

Transformation of Enterprises' Low-Carbon Business Model from the Perspective of ESG Investment

Hongsong Zhu, Jiahui Chen, Wenjuan Liu*

Guangzhou College of Technology and Business, Foshan 528100, Guangdong, China
13635474051@163.com
*corresponding author

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Abstract: Low-carbon economy is an important means to achieve sustainable development. As an indispensable part of technological innovation and industrial transformation, low carbon business model is a new way of enterprise operation. Under the concept of sustainable development investment, this paper conducts relevant research on the transformation of enterprises' low-carbon model in order to reduce environmental pollution and improve the social benefits of enterprises. This paper mainly analyzes the transformation of enterprises' low-carbon business model from the perspective of ESG investment by means of field survey and questionnaire survey. The survey results show that more than 50% of people believe that low-carbon development in the transformation of business model needs to start with the transformation of industrial structure and the promotion of low-carbon technology.

1. Introduction

The carbon emissions of enterprises are increasing, and environmental problems are increasingly prominent. Low energy consumption and efficient use of energy have become the top priority. Low-carbon economy is a new industrial model based on sustainable development and taking the route of cleaner production through technological innovation, industrial transformation and institutional reform. In the context of low-carbon economy, the goal of enterprise transformation is to achieve "reduction" and "green operation". This business philosophy is not only about technological innovation, but also about management and brand building.

There are many theories related to sustainable development and low-carbon business model. For example, some experts believe that the sharing economy, as an emerging business model, can effectively integrate resources and digest overcapacity [1-2]. Other experts believe that low-carbon economy plays an important role in reducing energy consumption, reducing carbon dioxide emissions and increasing corporate profits [3-4]. In addition, some experts suggest that if energy companies want to find their own position, they must actively explore new ways of development [5-6]. The impact of the low-carbon era on the investment of energy companies is very complex. In the context of the development of low-carbon economy, enterprises, as an important part of technological innovation and industrial transformation and upgrading, need to constantly strengthen

their own scientific and technological research and development capabilities and improve product quality and service level.

This paper first studies the core content of ESG investment, which is to analyze the social benefits and sustainability of enterprise investment. Secondly, the business model is discussed. Then the method and algorithm analysis of the performance evaluation of low carbon operation are carried out. Finally, through field survey and questionnaire survey, the low-carbon business model and its problems of local enterprises are elaborated and relevant data and conclusions are drawn.

2. Transformation of Low Carbon Business Model of Enterprises Invested by ESG

2.1. Corporate Social Responsibility Investment

Corporate social responsibility investment is a variety of investment activities carried out by a company to fulfill its responsibilities to all stakeholders. The investment object is a company committed to the five forces of economy, society, environment, resources and ecology. Its main goal is to encourage enterprises to make profits while taking social welfare into account. Corporate social responsibility practice is not only limited to corporate social responsibility investment behavior, but also includes how the concept of corporate social responsibility is integrated into corporate culture, corporate social responsibility expression and corporate social responsibility supervision mechanism. In essence, the company value is the present value of the company's future cash flow, the performance of the company's past and current profitability and development potential, and the expectations of the company's current and potential investors. Corporate social responsibility investment has a positive impact on long-term financial value.

Sustainable development means the proper use of resources within the framework of ecological sustainability and sustainable economic development. The development of industrial structure is also closely related to the ecological environment and economic development, with certain regularity. In order to support economic and social development, a reasonable industrial structure can often reasonably allocate factors according to the current market demand. When introducing new technologies, they can also play a communication role through good links between industries. Therefore, the benefit of economic resources input and output depends to a large extent on the reasonable state of industrial structure [7-8].

New impetus has brought new growth space. The rationalization of industrial structure should always make sustainable development the basic principle for achieving effective and coordinated development among different systems and components in the region. By adjusting the relationship between industry and other relevant factors, the supply and demand of different industrial sectors can be dynamically balanced, and the effective use of resources can be realized according to environmental capacity and technical conditions, so as to achieve better economic, social and industrial structure benefits.

2.2. Business Model

Business model is the logic that companies must follow to create value. In order to realize and maintain this logic, first of all, it is necessary to clarify the company's position in the value chain, that is, identify target customers, clarify customer value, and propose relevant product or service portfolio. Second, continuous innovation is to accumulate unique competitive advantages for companies different from the industry, while clarifying the opportunities for companies to maintain their value, financial status, price and profit sources. After all, business model is a value flow channel connecting customers and suppliers. The company must also update its business model to adapt to the changes in the internal and external environment to adapt to the long-term stable

development of the company. The main role of business model is to select target customers, clarify customer value, and provide appropriate products or services to meet customer needs [9-10]. Common business models are shown in Figure 1:

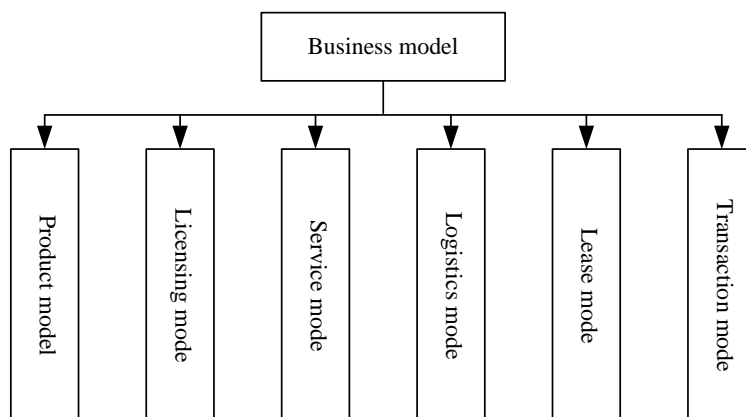


Figure 1: Common Business Models

The product model should be the most common business model: develop and sell technology-based products and generate revenue from them. The licensing model means that the company has some basic technology. If other companies have to use patented technology, they must pay certain license fees to companies that have patented technology or other intellectual property rights other than patent law. The service model generates profits by providing customers with relevant services that need to be paid. The main business model adopted by commodity trading companies is the logistics model, which mainly completes the work of a series of flow links of goods from factories to consumers through the production line. The leasing model is designed to meet the needs of some consumers. They only want to obtain the right to use a certain product, only need to use it for a certain period of time, and do not want to own the product for a long time and spend a relatively high price. In-application purchase is the unique business model of Internet companies. Transaction mode, mainly through promoting various transactions to collect some intermediate fees.

2.3. Enterprise Model Transformation

Low-carbon business model refers to the combined operation of enterprises for emission reduction targets through the development of green industrial chain suitable for themselves. It emphasizes the efforts made in sustainable economic growth and the realization of recycling resources. It requires the sustainable and coordinated development of environment, resources and human security in the process of transformation from traditional economy to modern society. It requires enterprises to pay attention to the coordination of resources and environment in the process of operation, and achieve the best balance among economic benefits, social values and ecological benefits.

From the perspective of enterprises, transformation can improve their position in the industrial chain and gain a new round of competitive advantages. In the context of the development of low-carbon economy, enterprises must conduct in-depth research and analysis if they want to transform successfully. The core of the transformation of enterprises' low-carbon business model is technological innovation. With the goal of promoting the transformation and upgrading of enterprises, technological innovation and industrial upgrading, we strive to achieve sustainable development. At the same time, strengthen the construction of cooperation mechanism and

information sharing platform for investors and domestic investors, and make a beneficial attempt. If enterprises want to transform and develop, they must adjust and upgrade the industrial structure. The first is to improve the management's awareness of environmental protection policies and technological innovation projects. The second is to introduce foreign advanced energy-saving and emission reduction new processes and equipment to reduce the energy waste in the production process. Finally, from the aspect of management methods, we should strengthen the enterprise information construction, establish an efficient and complete information management system, so that decision-makers can timely obtain effective data and make correct judgments [11-12].

3. Relevant Investigation of Enterprise Model Transformation

3.1. Low-Carbon Performance Evaluation Model Based on Entropy Weight TOPSIS

TOPSIS evaluation model based on entropy weight can reduce or even eliminate subjective factors. Compared with other algorithms with relatively simple algorithm mechanism, it ensures the objectivity of the results. Use the model combined with formulas to calculate the workflow and work effectively. Assume that the company's initial low-carbon performance matrix is as follows:

$$\mathbf{a} = \begin{bmatrix} a_{11} & a_{12} & \cdots & a_{1x} \\ a_{21} & a_{22} & \cdots & a_{2x} \\ \vdots & \vdots & \cdots & \vdots \\ a_{y1} & a_{y2} & \cdots & a_{yx} \end{bmatrix} \quad (1)$$

Standardized methods are used to process raw data. For benefit indicators, use formula (2) to determine the standardization matrix:

$$s_{ik} = \frac{a_{ik} - \min(a_{ik})}{\max(a_{ik}) - \min(a_{ik})} \quad (2)$$

In the formula, \mathbf{A} represents the initial evaluation matrix and a_{ik} represents the initial value of the k -th year of the i -th index. The entropy weight method can take into account the degree of variation of the index and reflect its importance objectively. The calculation is as follows:

$$W_i = \frac{1 - G_i}{y - \sum_{i=1}^y G_i} \quad (3)$$

The structure of the performance evaluation model of the enterprise's low-carbon model is shown in Figure 2:

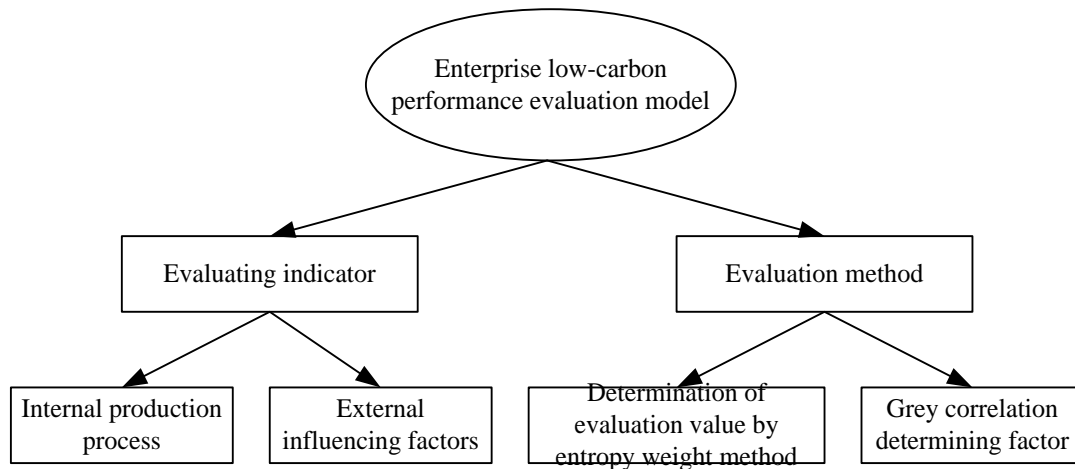


Figure 2: Performance Evaluation Model of Low Carbon Model of Enterprises

In order to improve the objectivity of the evaluation matrix, the weighted standardized evaluation matrix is constructed by using the weighted idea and entropy weight. There are many ways to calculate the distance, which is the reason why we choose the distance in this paper. In this paper, the low carbon performance of the company is close. According to the annual proximity, low carbon performance can be evaluated and the order of advantages and disadvantages can be determined. In order to determine the key factors affecting the low carbon performance of the company, it is necessary to determine the indicators that are closest to the change trend of the low carbon performance evaluation value. In this paper, the grey correlation method is used to calculate the grey correlation degree between the influencing factors and low-carbon performance, and determine the key factors.

3.2. Sampling

Using the company's low-carbon performance evaluation model, we can conduct a vertical evaluation of a single company according to the time series, or a horizontal comparison of multiple companies in the same period. Due to the huge workload of collecting data from multiple indicators in four years, this paper selects a single company to conduct a vertical evaluation, taking the local group as the evaluation object, to evaluate and analyze the low carbon performance of the company. Evaluate the key indicators in the low-carbon performance evaluation system. These include resource utilization, energy utilization, environmental protection and low carbon potential[13-14].

3.3. Field Survey

Based on the ESG investment perspective, this paper conducted a public opinion survey on the business model and mode transformation methods of local enterprises. The questionnaire designed in this paper is aimed at the management of enterprises and local residents. The number of people involved in the survey is 300. The questionnaire is online, which is conducive to data statistics and analysis. The questionnaire collection lasted two weeks, and 272 valid questionnaires were obtained[15].

4. Analysis of Survey Results

4.1. First-Level Index Evaluation Results

In terms of resource exploitation, there are still obvious deficiencies in the change rate of new water consumption, and the improvement is not significant. Only in this way can we improve the level of enterprise resource exploitation and promote the low-carbon development of enterprises. Good results have been achieved in environmental protection and reduction of environmental pollution. In terms of low carbon potential, enterprises need to strengthen the proportion of investment in science and technology. The specific evaluation results are shown in Table 1:

Table 1: Evaluation Results of First-Level Indicators

| | Resource exploitation | Energy utilization | Environmental protection | Low carbon potential |
|------|-----------------------|--------------------|--------------------------|----------------------|
| 2018 | 0.54 | 0.1 | 0.4 | 0.56 |
| 2019 | 0.76 | 0.13 | 0.53 | 0.38 |
| 2020 | 0.64 | 0.24 | 0.49 | 0.35 |
| 2021 | 0.45 | 0.75 | 0.62 | 0.44 |

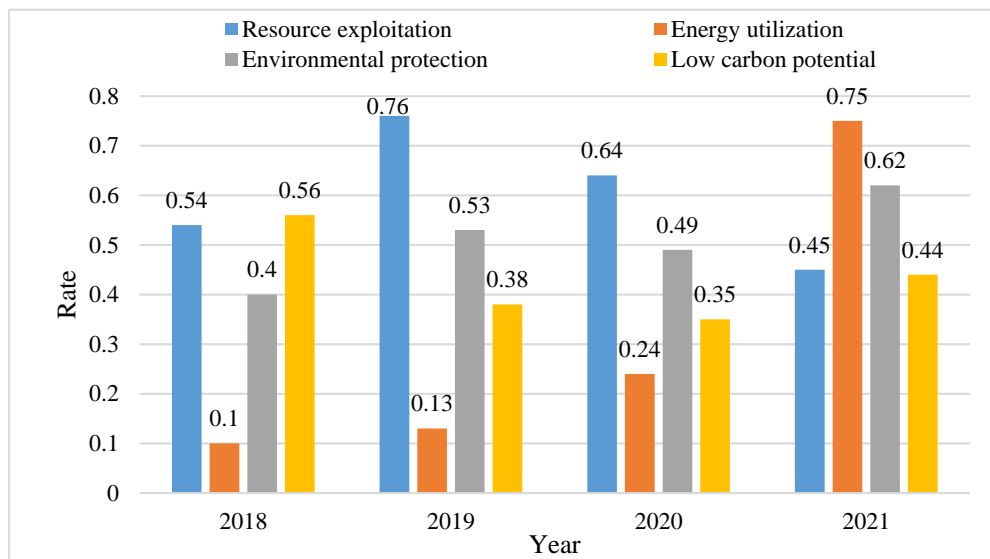


Figure 3: Evaluation Results of First-Level Indicators

As shown in Figure 3, we can see that the proximity of energy utilization and environmental protection has increased over time. However, the proximity of low carbon potential has gradually declined. Therefore, the low-carbon development methods of enterprises need to be further improved. In addition, in terms of resource exploitation, its proximity remains stable at half the effectiveness. In order to make the enterprise transformation successful, it is necessary to optimize the technology of resource exploitation.

4.2. Suggestions for Promoting Low-Carbon Transformation of Enterprises

In order to promote the transformation of enterprise business model and meet the requirements of low-carbon development. From the perspective of ESG investment, this paper has conducted a relevant survey on the low-carbon development measures of enterprises, and the results are as follows:

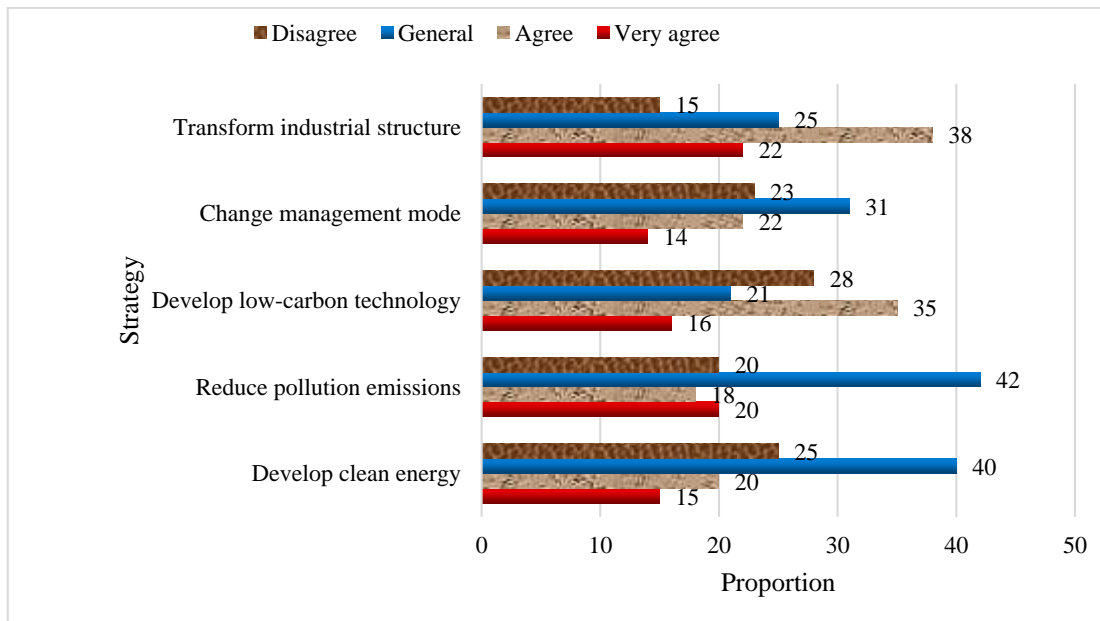


Figure 4: Suggestions for Promoting Low-Carbon Transformation of Enterprises

As shown in Figure 4, we can see that according to the statistics of the survey results, the direction of enterprise business model transformation can be carried out from the following aspects: developing clean energy, reducing pollution emissions, developing low-carbon technology, changing management methods and changing industrial structure. Among them, the measures supported by the majority include transforming the industrial structure and developing low-carbon technologies. Among these measures and suggestions, there are always some people who disagree with the suggestions. Therefore, the transformation of enterprises' low-carbon business model needs further research.

5. Conclusion

From the results of this study, we can see that China's low-carbon economic development is facing huge challenges, and enterprises must actively transform. At the initial stage of China's low-carbon business development, enterprises mainly take resource development as their main business model. However, it is possible to realize the transformation from traditional manufacturing industry to modern service industry with high added value under the influence of national energy conservation and emission reduction policies and the application and promotion of clean energy technologies. In the long run, the development of low-carbon economy is very likely. In the process of development, enterprises should improve their environmental awareness and establish green values from their own perspective.

References

- [1] Davide Benedetti, Enrico Biffis, Fotis Chatzimichalakis, Luciano Lillo Fedele, Ian Simm. (2021) *Climate Change Investment Risk: Optimal Portfolio Construction Ahead of the Transition to a Lower-Carbon Economy*. *Ann. Oper. Res.* 299(1): 847-871
- [2] Rajesh Bose, Sandip Roy, Haraprasad Mondal, Dipan Roy Chowdhury, Srabanti Chakraborty. (2021) *Energy-Efficient Approach to Lower the Carbon Emissions of Data Centers*. *Computing* 103(8): 1703-1721
- [3] Ana Beatriz Lopes de Sousa Jabbour, Charbel José Chiappetta Jabbour, Joseph Sarkis, Hengky Latan, David Roubaud, Moacir Godinho Filho, Maciel Manoel Queiroz. (2021) *Fostering Low-Carbon Production and Logistics Systems: Framework and Empirical Evidence*. *Int. J. Prod. Res.* 59(23): 7106-7125

- [4] Muhammad Riaz, Harish Garg, Hafiz Muhammad Athar Farid, Muhammad Aslam. (2021) Novel q -Rung Orthopair Fuzzy Interaction Aggregation Operators and Their Application to Low-Carbon Green Supply Chain Management. *J. Intell. Fuzzy Syst.* 41(2): 4109-4126
- [5] Mari Martiskainen, Benjamin K. Sovacool, Andrew Hook: *Temporality, Consumption, and Conflict.* (2021) Exploring User-Based Injustices in European Low-Carbon Transitions. *Technol. Anal. Strateg. Manag.* 33(7): 770-782
- [6] Valentine Kabanets, Sajin Koroth, Zhenjian Lu, Dimitrios Myrasiotis, Igor Carboni Oliveira. (2021) Algorithms and Lower Bounds for De Morgan Formulas of Low-Communication Leaf Gates. *ACM Trans. Comput. Theory* 13(4): 23:1-23:37
- [7] Javier Troya, Sergio Segura, Lola Burgueño, Manuel Wimmer. (2023) Model Transformation Testing and Debugging: A Survey. *ACM Comput. Surv.* 55(4): 72:1-72:39
- [8] Hitoshi Kiya, Ryota Iijima, April Pyone Maung Maung, Yuma Kinoshita. (2023) Image and Model Transformation with Secret Key for Vision Transformer. *IEICE Trans. Inf. Syst.* 106(1): 2-11
- [9] Ervan Kassarian, Francesco Sanfedino, Daniel Alazard, Charles-Antoine Chevrier, Johan Montel. (2023) Linear Fractional Transformation Modeling of Multibody Dynamics Around Parameter-Dependent Equilibrium. *IEEE Trans. Control. Syst. Technol.* 31(1): 418-425
- [10] K. Sunitha, Krishna A. N, B. G. Prasad. (2022) Copy-move Tampering Detection Using Keypoint Based Hybrid Feature Extraction and Improved Transformation Model. *Appl. Intell.* 52(13): 15405-15416
- [11] Kumud Tripathi, K. Sreenivasa Rao. (2022) CycleGAN-Based Speech Mode Transformation Model for Robust Multilingual ASR. *Circuits Syst. Signal Process.* 41(9): 5283-5305
- [12] Pramod P. Jadhav, Shashank D. Joshi. (2022) Fractional Weightage Based Objective Function to a Hybrid Optimization Algorithm for Model Transformation. *Evol. Intell.* 15(2): 851-863
- [13] Min G, Hui P. (2010) A hybrid approach for parameter optimization of RBF-AR model. *Decision & Control. IEEE.*
- [14] Vaitheeswaran R, Sathiya N, Bhangle J R, et al. (2011) A hybrid algorithm for instant optimization of beam weights in anatomy-based intensity modulated radiotherapy: A performance evaluation study. *Journal of Medical Physics*, 36(2):85-94.
- [15] Chowdary K U, Rao B P. (2020) Hybrid Mixture Model Based on a Hybrid Optimization for Spectrum Sensing to Improve the Performance of MIMO-OFDM Systems. *International journal of pattern recognition and artificial intelligence*, (7):34.