

Research on the Administration Dynamics of Green Provide Chain in China's Manufacturing Industry based on Fuzzy Cluster Analysis

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Abstract

The continuous occurrence of environmental disasters has aroused people's high awareness of manufacturing industry. How to peak the utilization efficiency of resources and decrease the negative impact of manufacturing industry on the environment has become the focus of attention of scholars and governments at home and abroad, and green provide chain administration is a new administration model to solve this focus. With the insufficient of resources and the deterioration of the environment, green provide chain administration, as the practice of circular economy at the enterprise level, has become an important strategy for the manufacturing industry to achieve sustainable improvement. The large-scale production of traditional manufacturing industry not only creates wealth for human beings, but also intensifies the contradiction between human beings and the environment. How to solve this contradiction is the key of our study and discussion. Faced with the continuous deterioration of the environmental situation, the gradual tightening of environmental laws and regulations, the intensification of international competition and the improvement of consumers' green consciousness, Chinese enterprises must consider incorporating environmental practices into their strategical plans and daily operations to adapt to social improvement. The green provide chain administration practice of enterprises has industry characteristics, and there are commonalities among different enterprises.

Keywords

Fuzzy Cluster Analysis; Chinese Manufacturing Industry; Green Provide Chain.

1. Introduction

Environmental disasters in burgeoned countries have aroused people's high awareness of the manufacturing industry, and environmental problems have become the focus of people's attention. The government's control of environmental behavior has become more and more strict, and the punishment of environmental polluters has become more and more austere. Since modern times, the progress of science and technique has made social productive forces burgeon by leaps and bounds [1]. Human beings enjoy the superiority brought by the improvement of science and technique and economy, and are intoxicated with the victory over nature. At the same time, human beings' unlimited demand for nature has caused austere environmental problems and ecological crises. As a strategical administration mode of enterprises, green provide chain administration is paid more and more attention by governments, enterprises and scholarly circles [2]. Due to the neglect of environmental concerns, Chinese enterprises are also facing the same problems in the process of modernization, which to some extent affects the competitiveness of enterprises, especially in the global market, and some enterprises even lose the ability of sustainable improvement [3]. As the main body causing environmental damage, enterprises must realize that a good ecological environment is the foundation and premise of all improvement. Building green and

environment-friendly enterprises has become an urgent task for the improvement of manufacturing enterprises in China [4]. Only by taking the initiative to make strategic changes and making full use of the chances brought by green provide chain can enterprises continue to survive and burgeon in the new competitory environment. How to peak the use of resources to create more social wealth and enterprise value has become a topic of common concern [5]. Green provide chain administration, which integrates environmental administration into provide chain administration, is an important strategy for circular economy to achieve reduction, reuse, recycling and regeneration at the enterprise level. It is also an effective way to stimulate the coordinated improvement of economy and environment, as well as the sustainable improvement of modern enterprises [6].

2. Research on Power of Green Supply Chain Management in China's Manufacturing Industry

2.1. Green Provide Chain

Green provide chain comes from the idea of provide chain administration and sustainable improvement, and its study time is not long. From the existing study, there is no unified, clear and authoritative definition [7]. On the basis of previous study results, this paper agrees to define green provide chain as a collection of activities from resource improvement to product consumption, such as material acquisition, processing, packaging, warehousing, transportation, sales, use, scrap disposal, recycling, etc., with the goal of optimal allocation of resources, improvement of welfare, and realization of compatibility with the environment, and with the principle of intra-generation fairness [8]. Accordingly, we can get the concept of green provide chain administration (GSCM): Green provide chain administration refers to the planning, organization, leadership, coordination and control of logistics, information flow and capital flow among all participating actors in the whole green provide chain under the guidance of sustainable improvement theory and basic principles of provide chain administration [9]. Its purpose is to optimize the allocation of resources, improve welfare and achieve the goal of compatibility with the environment by optimizing and improving the speed, certainty and friendliness of related activities.

The implementation of green provide chain administration is a complex system, including suppliers, manufacturers, distributors, retailers, users and logistics providers [10]. From the aspect of implementation, it includes green procurement, green design, green manufacturing, green distribution, green logistics, green consumption and green recycling. From the definition of green provide chain administration, it is related to traditional provide chain administration. The concrete performance is as follows: both of them emphasize the concept of system, instead of looking at each enterprise or each business department in isolation, they fully consider all relevant internal and external links [11]. From the definition of green provide chain administration, it can be seen that the problem areas involved in green provide chain administration include three parts: provide chain administration, environmental protection and resource optimization. At the same time, green provide chain administration is different from general provide chain administration.

2.2. Actorial Analysis

Factor analysis is a method of obtaining a large amount of data and reducing it to a smaller data set that is easier to manage and understand. This is a method of finding hidden patterns, showing how these patterns overlap and displaying features seen in multiple patterns [12]. It is also used to create a set of variables (these variable sets are called dimensions) for similar items in a set. Factor analysis was carried out by using SPSS, a statistical software package of social sciences. Classify the indicators of motivation/pressure, practice and performance of

green provide chain administration from the survey data to clarify and simplify the analysis of problems [13]. The eigenvalue and contribution rate of the factor are shown in Table 1.

Table 1. Eigenvalues and contribution rates of table factors

Main factor	Eigenvalues	Contribution rate %	Cumulative contribution rate %
Corporate environmental Strategy	8.198	48.903	48.909
Supply chain pressure	2.906	8.891	50.631
Environmental activity costs	2.494	5.806	60.831

Both gravel test and characteristic root test show that four factors can be selected for in-depth analysis of the pressure/motivation of green provide chain administration, and the extracted information is 61.564%, that is, these four main factors can reflect 65.298% of the information of the initial 20 variables. In order to verify whether each problem of the same factor obtained by factor analysis measures the same problem, we further analyzed the internal reliability analysis, and got the Kronbach α coefficients of four green provide chain administration forces/pressures of 0.6099, 0.8451, 0.8725 and 0.7244 respectively. It can be a very useful tool for complex data sets involving psychological study, socio-economic status and other related concepts. Descriptive statistical analysis of power/pressure factors of green provide chain administration is shown in Table 2.

Table 2. Descriptive statistical analysis of driving force/pressure factors in green provide chain administration

	Main factor	Mean	Standard deviation
Power/Pressure	Corporate environmental strategy	4.062	0.8408
	Supply chain pressure	4.106	0.7166
	Environmental activity costs	4.843	0.8408

"Factor" is a group of observed variables with similar response patterns; Their association with hidden variables is not directly measured. The coefficient from the cost of environmental activities and the current and potential chances is very small, which shows that enterprises think that they have little effect on promoting enterprises to implement green provide chain administration. Without obvious financial performance, it is difficult for environmental protection personnel of enterprises to explain that the administration has carried out extensive green provide chain administration. List the factors according to their load, or the degree of change of the data they can explain. All factors are not equal, and some are more important than others. Factors are like correlation coefficients in that they can vary from -1 to 1. The closer the factor is -1 or 1, the greater their influence on variables.

3. Implementation Countermeasures of Green Management in Chinese Manufacturing Enterprises

3.1. Change Ideas and Establish Green Strategical Thinking.

Green provides chain administration is a brand-new administration concept, which requires enterprises to actively improve their sense of social responsibility and bring the environment into cost control. At the same time, we should focus on long-term interests and take the whole provide chain as the starting point to form an integrated environmental administration system. Leadership and participation are essential for enterprises to implement green provide chain strategy smoothly and successfully. Members set up a team spirit of collective cooperation,

saving environmental protection and high efficiency, sharing risks and devoting themselves to their respective core competitiveness, so that the behavior of the enterprise can meet the requirements of maximizing the overall environmental value, and make the real green provide chain possible. The green provide chain strategical project has a large investment and a long cycle, so the senior leaders should ensure enough manpower, material resources and financial resources, which is the basic guarantee for the smooth implementation of the green provide chain. Enterprises are required to change their concepts, enhance their awareness of environmental protection and sustainable improvement, and take the goals of saving resources, reducing waste, avoiding pollution and green design as their long-term improvement goals. Senior leaders should not only support the budget and infrastructure investment, but also participate in the implementation process of green provide chain, and provide timely guidance and help to the implementation team. Green corporate culture should be created and publicized in the enterprise, so that building the "green image" and creating the "green brand" of the enterprise can become the conscious action of every employee, so that the enterprise can form a strong cohesive force from within, unite all employees and form a common green value.

3.2. Strengthen the Partnership of Green Provide Chain

Manufacturers should establish a new "win-win" concept, actively establish a new strategical alliance relationship with suppliers and distributors, and recycle the used packages through the cooperation of new strategical alliances, which not only saves the production cost and gains commercial benefits, but also decreases the harm to the environment and gains environmental benefits. The implementation of green provide chain administration puts forward higher requirements for the partners of enterprises. The green provide chain administration level of enterprise partners will affect the enterprise's green provide chain strategy. At present, most suppliers in China can't meet the requirements of enterprises for environmental protection. Therefore, when implementing green provide chain administration, China's national conditions should be taken into account. Instead of blindly excluding those suppliers that don't meet the requirements for environmental protection, the wiser way is to cooperate with suppliers, learn from each other and make joint efforts to gradually meet the requirements through a period of improvement. The green administration state of enterprise competitors will also affect the normal operation of enterprise green provide chain administration. Competitors lacking the concept of green administration will easily cause vicious competition among enterprises, which will make enterprises deviate from the healthy improvement track. For customers in green provide chain administration, we can rent goods, not just buy them. In this way, consumers buy the right to use products, not the ownership. It can be recycled or refurbished to decrease costs and protect the environment.

3.3. Optimize Green Provide Chain

The basis for provide chain administration to gain advantages is to have the support of advanced technique, and at the same time, to follow the improvement of technique and strengthen the ability of enterprises to apply and integrate technique. Green provides chain is organized by many enterprises, and it is difficult for any independent enterprise to manage green provide chain independently. The establishment of green provide chain also needs special environmental protection technique. Therefore, enterprises should invest more money and energy in product R&D and innovation based on the original technique, improve the greenness of products and burgeon more green products, so as to ensure the smooth implementation of "greening" in all aspects of green provide chain administration. To implement the green, provide chain administration system, enterprises must reform or improve the provide chain administration system, integrate the original provide chain administration system resources, formulate measures aimed at integrating and optimizing the allocation of superior resources within enterprises, and constantly optimize the business flow,

information flow and internal organization of the whole provide chain system. Enterprises should also attach importance to the role of administration consulting, and seek the high-level enterprise administration consulting company in credit reliability, internal administration experts and key business personnel to form an overall planning group, to strengthen the concept training of green provide chain administration for enterprise leaders and employees and improve the success rate of green provide chain administration. Enterprises must improve the ability of collaborative optimization and centralized administration of provide chain, optimize and restructure the provide chain process by using information technique, and complete green provide chain administration through industry and information integration.

4. Conclusion

In recent years, with the sustained and rapid improvement of China's economy, the demand for natural resources has increased dramatically, resulting in the over-exploitation of environmental resources and the destruction of ecosystems. Therefore, green provide chain administration has become an important part of sustainable improvement of enterprises. As a pillar industry of the national economy, the manufacturing industry must strengthen its understanding of "green" construction as soon as possible, integrate the environmental ecological consciousness into the provide chain administration, and implement the green provide chain administration that adapts to the environment and resource conditions. In our country, because the integration of the power wheel model of green provide chain administration in manufacturing enterprises is not high, the economic performance brought by green provide chain administration is sometimes not obvious, and even its negative financial impact will be greater than its positive financial impact. With the intensification of global market competition and environmental pressure, Chinese enterprises must improve their environmental administration level in order to go abroad and participate in the world competition. Therefore, enterprises are required to cultivate and establish the concept of environmental administration. Instead of passively obeying the government's environmental administration regulations, they should take the initiative to improve their sense of social responsibility and adopt positive attitudes and methods to improve their environmental administration level.

References

- [1] Nallusamy S. Enhancement of Overall Equipment Effectiveness using Total Productive Maintenance in a Manufacturing Industry[J]. International Journal of Performability Engineering, 2017, 13 (2): 01 -16.
- [2] Xu R, Lin B. Why are there large regional differences in CO₂ emissions? Evidence from China's manufacturing industry[J]. Journal of Cleaner Production, 2017, 140(pt.3):1330-1343.
- [3] Wang L, He J, Xu S, et al. The Application of Industry 4.0 in Customized Furniture Manufacturing Industry[J]. MATEC Web of Conferences, 2017, 100:03022.
- [4] Wang N, Zhang W, Fu Y H. Decomposition of energy intensity in China's manufacturing industry using an agglomeration extended LMDI approach[J]. Energy Efficiency, 2021, 14(7):1-32.
- [5] Martinez P, Mohsen O, Al-Hussein M, et al. Vision-based automated waste audits: a use case from the window manufacturing industry[J]. The International Journal of Advanced Manufacturing Technology, 2022, 119(11-12):7735-7749.
- [6] Rui G. Non-Formaldehyde, Bio-Based Adhesives for Use in Wood-Based Panel Manufacturing Industry--A Review[J]. Polymers, 2021, 13.
- [7] Kristiāna Dolge, Dagnija Blumberga. Key Factors Influencing the Achievement of Climate Neutrality Targets in the Manufacturing Industry: LMDI Decomposition Analysis[J]. Energies, 2021, 14.

- [8] Rao G, Nallusamy S, Chakraborty P S, et al. Study on Productivity Improvement in Medium Scale Manufacturing Industry by Execution of Lean Tools[J]. International Journal of Engineering Research in Africa, 2020, 48.
- [9] Lihui, Wang, Bernard, et al. Context preparation for predictive analytics --a case from manufacturing industry[J]. Journal of Quality in Maintenance Engineering, 2017, 23(3):341-354.
- [10] Li X, Qiao Y, Shi L. The aggregate effect of air pollution regulation on CO2 mitigation in China's manufacturing industry: An econometric analysis[J]. Journal of Cleaner Production, 2017, 142 (PT.2): 976-984.
- [11] Khaleel H, Conzon D, Kasinathan P, et al. Heterogeneous Applications, Tools, and Methodologies in the Car Manufacturing Industry Through an IoT Approach[J]. IEEE Systems Journal, 2017, 11 (3): 1412-1423.
- [12] Skellern K, Markey R, Thornthwaite L. Identifying attributes of sustainable transitions for traditional regional manufacturing industry sectors – A conceptual framework[J]. Journal of Cleaner Production, 2017, 140:1782-1793.
- [13] Kang Y Q, Xie B C, Wang J, et al. Environmental assessment and investment strategy for China's manufacturing industry: A non-radial DEA based analysis[J]. Journal of Cleaner Production, 2018, 175 (FEB.20):501-511.