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Enterprise Green Technology Innovation Strategy Based on Environmental Responsibility

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Abstract: *Green development is a hot issue that academia is currently paying more attention to, and green technological innovation is an important strategic choice for enterprises to deal with environmental issues at this stage, promote sustainable development of enterprises, and improve their competitiveness. The purpose of this article is to study the green technology innovation (This article is abbreviated as GTI) strategy of enterprises mainly based on environmental responsibility. Taking 40 domestic manufacturing companies as cases, the research method of horizontal research and case investigation is adopted to carry out the definition, ecological chain and advantages of GTI strategy. This study compares the traditional enterprise innovation strategy and the enterprise GTI strategy through the design experiment to further analyse the enterprises' emphasis on environmental responsibility. In addition, the company's performance and environmental performance were further analysed, and the implementation of the company's strategy was analysed by mathematical statistics to verify the effectiveness of the company's GTI strategy. The experimental data shows that most entrepreneurs choose the development concept under GTI. The introduction of a GTI strategy is beneficial to reducing the time and production costs of production and operation, which can further increase the operational productivity of a company. The experimental data show that the implementation of environmentally responsible corporate GTI strategy has improved the financial performance of the company by about 20%, and the economic performance of environmental performance has been reduced by about 21%, which has promoted the production and healthy and orderly operation of the enterprise. It is a guideline for the study of companies' GTI strategies and environmental responsibility.*

Keywords: *Environmental Responsibility, Green Technology, Innovation Strategy, Business Operation Efficiency, Business Performance*

1. Introduction

Nowadays, problems such as shortage of relevant resources, serious environmental pollution, and destruction of ecosystems are gradually emerging in the development process. The report of the 19th National Congress of the Communist Party of China states that "the establishment of a legal system and policy guidance for green production and consumption, and the establishment of a sound and low-carbon economic development system." It is necessary to build a resource-saving and environment-friendly green development system, realize green cycle and low-carbon development, and harmonious coexistence between man and nature, firmly establish and practice the concept of green mountains and green mountains is the golden mountain and silver mountain, and form a new pattern of modern development of harmonious development between man and nature. However, in this process of rapid development in China, enterprises play a crucial role. As the most basic organization and the main body of market development in China's economic and social development, enterprises are the foundation of China's economic development and can promote the construction of a green economic system. The business model and development path of an enterprise are the key to promoting the realization of corporate goals. However, in the midst of rapid corporate growth, corporate environmental responsibility is increasingly being taken seriously by companies.

Contradictions in the process of economic and social development have gradually emerged. For example, problems such as the waste of related resources and serious environmental pollution need to be resolved. Therefore, further changes in the model of economic development are aspects that need urgent attention in economic and social development at this stage. In the new mode of economic

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development, the strategy of corporate green innovation is the key to accelerating corporate development and improving corporate performance [1-2]. The GTI strategy is mainly to adopt green technology development strategies in the related business activities of the enterprise, to further reduce the degree of pollution in the development process of the enterprise, and to focus on the innovation and development of the enterprise. Enterprise GTI strategy is an area that China's academic circles pay more attention to. This strategy mainly focuses on integrating environmental responsibility into the process of enterprise innovation and development [3].

Buwule R S and other researchers found that GTI is an important economic strategy. In order to achieve an overall improvement in the GTI capability of Chinese enterprises, the GTI efficiency of industrial enterprises needs to be measured and regional differences need to be studied. This will lead to the establishment of a system of indicators to assess the efficiency of green innovation in enterprises [4]. The loop of environmental degradation and economic development, according to Anthony B J and other researchers, is a challenge for the nation's effort at sustainable development. Green technological innovation, a sophisticated environmental protection and technology innovation idea, has the secret to breaking this perplexing loop. His research is assessed in terms of how much energy is saved and how much emissions are reduced. Anthony B J and other researchers also looked at how government R & D funding and environmental regulations affected the development of green technologies. Anthony B J and colleagues provided three additional controls (regional development level, regional manufacturing percentage, and regional export-oriented economic development level), and discussed their effects on the development of green technology [5].

In today's world, China’s economy is growing day by day, and residents ’living standards are gradually improving. The development of enterprises is an important part of China’s economic and social development. Enterprise reforms and accelerated transformation of corporate structures have made corporate responsibility for production development and production environment an important part of corporate social responsibility.

2. Proposed Method

2.1 Definition and Classification of GTI Strategy

(1) Characteristics of GTI strategy

GTI is the integration of environmental responsibility into corporate technology innovation, the so-called GTI. In every stage of enterprise innovation, we should pay attention to the protection of the environment and strengthen the integration of environmental protection consciousness to reduce the pollution problems generated by enterprises in the production process, thereby further reducing production costs. GTI emphasizes that we should learn to save resources and recycle resources. Green technology mainly includes three aspects, that is, governance level technology, production level technology, and product level technology. First of all, in terms of governance, mainly based on the current production technology, a certain treatment of waste in production is performed to reduce the environmental pollution as much as possible [6-8]. Secondly, at the production level, it is mainly improved by improving production technology, such as using clean raw materials, simplifying production processes, and adopting advanced production technologies. Finally, at the product level, green products mainly refer to products that are discarded after consumption and are in a state of scrap, and may face natural degradation processes, but this process will not cause damage to the external environment.

(2) Structural system of GTI ecological chain

GTI is mainly based on green innovation, taking environmental responsibility into consideration. This process not only includes the theoretical knowledge of green innovation, but also includes the process of green innovation as a technology application market. It is the application of theoretical knowledge. No matter what stage of innovation, environmental responsibility needs to be considered accordingly. Thus, a sustainable supply chain of "green design → green manufacturing → green packaging → green products → green marketing" is formed, integrating environmental responsibility into every application stage of the supply chain. In addition, enterprises supervise each production process by establishing corresponding environmental management systems. Enterprises should shorten the production cycle of their products as much as possible, eliminate or reduce pollution and waste in the production process as much as possible, so as to promote the development of enterprises and improve their performance [9].

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(3) Characteristics of GTI strategy

Green innovation strategy can further enhance corporate image and corporate core competitiveness. The implementation of this strategy, on the one hand, is conducive to reducing the production costs and time costs of enterprises, shortening the production cycle of products, at the same time, it can reduce the waste of corporate resources, reduce the environmental damage caused by corporate production, and further enhance the corporate image, thereby Improve the competitiveness of enterprises [10-12]. On the other hand, green innovation strategies can bring opportunities to the development of enterprises. Transforming the advantages of corporate green innovation into economic advantages can further enhance the competitiveness of enterprises. In today's era, China is committed to building an environment-friendly society. It should establish the concept of protecting the environment, increase investment in environmental protection, and actively fulfill the responsibility of environmental protection, which is conducive to the improvement of corporate environmental performance, financial performance and economic performance. The implementation of GTI and development strategy is an important strategy implemented by Chinese enterprises at this stage. This strategy can well fit the overall strategic deployment of the enterprise, meet the needs of enterprise development, and can promote the production development and economic benefits of enterprises. 13-15]. At this stage, the environmental pollution caused by the development of enterprises is becoming more and more serious. There is an urgent need for a new type of enterprise development path, and a new type of enterprise development model suitable for the development of the era is urgently needed. Therefore, the implementation of GTI strategy is particularly important. First, implementing a GTI strategy can reduce the time cost and production cost of the company’s product production, reduces the pollution to the external environment, reduce the single cycle of the company's production of products, and then reduce the overall cycle of the company's production, which can be used rationally. Enterprise resources make full and effective use of enterprise resources, which has a very important impact on the improvement of enterprise operation efficiency and performance. Second, the implementation of GTI strategies is closely related to national policies and government support. The state should improve the relevant laws and regulations as much as possible, and focus on the planning of corporate strategy from the national level. The relevant government departments should also issue corresponding policies that closely conform to the national laws and regulations. At the same time, government departments should increase Investment in environmental protection provides a guarantee for the implementation of enterprises' GTI strategies [16-18].

2.2 Corporate Environmental Responsibility

(1) Characteristics of corporate environmental responsibility

Corporate environmental responsibility is one of the components of corporate social responsibility. Corporate environmental responsibility can not only improve the economic benefits of enterprises, but also further improve the utilization of corporate resources, reduce environmental pollution as much as possible, and improve production efficiency. In general, corporate environmental responsibility can be divided into two parts, namely the corporate legal environment and corporate ethical environment. The legal environment of an enterprise means that the enterprise is stipulated by laws, regulations, legal standards, etc., and should assume the obligation to protect the environment and use resources reasonably; the moral environment of the enterprise refers to the consciousness of responsibility for protecting the environment from the perspective of environmental ethics. Corporate environmental responsibility is a part that must be taken into account in the production process of enterprises, and has a crucial impact on the development of enterprises and the improvement of economic benefits [19]. Therefore, in the process of enterprise production and operation, it is necessary to strengthen the propaganda of environmental protection consciousness of the enterprise, and take on the responsibility of environmental protection as much as possible.

(2) Structural characteristics of corporate environmental responsibility

China has long ago proposed that the strategy of sustainable development should be fully implemented and the environmental responsibility of enterprises should be fulfilled. Today, the contradictions in the environment have become very prominent, and the dual needs of economic growth and environmental protection should be considered. Under pressure, companies pay close attention to the environmental issues of enterprises, and enterprises face very large bases and challenges in terms of environmental responsibility. The operation and development of Chinese enterprises are affected by external and internal environments [20]. From the perspective of the internal environment of enterprises, nowadays, China is vigorously promoting green consumption, and

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environmental responsibility has attracted great attention from the business community. First of all, the increased awareness of consumers' environmental protection has made companies pay more and more attention to various environmental issues, and make corresponding adjustments and reforms according to consumer needs. Secondly, various stakeholders are paying more and more attention to the environmental impact of corporate development. This is an important reflection of corporate image and a reflection of the competitiveness of an enterprise market. From the perspective of the external environment, foreign countries have earlier paid attention to environmental problems caused by corporate development, and adopted relevant measures to restrict the environmental responsibility accordingly, and formulated strict rules for corporate development. From the perspective of the internal and external environmental characteristics of corporate development, corporate environmental responsibility has attracted increasing attention.

(3) Strategic characteristics of environmental responsibility of enterprises

Environmental responsibility is an important part that must be considered during the development of an enterprise. Environmental responsibility of a company is crucial to the improvement of corporate performance. Nowadays, with the vigorous implementation of the science, technology and innovation strategy, corporate environmental responsibility is the first and foremost important concern in the production and development process of enterprises. On the one hand, enterprises' environmental responsibility can enable them to establish certain competitive advantages and promote their ideal development. Such as the development path of China's multinational companies can well reflect this characteristic significance. At this stage, the development of multinational corporations has gradually shifted from hardware competition to software competition, gradually from the corresponding competition in technology, to the competition in environmental ideas and environmental ethics. On the other hand, enterprises' environmental responsibility can further reduce their production costs and increase their production efficiency. For the enterprise, in the daily production and operation process, the enterprise's environmental protection investment is a relatively large expenditure. Strengthening GTI is a key step to further reduce costs and improve efficiency. Therefore, we should accelerate corporate green innovation, change the company's current operating model, and promote a certain degree of reform in order to reduce production costs and promote production development. Therefore, implementing a GTI strategy is a key strategy at this stage to further enhance corporate competitiveness and meet the challenges of environmental responsibility (Figure 1).

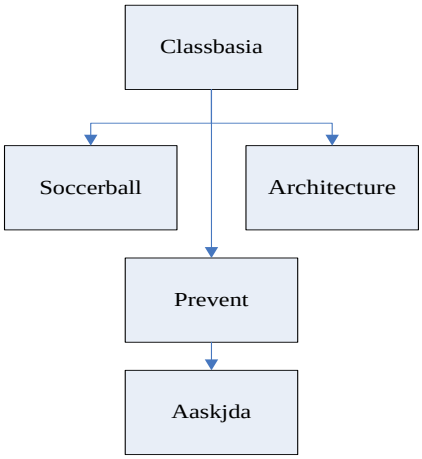

Figure 1: Classification of carbon nanomaterials

3. Experiments

3.1 Experimental Settings

(1) Experimental background

This experiment mainly takes China's manufacturing enterprises as an example. By monitoring and measuring the operational effectiveness of 40 manufacturing companies nationwide in real time, and the arrangement of multi-level management personnel to transfer tasks, this experiment can further ensure the orderly conduct of the experiment Successful implementation. Therefore, in the future, whether it can further improve the efficiency of the company's operations. This article mainly uses

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experimental methods to test 40 manufacturing companies at this stage, and considers environmental responsibility. The company implements GTI strategies to evaluate and ensure the development of production and the improvement of enterprise efficiency.

(2) Experimental setup process

In this paper, environmental responsibility is incorporated into the production and development of manufacturing companies, and the operating efficiency of the company is studied. The method of horizontal comparison and case investigation is used to record the development status of manufacturing companies at various stages. Real-time data transmission through network technology can further ensure the production development and operation efficiency of manufacturing enterprises. Then it compares with the development of traditional enterprises, and further determines the operating efficiency of enterprises that take environmental responsibility into consideration, so as to evaluate the development of enterprise performance under the environmental technology innovation strategy.

3.2 Experimental Steps

1) Operational efficiency of manufacturing enterprises under corporate GTI strategy

Through human control, GTI strategy is implemented in each link, environmental responsibility is taken into account, and operational efficiency evaluation is carried out according to the actual stage of the company's actual operation to test the operational effectiveness of each manufacturing enterprise.

2) Operational efficiency of manufacturing companies under traditional corporate innovation strategies

Using manufacturing firms under the innovation strategy of traditional firms as a control group, the 40 firms were divided into four groups. Each group is a manufacturing firm under the innovation strategy of a traditional firm.

3) The importance of implementing GTI strategies

As a control group, the traditional enterprise innovation strategy is compared with the data obtained by implementing the GTI strategy, and the accuracy and cost of the data obtained by the two methods are observed.

4) Evaluation of business operation efficiency

The operating efficiency of manufacturing enterprises is mainly reflected by their performance. Financial performance is mainly expressed by the total revenue of the enterprise, and environmental performance is mainly reflected by environmental protection expenditures and the degree of pollution of the enterprise.

5) Feasibility of implementing GTI strategy based on environmental responsibility

The parameters of manufacturing organizations' GTI strategies are monitored based on comparisons between experimental and control groups, and the simulation parameter estimation method is practical thanks to the simulation database.

4. Discussion

4.1 Data Analysis

(1) From the traditional group's corporate innovation strategy and the experimental group's GTI strategy, we can find a comparison between the two in terms of time spent, cost of consumption, business operation efficiency, and measurement of business innovation strategy. First, in terms of time spent, the traditional group spent 5.1, 4.7, 4.8, and 5.2 hours, while the experimental group spent 2.2, 2.4, 2.6, and 2.5 hours, respectively. It can be found that compared with the data of the traditional group, the experimental group can shorten the time to a certain extent and reduce the corresponding time cost. Second, in terms of consumption costs, the costs consumed by the traditional group are: 2.2, 2.5, 2.4, and 2.6 yuan, while the costs consumed by the experimental group are 1.1, 1.3, 1.5, and 1.2 yuan. It can be found that compared with the traditional group, the experimental group can further reduce production costs, reduce waste of resources, and can reasonably use resources. Thirdly, in terms of corporate operational efficiency, the corporate operational efficiency of the traditional group is 6.5, 6.9, 6.4, and 6.6, while the corporate operational efficiency of the experimental group is 7.7, 7.9, 7.8,

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and 7.6, respectively. It can be found that the experimental group has more advantages than the traditional group, especially in the operation of the enterprise, which is helpful for boosting the enterprise's operational effectiveness and encouraging the enterprise's development. Fourth, in the measurement of enterprise innovation strategy, the measurement results of the traditional group are: 5.6, 5.5, 5.7, and 5.9; and the measurement results of the experimental group are: 6.6, 6.5, 6.3, and 6.4. Therefore, the evaluation results of companies implementing GTI strategies show high data, indicating that they are conducive to the future innovation and development of enterprises. Overall, the implementation of the GTI strategy has not only shortened the production time of the company's products, but also reduced its production costs. It can be seen from the data that compared with the traditional group, the results of the experimental group are more advantageous. The experimental data of the traditional group are shown in Table 1 and Figure 2. Table 2 and Figure 3 reflect the experimental data for the experimental group.

Table 1: Results of traditional corporate innovation strategies

	Response time in traditional mode	Response time to the first algorithm in this experiment	Response time to the second algorithm in this experiment
Service terminal A	35	12	15
Service terminal B	34	13	13
Service terminal C	36	13	15
Service Terminal D	33	14	13

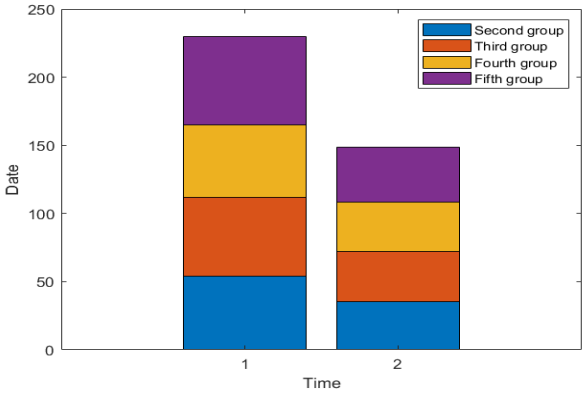

Figure 2: Results of traditional corporate innovation strategies

Table 2: Results of corporate GTI strategies

Volume of tasks	Individual fog nodes	CF-CPSO-LB
1.8	2	2
1.9	4	3
2	6	3.5
2.2	8	3.7
2.5	10	4.2

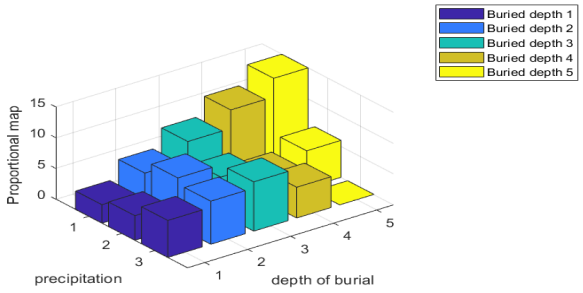

Figure 3: Results of corporate GTI strategies

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(2) Judging from the time spent by the experimental group and the traditional group and the degree of enterprise operation efficiency, the overall performance level of the enterprise has been improved. First, in terms of production time of a single product, the experimental group saved nearly half of the production time compared with the traditional group, shortened the production cycle of the company's products, and benefited the healthy operation of the company. In terms of the satisfaction of internal and external personnel of the company, compared with the results of the previous strategy implementation, the results of the experimental group can make people more satisfied, and can improve people's identity and trust in the company. It is further conducive to providing enterprises with a steady stream of labor. The comparative analysis results of the traditional group and the experimental group are shown in Figure. 4.

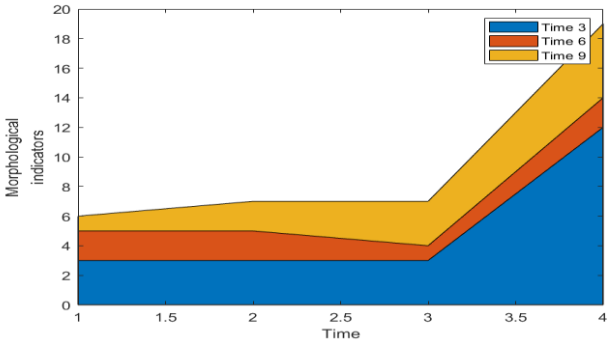

Figure 4: Results of corporate GTI strategies

4.2 System Data Analysis

(1) Enterprise performance analysis

The corporate performance involved in this study mainly includes two aspects, namely corporate financial performance and corporate environmental performance. In this paper, through investigation and analysis of 40 manufacturing companies, we can get data on financial performance and environment of the company. The minimum value of corporate financial performance is -2.8, the highest is 6.5, the average is 0.9, and the standard deviation is 0.6. The minimum value of environmental performance is -0.4, the maximum is 0.6, and the average is 0.1, as shown in Table 4 below. There is a 0.2 standard deviation. In this survey, the control variables were controlled accordingly to ensure that the experiment was performed effectively and made the experimental data more accurate and credible. The comparative analysis of corporate financial performance and environmental performance is shown in Table 3 and Figure 5.

Table 3: Descriptive statistics of corporate financial performance

name	Minimum value	Max	Mean	Standard deviation
Financial Performance	-2.8	6.5	0.9	0.6
Environmental performance	-0.4	0.6	0.1	0.2
Enterprise size	1	26	19	5
age	2	20	12	5

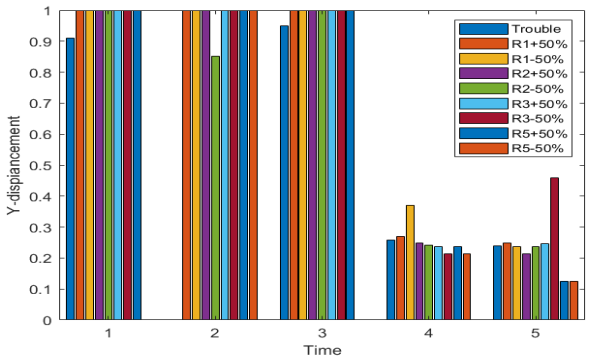

Figure 5: Descriptive statistics of corporate financial performance

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(2) Survey of corporate satisfaction

An enterprise implementing an environmental friendly innovation strategy can further reduce its production costs, shorten its production cycle, and promote its further transformation. For this reason, a survey on the satisfaction of the environmental friendly innovation strategy of the 40 companies surveyed was conducted to further obtain people's views and opinions on the strategy. For the traditional group, the scores of the five companies surveyed are: 10, 35, 56, 40, and 20; for the experimental group, the scores of the five companies surveyed are: 25, 48, 80, 52, 36. It can be seen that the experimental group's level of satisfaction has increased in line with that of the traditional group. As a result, implementing a GTI plan is crucial for the growth of businesses. The results of the corporate satisfaction survey are shown in Table 4 and Figure 6.

Table 4: Satisfaction survey

	Traditional group	Test group
1	10	25
2	35	48
3	56	80
4	40	52
5	20	36

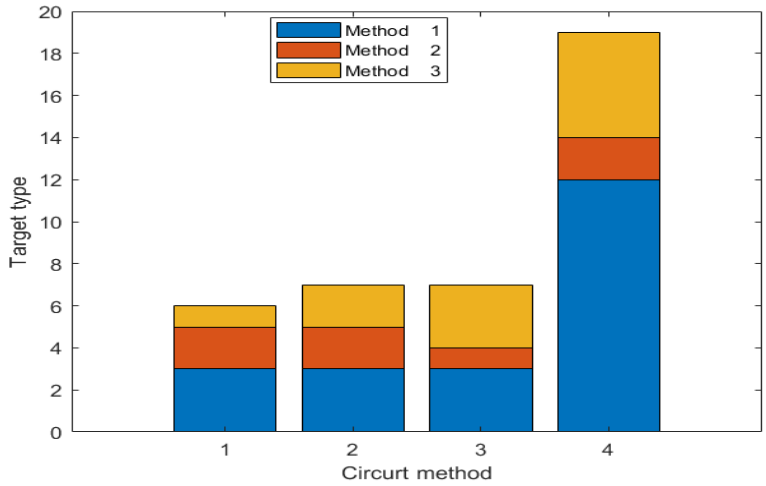

Figure 6: Satisfaction survey

5. Conclusions

With the rapid economic development in today's world, enterprises are also facing a crisis of transformation. Only by accelerating the transformation of enterprises can they keep up with the times. However, we must first strengthen the macro-deployment of the development of the enterprise and improve the strategic planning of enterprise development. Through the investigation and research in this article, we can find that the common problem facing the development of enterprises is environmental protection. Enterprises should strengthen the study of environmental theoretical knowledge, and at the same time be able to apply it to practice on the basis of learning theoretical knowledge. In this article, we effectively combine environmental responsibility with corporate GTI strategies to further promote corporate transformation and development and strategic planning.

Through the research on the GTI strategy of the enterprise, the following conclusions can be drawn: First, the implementation of the GTI strategy is conducive to reducing the time and production costs of the production and operation of the enterprise, and can further improve the operational efficiency of the enterprise. Green innovation refers to integrating environmental responsibility into the daily production and operation scope of enterprises in the production process, emphasizing the promotion of environmental protection knowledge. No matter what stage of production development, enterprises should always take into account the environmental pollution caused by production. The enterprise shall supervise the various processes of production and operation to prevent the abuse of resources. Enterprises do their best to reduce the damage to the environment and the healthy operation of product

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production. The implementation of GTI strategy is conducive to the improvement of financial performance and environmental performance, and promotes the development and healthy and orderly operation of enterprises. The GTI strategy can shorten the production cycle of the company's products, which in turn can bring more profits to the company, which will help the company to further expand its market share and enhance its market competitiveness. Second, it is also conducive to the improvement of corporate environmental performance. Incorporating environmental responsibility into the process of GTI strategy has strengthened people's awareness of environmental protection, enabling enterprises to use resources to the greatest extent, reducing waste of resources and reducing production costs, and promoting better development of enterprises.

The green innovation strategy is not only conducive to the improvement of corporate performance, but also enhances the market competitiveness of the enterprise, enables the enterprise to establish a good social image, and has a certain foothold in the market. The implementation of the GTI strategy can save enterprises time, reduce costs, and save resources. At the same time, green innovation at the technical level is also conducive to companies' transformation from products and processes, and enhances their core competitiveness. The purpose of this article is to study the GTI strategy of enterprises mainly based on environmental responsibility. Taking 40 domestic manufacturing companies as cases, the research method of horizontal research and case investigation is adopted to carry out the definition, ecological chain and advantages of GTI strategy. Elaborate and further point out the importance of implementing this strategy. And through the design of experiments comparing traditional corporate innovation strategies and corporate GTI strategies, to further analyze the degree of emphasis on environmental responsibility. In addition, further analysis of corporate performance and environmental performance, and mathematical statistical analysis of the company's implementation of the strategy, to verify the effectiveness of the company's GTI strategy. Experimental data show that most entrepreneurs choose the development concept under GTI. The implementation of GTI strategy is conducive to reducing the time and production costs of production and operation of the enterprise, and can further improve the operational efficiency of the enterprise. The experimental data show that the implementation of environmentally responsible corporate GTI strategy has improved the financial performance of the company by about 20%, and the economic performance of environmental performance has been reduced by about 21%, which has promoted the production and healthy and orderly operation of the enterprise. It has certain guiding significance for the research on corporate GTI strategy and environmental responsibility.

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