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Enterprise Green Supply Chain Management Practice: Cost-benefit Analysis from the Perspective of Environmental Management

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Abstract: With the global attention to environmental protection, the role of enterprise green supply chain (GSC) management in environmental management is becoming more and more critical. This article focuses on the GSC management of enterprises and discusses its cost-effectiveness from the perspective of environmental management. The cost components of GSC management in green procurement, manufacturing, logistics and marketing are analyzed in detail, and the economic benefits (long-term cost saving, market competitive advantage), environmental benefits (pollutant emission reduction and resource protection) and social benefits (enhancing corporate image and promoting green development of the industry) are analyzed. It is found that although enterprises implement GSC management in the short term, it can bring many significant benefits in the long run. It is concluded that enterprises should attach importance to GSC management and integrate the concept of environmental management into it in order to achieve a win-win situation between economy and environment and achieve the goal of sustainable development.

1. Introduction

At the moment when the global ecological and environmental problems are becoming more and more serious, the concept of sustainable development is deeply rooted in people's hearts and becomes an important consideration that can not be ignored in enterprise management decision-making [1]. In this context, GSC management, as a key strategy for enterprises to meet environmental challenges and achieve a win-win situation between economy and environment, has gradually attracted widespread attention [2]. GSC management integrates the concept of environmental protection into all aspects of the supply chain, from procurement, production, logistics to sales, striving to reduce the negative impact on the environment and realize the economic benefit growth of enterprises [3].

The rise of environmental management concept provides a new perspective for enterprises to carry out GSC management [4]. It emphasizes that enterprises should not only pursue economic interests, but also assume the social responsibility of environmental protection and incorporate environmental factors into their strategic planning and daily operations [5]. Through environmental

management, enterprises are expected to achieve effective cost control and significant improvement of benefits while improving environmental performance.

However, enterprises still face many puzzles in the process of implementing GSC management. Among them, the trade-off between cost and benefit is particularly prominent [6]. On the one hand, enterprises often need to invest extra resources to implement GSC management, such as using environmentally friendly raw materials and introducing advanced environmental protection technology and equipment, which will undoubtedly increase the cost of enterprises. On the other hand, enterprises expect to obtain benefits such as enhancing brand image and expanding market share through GSC management, but the degree of realization of these benefits and the matching relationship with costs are not clear [7].

Therefore, it is of great theoretical and practical significance to deeply analyze the cost-benefit of enterprise GSC management from the perspective of environmental management. The purpose of this study is to clarify the composition and relationship of cost-benefit of GSC management through systematic theoretical analysis, provide theoretical support for scientific decision-making of enterprises, and help enterprises achieve the balance between environmental and economic goals on the road of sustainable development.

2. Environmental management and cost-effectiveness related theory

GSC management is a management mode that combines supply chain activities with environmental protection on the basis of traditional supply chain management. It requires enterprises to consider the environmental impact in the whole supply chain process, from raw material acquisition, product production, product sales to recycling after product abandonment, and strive to maximize economic and environmental benefits [8]. The development of this theory stems from the response of enterprises to the increasing environmental pressure and the pursuit of sustainable development. Its core content covers green procurement, green production, green logistics and other links. By integrating the resources and actions of enterprises in the supply chain, we can jointly promote the greening process.

The concept of environmental management emphasizes that enterprises regard environmental protection as an important part of their business activities rather than an isolated social responsibility [9]. It requires enterprises to fully consider environmental factors at all levels, such as strategic planning, product research and development, production and operation, and reduce the negative impact of production and operation on the environment and create new business value through innovative technologies and optimized processes. According to the theory of environmental management, enterprises' active response to environmental problems will not only help to enhance their social image, but also bring long-term competitive advantages to enterprises through efficient use of resources and cost reduction.

Cost-benefit theory is an important theory in economics, which is used to evaluate the feasibility of decision-making or project. In the context of enterprise management, this theory guides enterprises to systematically analyze the input cost and expected benefit to determine whether a certain business activity is worth carrying out [10]. Cost-benefit analysis not only pays attention to direct economic costs and benefits, but also considers potential and indirect costs and benefits. In the practice of GSC management, the application of cost-benefit theory is helpful for enterprises to accurately evaluate the cost of implementing green measures and the possible economic, environmental and social benefits, thus providing scientific basis for enterprise decision-making.

3. Cost composition of enterprise GSC management from the perspective of environmental management

From the perspective of environmental management, the cost of enterprise GSC management covers many aspects. An in-depth analysis of these cost components will help enterprises fully understand the economic input of GSC management and provide a basis for scientific decision-making.

3.1. Green procurement costs

Green procurement requires enterprises to give priority to environmentally-friendly raw materials and components, which often leads to a purchase price premium. Supplier environmental assessment and management costs are also an important part of green procurement costs. Enterprises need to invest manpower and material resources to evaluate suppliers' environmental protection measures and production processes to ensure that they meet the requirements of GSC. At the same time, management activities such as communication and supervision with suppliers on environmental protection standards will also generate corresponding costs.

3.2. Green manufacturing costs

Environmental protection technology research and development and equipment investment are the key parts of green production and manufacturing costs. In order to reduce pollutant emissions in the production process and improve resource utilization efficiency, enterprises need to develop or introduce advanced environmental protection technologies and equipment. In addition, the cost of environmental control in the production process can not be ignored, including the cost of pollution monitoring and waste treatment in the production process. Take a manufacturing enterprise as an example (see Table 1). In order to realize green production, the enterprise has invested heavily in the purchase of environmental protection equipment, accounting for 40% of the manufacturing cost of green production, while the research and development expenses of environmental protection technology account for 25%, and the costs of environmental control and waste treatment account for 35%. Although these costs increase the burden on enterprises in the short term, they will help enterprises achieve sustainable development in the long run.

Table 1 Proportion of green manufacturing cost of manufacturing enterprises

Cost item	Proportion of green manufacturing cost
Purchase of environmental protection equipment	40%
Environmental protection technology research and development	25%
Environmental control and waste disposal	35%

3.3. Green logistics cost

The cost of green logistics is reflected in many links. The use cost of environmental protection packaging materials is high. Compared with traditional packaging materials, environmental protection packaging materials usually pay more attention to environmental protection properties such as degradation and recycling, and the price is relatively expensive. In logistics and transportation, in order to reduce carbon emissions, enterprises may need to adopt new energy vehicles and optimize transportation routes, which will increase logistics costs. In addition, the cost

of reverse logistics is also a part of the cost of green logistics, including the cost of product recovery, disassembly and reuse.

3.4. Green marketing costs

The cost of green product marketing and certification is an important component of green marketing cost. In order to make consumers recognize their green products, enterprises need to invest a lot of money in advertising and participating in green product exhibitions. At the same time,it is also necessary to pay a certain fee to obtain relevant green product certification, such as ISO14001 environmental management system certification. In addition, the cost of investigating and communicating with consumers' green preferences should not be underestimated. Enterprises need to know consumers' demand and willingness to buy green products in order to formulate accurate marketing strategies. This process involves market research, consumer feedback collection and other activities, which will generate costs.

4. Benefit analysis of enterprise GSC management from the perspective of environmental management

From the perspective of environmental management, the implementation of GSC management in enterprises can bring many benefits, which not only helps to improve the economic benefits of enterprises, but also produces positive environmental and social benefits.

4.1. Economic benefits

Recycling resources is an important way to realize long-term cost saving. Through GSC management, enterprises can recycle the wastes in the production process, reduce the dependence on primary resources, and thus reduce the procurement cost of raw materials. For example, after implementing GSC management, an electronic product manufacturing enterprise recycles waste circuit boards and extracts precious metals from them for production, which significantly reduces the cost of raw materials. According to statistics (see Table 2), in the first three years of implementing GSC management, the cost of raw materials saved by recycling resources was 1 million yuan, 1.5 million yuan and 2 million yuan each year, showing an upward trend year by year.

Table 2 Cost savings of resource recycling in electronic product manufacturing enterprises

Year	Cost Saving in Mobile Product Line (10,000 yuan)	Cost Saving in Computer Product Line (10,000 yuan)	Cost Saving in Other Product Lines (10,000 yuan)	Total Cost Saving (10,000 yuan)
First Year	30	40	30	100
Second Year	50	60	40	150
Third Year	70	80	50	200

Improving energy efficiency is also the key to reducing energy consumption costs. Enterprises adopt energy-saving equipment and optimize production processes to reduce energy consumption. A textile enterprise introduced advanced energy-saving printing and dyeing equipment, which reduced the energy consumption per unit product by 20% and saved the energy cost by about 800,000 yuan per year (see Table 3).

Table 3 Energy efficiency improvement and cost saving of textile enterprises

Year	Production Volume (10,000 meters)	Reduction Ratio of Energy Consumption per Unit Product	Annual Energy Cost Saving (10,000 yuan)	Growth Rate of Energy Cost Saving
First Year	500	15%	60	-
Second Year	600	18%	75	25%
Third Year	700	20%	95	26.7%

Green brand image building can increase the added value of products. Consumers' recognition of environmental protection products is increasing, and they are willing to pay higher prices for green products. Enterprises build green brands through GSC management, attract more consumers and increase product prices. For example, a cosmetics brand pays attention to GSC management, and its product price is 15% higher than that of similar non-green products, and its market share is also expanding. At the same time, meeting the requirements of environmental regulations avoids potential fines and market access losses, and ensures the stable operation of enterprises in the market.

4.2. Environmental benefits

GSC management significantly reduces pollutant emissions and protects natural resources. Enterprises adopt cleaner production technology in the production process to reduce the discharge of waste water, waste gas and waste residue and reduce the pressure on the environment. In the procurement of raw materials, priority should be given to sustainable resources to protect the ecological balance. For example, through GSC management, a paper-making enterprise reduced the wastewater discharge by 30%, reduced the pollution to the surrounding water environment, and protected forest resources by using sustainable raw materials such as fast-growing forests.

4.3. Social benefits

The implementation of GSC management in enterprises has enhanced social image and reputation, and enhanced the trust of consumers, investors and other stakeholders in enterprises. In addition, GSC management also has the demonstration effect of promoting the green development of the industry, guiding other enterprises to follow suit, jointly promoting the sustainable development of the whole industry and contributing to the green transformation of society.

5. Conclusions

This article systematically analyzes the cost-benefit of enterprise GSC management from the perspective of environmental management. In terms of cost composition, GSC management involves the costs of green procurement, manufacturing, logistics and marketing. The cost of green procurement covers the price premium of raw materials and the management expenses of supplier's environmental assessment; The manufacturing cost of green production includes environmental protection technology research and development, equipment investment and environmental control expenses in the production process; The cost of green logistics is reflected in the expenditure of energy saving and emission reduction in environmental protection packaging and transportation; Green marketing costs include marketing promotion and certification costs.

On the benefit level, the economic benefit is remarkable, and the long-term cost saving effect is obvious, such as resource recycling and energy efficiency improvement to reduce costs, while green brand building and meeting the requirements of environmental protection laws and regulations to

enhance market competitive advantage. Outstanding environmental benefits, effectively realize pollutant emission reduction and resource protection. Good social benefits, enhanced corporate social image and produced industry demonstration effect.

To sum up, although the GSC management of enterprises will increase the cost in the initial stage of implementation, it can bring economic, environmental and social benefits to enterprises in the long run and comprehensively, and effectively promote the sustainable development of enterprises. Enterprises should actively practice GSC management, and the government should also introduce relevant policy support to guide enterprises to take into account environmental protection and social responsibility while pursuing economic benefits, so as to achieve coordinated progress between economy and environment.

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