9]. Third, research based on the Economy-Environment-Society (EES) coordinated development perspective emphasizes the value of organizations achieving synergistic development across economic, environmental, and social performance through green innovation. For instance, Sun and Chen (2018), building on a clear conceptualization and value dimensions of green innovation, decomposed green innovation performance into economic performance, environmental performance, and social performance. They conducted a performance evaluation using the projection pursuit model and a coordinated development degree model, taking the Bohai Rim Economic Zone as an example[10]. Hu and Hu (2023), based on a two-stage model of green technology innovation, constructed a four-dimensional green technology innovation performance evaluation index system comprising R&D performance, economic performance, environmental performance, and social performance. They combined the Analytic Hierarchy Process (AHP) and entropy method to evaluate the green technology innovation performance of strategic emerging enterprises in Jiangxi Province from 2016 to 2019[11].

In summary, green innovation performance pertains to the evaluation of entities implementing green innovation. This paper posits that green innovation performance represents the concerted efforts—including the input of green innovation resources and the establishment of green innovation management safeguards—and their resulting effectiveness, undertaken by enterprises with the goal of achieving coordinated economic-environmental-social development. Consequently, from an input-output perspective and incorporating considerations of corporate green innovation management, this paper evaluates and analyzes the green innovation performance of case enterprises. Specifically, green innovation performance is assessed through three aspects: the resource input into green innovation objects, the management safeguards supporting them, and the resultant output benefits.

### **3. Establishment of the green innovation performance evaluation system for Enterprise G**

#### **3.1. Brief introduction of Enterprise G**

Enterprise G is a National Key High-Tech Enterprise specializing in the R&D, production, sales, and service of new energy equipment, with a focus on solar, wind, energy storage, and hydrogen energy. Its primary product portfolio includes PV inverters, wind power converters, energy storage systems, floating PV systems, new energy vehicle drive systems, charging equipment, renewable energy hydrogen production systems, and smart energy operation and maintenance services. The enterprise is committed to providing world-class full lifecycle solutions for clean energy. The core products, its PV inverters, have obtained certifications and passed tests conducted by multiple internationally recognized authorities such as TÜV, CSA, and SGS. These products have been mass-marketed to over 170 countries and regions worldwide.

#### **3.2. Selection of green innovation performance evaluation indicators**

Referencing “China Green Innovation Index Report (2022)”, “2023 Yangtze River Economic Belt Green Innovation Development Index Report”, and the sustainability reports disclosed annually by Enterprise G, this study adopts an input-output perspective while incorporating considerations of Enterprise G's green innovation management. An evaluation indicator system for Enterprise G's green innovation performance is constructed by selecting specific indicators across three dimensions: Green Innovation Resource Input, Green Innovation Management Support, and Green Innovation Output Benefits. This system encompasses the majority of Enterprise G's green innovation activities and behaviors, reflecting the influence of various factors in the green innovation process on its performance.

(1) Green Innovation Resource Input refers to the allocation of various resource elements by an enterprise in the process of promoting green innovation development. These resources primarily include capital and human resources. Consequently, this study selects third-level indicators from the aspects of capital input and human resource input, determining six specific indicators: R&D Investment Intensity, Environmental Protection Investment Intensity, Government Subsidy Intensity, Proportion of R&D Technical Personnel, Proportion of Highly Educated R&D Technical Personnel, and Average Training Hours per R&D Technical Personnel.

(2) Green Innovation Management Support denotes the level of management system assurance during the transformation of green innovation resources into sustainable output benefits. It directly affects the allocation efficiency of green innovation resources, the organizational and coordination capacity for green innovation activities, and the conversion efficiency of green innovation outcomes. This institutional support is primarily manifested in aspects such as internal management and collaborative cooperation within the enterprise's green innovation process. Therefore, this study selects third-level indicators from the aspects of internal management and collaborative cooperation, determining five specific indicators: Completeness Level of Green Management Systems, Level of Equity Incentives for Innovation Talents, Depth of Industry-University-Research Institute Collaboration, Depth of Green Supplier Audit Management, and Depth of Green Supplier Capability Co-development.

(3) Green Innovation Output Benefits refer to the sustainable output benefits achieved across economic, environmental, and social dimensions, ultimately realized during the enterprise's green innovation activities. These outcomes are based on the input of capital and human resources and supported by the assurance levels of internal management and collaborative cooperation. Thus, this study selects third-level indicators from the aspects of economic benefits, environmental benefits, and social benefits, determining eleven specific indicators: Increase in Authorized Green Innovation Patents, Proportion of Green Innovation Product Sales Revenue, Green Innovation Cost-to-Profit Ratio, Green Innovation Sales Profit Ratio, Recycled Resource Utilization Rate, Greenhouse Gas Emission Intensity per Million CNY of Output Value, Amount of Environmental Violation Fines,

Energy Consumption per Ten Thousand CNY of Output Value, Number of Industry Standard Formulation Projects, Number of Green Innovation Awards Received, and Customer Satisfaction.

**Table 1.** Indicator definition table

Indicator Name	Indicator Symbol	Indicator Definition
R&D Investment Intensity	A1-1	Current R&D Investment / Main Business Revenue
Environmental Protection Investment Intensity	A1-2	Current Environmental Protection Investment / Main Business Revenue
Government Subsidy Intensity	A1-3	Current Government Subsidy Amount / Total Assets at Period End
Proportion of R&D Technical Personnel	A2-1	Number of R&D Technical Personnel / Total Number of Employees
Proportion of Highly Educated R&D Technical Personnel	A2-2	Number of R&D Technical Personnel with Master's Degree or Above / Total Number of R&D Technical Personnel
Average Training Hours per R&D Technical Personnel	A2-3	Total Training Hours for R&D Technical Personnel / Number of R&D Technical Personnel
Completeness Level of Green Management Systems	B1-1	Refer to Xi and Zhao (2022)[12]
Level of Equity Incentives for Innovation Talents	B1-2	Total Equity Granted to Core Technical/Business Personnel / Total Share Capital
Depth of Industry-University-Research Institute Collaboration	B2-1	Number of Joint R&D Projects with Universities/Research Institutes
Depth of Green Supplier Audit Management	B2-2	Number of Suppliers Undergoing ESG Audit / Total Number of Suppliers
Depth of Green Supplier Capability Co-development	B2-3	Number of Suppliers Participating in ESG Training / Total Number of Suppliers
Increase in Authorized Green Innovation Patents	C1-1	Number of Authorized Green Invention Patents + Authorized Green Utility Model Patents
Proportion of Green Innovation Product Sales Revenue	C1-2	Revenue from Green Innovation Products / Total Sales Revenue
Green Innovation Cost-to-Profit Ratio	C1-3	Total Profit / Total Cost
Green Innovation Sales Profit Ratio	C1-4	Total Profit / Operating Revenue
Recycled Resource Utilization Rate	C2-1	Sourced from Enterprise Sustainability Report
Greenhouse Gas Emission Intensity per Million CNY of Output Value	C2-2	Total GHG Emissions / Total Output Value * 1,000,000
Amount of Environmental Violation Fines	C2-3	Sourced from Enterprise Sustainability Report
Energy Consumption per Ten Thousand CNY of Output Value	C2-4	Total Comprehensive Energy Consumption / Total Output Value * 10,000
Number of Industry Standard Formulation Projects	C3-1	Sourced from Enterprise's Sustainability Report
Number of Green Innovation Awards Received	C3-2	Sourced from Enterprise's Sustainability Report
Customer Satisfaction	C3-3	Sourced from Enterprise's Sustainability Report

### 3.3. Weight determination of green innovation performance evaluation indicators

A total of 46 valid questionnaire responses were collected for this study. The respondents included experts with senior professional titles or higher, professors in the field of performance evaluation from universities, chief accountants from enterprises, internal employees of Enterprise G, and MBA students/seniors. The average scores assigned by these respondents regarding the importance of each indicator were calculated and used as the basis for forming the judgment matrices for the Analytic Hierarchy Process (AHP). SPSSAU software was utilized during the research process to enhance the efficiency of data analysis and ensure the accuracy of the results. The results are shown in Table 2.

**Table 2.** Indicator weight table

Objective Layer	Dimension Layer	Criterion Layer	Indicator Layer	Weight	Comprehensive Weight
Evaluation of G Enterprise's Green Innovation Performance	Green Innovation Resource Input (39.47%)	Capital Input (59.28%)	A1-1	49.08%	11.48%
			A1-2	36.18%	8.47%
			A1-3	14.74%	3.45%
		Human Input (40.72%)	A2-1	61.22%	9.84%
			A2-2	21.97%	3.53%
			A2-3	16.81%	2.70%
	Green Innovation Management Support (25.76%)	Internal Management (64.39%)	B1-1	58.17%	9.65%
			B1-2	41.83%	6.94%
		Collaborative Cooperation (35.61%)	B2-1	30.90%	2.83%
			B2-2	52.49%	4.81%
			B2-3	16.61%	1.52%
	Green Innovation Output Benefits (34.77%)	Economic Benefits (36.24%)	C1-1	13.36%	1.68%
			C1-2	36.25%	4.57%
			C1-3	20.60%	2.60%
			C1-4	29.79%	3.75%
		Environmental Benefits (39.91%)	C2-1	13.98%	1.94%
			C2-2	40.80%	5.66%
C2-3			33.61%	4.66%	
C2-4			11.61%	1.61%	
Social Benefits (23.85%)		C3-1	18.13%	1.50%	
		C3-2	48.81%	4.05%	
		C3-3	33.06%	2.74%	

As can be seen from the Table 2, the top-ranked dimension is Green Innovation Resource Input (39.47%). Within this dimension, the top three indicators by comprehensive weight are R&D Investment Intensity, Proportion of R&D Technical Personnel, and Environmental Protection Investment Intensity. The second-ranked dimension is Green Innovation Output Benefits (34.77%), where the top three indicators by comprehensive weight are Greenhouse Gas Emission Intensity per Million CNY of Output Value, Amount of Environmental Violation Fines, and Proportion of Green Innovation Product Sales Revenue. The third-ranked dimension is Green Innovation Management Support (25.76%), with the top three indicators by comprehensive weight being Completeness Level of Green Management Systems, Level of Equity Incentives for Innovation Talents, and Depth of Green Supplier Audit Management.

#### 4. Evaluation and Analysis of Enterprise G's Green Innovation Performance

##### 4.1. Overview of the Evaluation Method

The fundamental principle of the TOPSIS model is to measure the relative distance of a finite number of evaluation objects within the research sample from both the positive ideal solution and the negative ideal solution, subsequently ranking the measurement results. For each evaluated item, a smaller distance to the positive ideal solution and a larger distance to the negative ideal solution result in a higher relative closeness degree and, consequently, a higher overall evaluation score. If the vector of indicator values for a case enterprise exhibits a smaller distance to the positive ideal solution and simultaneously a larger distance to the negative ideal solution, it indicates better green innovation performance. Conversely, it signifies poorer performance.

##### 4.2. Evaluation Results and Analysis of Enterprise G's Green Innovation Performance

Utilizing the weight coefficients for each indicator calculated in Table 2 and applying the TOPSIS method, the Euclidean distances to the positive and negative ideal solutions for each indicator were first determined. Subsequently, the relative closeness degree of each alternative to these ideal solutions was calculated. This process yielded the green innovation performance evaluation results

for Enterprise G for the years 2022-2024. Based on these results, the annual performance was ranked, as shown in Table 3-Table 5 below.

**Table 3.** Green Innovation Performance Evaluation Results for Enterprise G

Year	Positive Ideal Solution Distance (D+)	Negative Ideal Solution Distance (D-)	Relative Closeness (C)	Ranking
2022	0.315	0.212	0.402	3
2023	0.186	0.334	0.643	2
2024	0.147	0.400	0.732	1

**Table 4.** Dimension Layer Evaluation Results for Enterprise G's Green Innovation Performance

Indicator / Year	2022	2023	2024
Green Innovation Resource Input	0.406	0.432	0.595
Green Innovation Management Support	0.399	0.634	0.835
Green Innovation Output Benefits	0.410	0.802	0.657

**Table 5.** Criterion Layer Evaluation Results for Enterprise G's Green Innovation Performance

Indicator / Year	2022	2023	2024
Capital Input	0.531	0.070	0.492
Human Input	0.031	0.934	0.990
Internal Management	0.538	0.877	0.769
Collaborative Cooperation	0.276	0.472	0.985
Economic Benefits	0.506	0.604	0.804
Environmental Benefits	0.442	0.868	0.606
Social Benefits	0.187	0.747	0.998

As seen in Table 3, the ranking of the green innovation performance scores is 2024 > 2023 > 2022. Enterprise G's green innovation performance improved year by year, achieving the best performance in 2024.

From Table 3-Table 5, it is evident that Enterprise G's green innovation performance score showed a consistent upward trend from 2022 to 2024. During the 2022-2023 period, performance grew steadily, primarily driven by continuous improvements in Green Innovation Management Support and Green Innovation Output Benefits. This growth occurred despite a slight decline in Green Innovation Resource Input during this interval. Analysis of the raw data indicates that the increase in Management Support benefited from both enhancements in the completeness of green management systems and advancements in industry-university-research collaboration, green supplier audits, and training. The rise in Output Benefits was attributable not only to reductions in greenhouse gas emission intensity and energy consumption but also to increased participation in industry standard formulation and higher customer satisfaction. During the 2023-2024 period, despite a dip in Output Benefits, simultaneous improvements in both Resource Input and Management Support effectively counteracted this negative impact, driving Enterprise G's green innovation performance to a new high of 0.732. Analysis of the raw data suggests the increase in Resource Input was mainly due to improvements across multiple indicators under both capital and human input, while the rise in Management Support was primarily fueled by enhanced green supplier auditing and training.

In summary, Enterprise G's green innovation performance is collectively shaped by resource input, management support, and output benefits. Consequently, the enterprise must strategically orchestrate the relationships among these three dimensions, maintain vigilant monitoring of evolving factors, and implement proactive adaptations to effectively drive the enhancement of its green innovation performance.

#### 4.3. Recommendations for Improvement in Enterprise G's Green Innovation Performance

##### (1) Recommendations for Improvement in Green Innovation Resource Input

Regarding green innovation resource input, Enterprise G needs to prioritize the control and adjustment of the allocation of financial and human resources for green innovation. First, establish

minimum intensity thresholds for green innovation resource input. Enterprise G should move beyond focusing solely on the growth of absolute amounts and set specific minimum percentage targets for R&D investment to total assets and environmental protection investment to total assets. These targets should be incorporated as Key Performance Indicators into the executive evaluation system, triggering specialized assessments and corrective actions if thresholds are approached or breached. Furthermore, when formulating large-scale expansion plans, the potential impact on the intensity of green innovation resource input must be concurrently assessed. Proportional increases in green innovation resources should be pre-emptively planned to ensure expansion does not dilute investment intensity. Second, optimize the structure of green innovation fund allocation to enhance efficiency. Given the finite nature of green innovation funds, Enterprise G must rigorously evaluate R&D projects, prioritizing funding for those with significant impact on the enterprise's core competitiveness and future growth engines. Strengthened project management and process control, including regular project reviews, are essential to promptly identify and adjust projects that are inefficient or misaligned with the green innovation strategy, thereby avoiding wastage of funds. Third, enhance R&D organizational effectiveness and talent density. As the enterprise scales, Enterprise G should further optimize its R&D organizational structure to ensure that the quantity and quality of core R&D talent increase in tandem, or even prioritize talent growth. Continuously identifying and nurturing high-caliber R&D personnel is crucial for building a robust talent reservoir for the enterprise.

## (2) Recommendations for Improvement in Green Innovation Management Support

In terms of green innovation management support, Enterprise G needs to further refine its green management systems and deepen collaborative efforts in green innovation. First, improve the green energy management system. While Enterprise G's overall green management system is relatively well-developed, its green energy management remains nascent. The enterprise should continuously optimize its energy management system, integrating energy management into internal management processes. Accelerating the digitalization and intelligent management of green energy will ensure efficient and sustainable energy use. Second, persistently enhance collaborative cooperation in green innovation. Although Enterprise G currently performs well in industry-university-research collaboration and green supply chain management, it should strive to move beyond traditional project-based cooperation models. Building a sustainable ecosystem characterized by "demand orientation-resource integration-value co-creation" for deeper industry-university-research ties is recommended. Furthermore, incorporating supplier greenification metrics into executive performance evaluations will elevate green supplier management standards, thereby consolidating advantages in these key areas.

## (3) Recommendations for Improvement in Green Innovation Output Benefits

Regarding green innovation output benefits, Enterprise G needs to focus on controlling the costs of green innovation products, clarifying environmental responsibilities, undertaking the social obligation of promoting the value of green innovation, and enhancing customer recognition of its green innovation efforts. First, reduce costs and improve efficiency. Given the high costs associated with green innovation, Enterprise G should strengthen cost control through robust product lifecycle cost design, technology-driven cost reduction, digital cost management, and linking R&D personnel performance bonuses to cost-related metrics. Second, Enterprise G should clearly define its environmental responsibilities. It can leverage green innovation to profoundly adjust its energy structure, reduce energy consumption, increase the proportion of installed clean energy capacity, and supply more green electricity to society. Third, Enterprise G should proactively take the lead in establishing authoritative and efficient industry exchange and cooperation platforms. By convening diverse stakeholders to facilitate information exchange and resource sharing, and by actively and deeply participating in the formulation of influential international and domestic industry standards, specifications, and certification systems, the enterprise can enhance its voice in rule-making and significantly boost the industry's green innovation capability and sustainable development level. Fourth, Enterprise G should enhance the brand value of its green innovation products and services.

Strengthening customer recognition and satisfaction regarding its green innovations will ultimately advance the enterprise's green innovation development.

## 5. Conclusions

This study constructed a green innovation performance evaluation indicator system based on an input-output perspective, incorporating considerations of Enterprise G's green innovation management across three dimensions: Green Innovation Resource Input, Green Innovation Management Support, and Green Innovation Output Benefits. Subsequently, the indicator weights for the evaluation system were determined using the Analytic Hierarchy Process (AHP), and the TOPSIS model was applied to calculate the green innovation performance results. Finally, based on the evaluation results, existing problems in the enterprise's green innovation were identified, and targeted recommendations were proposed for Enterprise G, leading to the following conclusions:

(1) The evaluation and analysis were conducted using a combined AHP-TOPSIS approach. First, AHP was used to determine the weights of the observed indicators. Then, TOPSIS was employed for comprehensive evaluation, deriving the relative closeness value for each decision alternative (each year). This allowed for the specific ranking of Enterprise G's scores across dimensions from 2022 to 2024 and a detailed analysis of its score trends over this period. The analysis revealed that: a. In the initial phase of scaling up green innovation resources, Enterprise G experienced an imbalance in the allocation of capital and human resources. However, following timely adjustments, both areas showed significant increases in the most recent two years; b. The level of Green Innovation Management Support continuously improved, but a shortcoming remains in the area of equity incentives for innovation talent; c. The Green Innovation Output Benefits of Enterprise G were generally good overall, but further improvements are needed in reducing energy consumption and enhancing customer satisfaction; d. The overall green innovation performance showed an upward trend, constrained collectively by the levels of Resource Input, Management Support, and Output Benefits.

(2) Optimization recommendations are proposed based on Enterprise G's green innovation performance evaluation results. According to the aforementioned analysis, enhancing Enterprise G's green innovation performance primarily involves the following aspects: a. Regarding Green Innovation Resource Input: Enterprise G needs to focus on the control and adjustment of the allocation of both financial and human resources dedicated to green innovation; b. Regarding Green Innovation Management Support: Enterprise G should further refine its green management systems and innovation talent incentive mechanisms, while also deepening industry-university-research collaboration and green supply chain management; c. Regarding Green Innovation Output Benefits: Enterprise G needs to prioritize cost control for green innovation products, clarify environmental responsibilities, undertake the social obligation of promoting the value of green innovation, and enhance customer recognition and satisfaction regarding its green innovation efforts.

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## References

- [1] Guan Jiancheng, Chen Kaihua. Measuring innovation performance of Chinese high-tech industries. *Journal of Quantitative & Technical Economics*, 2009, 26(10): 19-33.
- [2] Zhang Jingxiao, Kang Le, Li Hui, et al. The impact of environmental regulations on urban green innovation efficiency: The case of Xi'an. *Sustainable Cities and Society*, 2020, 57: 102123.
- [3] Lin Shoufu, Wang Qian, Guan Heshan. Dynamic Evaluation on Green Technology Innovation Efficiency of Chinese Industrial Enterprises. *Science Research Management*, 2023, 39(16): 163-168.
- [4] Fan Decheng, Jia Mingzhe. Research on the impact of R&D resource mismatch on the efficiency of industrial green technology innovation: Based on the threshold effect of digital economy. *Science Research Management*, 2024, 45(06): 95-104.

- [5] Chen Yushan, Lai Shyhbao, Wen Chaotung. The Influence of Green Innovation Performance on Corporate Advantage in Taiwan. *Journal of Business Ethics*, 2006, 67(4): 331-339.
- [6] Sarkis Joseph, Gonzalez-Torre Pilar, Adenso-Diaz Belarmino. Stakeholder pressure and the adoption of environmental practices: The mediating effect of training. *Journal of Operations Management*, 2010, 28(2): 163-176.
- [7] Xu Wen. Market pressure, green innovation strategy and firm financial performance. *Communication of Finance and Accounting*, 2020(04): 51-55.
- [8] Xie Xuemei, Zhu Qiwei. How Can Green Innovation Solve the Dilemmas of "Harmonious Coexistence"? . *Journal of Management World*, 2021, 37(1): 128-149.
- [9] Bi Kexin, YANG Chaojun, Sui Jun. Impact of MNCs' Technology Transfer on Green Innovation Performance: Perspective of Manufacturing Green Innovation System. *China Soft Science*, 2015(11): 81-93.
- [10] Sun Liwen, Chen Jilin. Performance Evaluation of Green Innovation Based on EES Coordinated Development: Taking Bohai Economic Rim as an Example. *Science and Technology Management Research*, 2018, 38(08): 87-93.
- [11] Hu Junan, Hu Jin. Research on Performance Evaluation of Green Technology Innovation of Enterprises in Strategic merging Industries in Jiangxi Province. *Science and Technology Management Research*, 2023, 43(07): 33-41.
- [12] Xi Longsheng, Zhao Hui. *Business and Management Journal*. Senior Executive Dual Environmental Cognition, Green Innovation and Enterprise Sustainable Development Performance, 2022, 44(03): 139-158.