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Sustainable Supply Chain Management and Green Logistics Practice Analysis: Case Study of Wahaha and Patagonia

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Abstract: In globalization and digitization, supply chains have become key for companies to gain competitive advantages and achieve sustainable development. This study provides a detailed analysis of the sustainable supply chain management practices of China's leading food and beverage company, Wahaha, and the American outdoor brand, Patagonia. It explores their successes in green production, logistics, packaging, and environmental governance. The research finds that Wahaha has achieved efficient resource utilization and cost reduction through digital and intelligent transformation, enhanced recycling, and the use of clean energy. On the other hand, Patagonia maintains a strong environmental commitment by using organic cotton and recycled materials, supporting environmental projects, and promoting a green supply chain. Despite their different strategies, both companies have achieved significant sustainable supply chain management results, offering valuable insights for other businesses. Future research should include different regions and industries, explore the challenges and solutions in sustainable development, and optimize evaluation systems through quantitative analysis and model building to enhance practical application value.

Keywords: Sustainable supply chain management, Green logistics practices, Wahaha, Patagonia

1. Introduction

In globalization and digitization, with the rapid development of multinational corporations, enterprise supply chains have become a key element for companies to gain competitive advantage and sustainable growth. However, supply chains can cause environmental damage, such as greenhouse gas emissions, energy consumption, and natural resource depletion. Therefore, sustainable supply chain management and green logistics have become important topics in enterprise management [1]. These methods help firms establish long-term sustainable and competitive supply chain systems by efficiently allocating resources and improving efficiency. They also play a crucial role in environmental protection and corporate social responsibility. This study will analyze the practices of Wahaha and Patagonia using this method, exploring their successful experiences and outcomes and providing reference suggestions for industry development.

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Wahaha has adhered to the concept of "health, happiness, and win-win" as a leading enterprise in China's food and beverage industry since its establishment in 1987. While continuously expanding its product line and strengthening its market position, the company actively promotes digital production and builds a recyclable supply chain. For example, Wahaha introduces advanced energy-saving technologies and equipment in its production process to reduce energy consumption and waste emissions. Additionally, the company has established close cooperation with suppliers and distributors to promote green development and provide consumers with high-quality green food.

Patagonia is a company that focuses on high-quality outdoor equipment and is known for its strong environmental awareness and social responsibility. The company uses organic cotton and recycled materials in its manufacturing and donates some of its profits to support environmental organizations and projects. In 2022, founder Yvon Chouinard donated $3 billion worth of company shares to the Environmental Trust Fund to further support environmental causes worldwide. Patagonia also provides product maintenance services to encourage consumers to extend their product life and reduce resource waste.

2. Sustainable supply chain management practices

2.1. Wahaha

2.1.1. Green production and storage management

Wahaha Company has embraced digitalization and intelligent transformation in recent years, firmly adhering to green and low-carbon development [2]. In the manufacturing sector, the company strengthens packaging recycling and recycling utilization, reduces the production of solid waste, and promotes green procurement and supply chain construction at the same time. Promoting recyclable packaging and coordinating delivery equipment can further reduce the environmental impact during production. In terms of technology, Wahaha has continuously implemented energy conservation and emission reduction improvements, optimized processes such as canning and bottling, achieved green production, and improved material utilization rates [3]. Wahaha Company has embraced digitalization and intelligent transformation in recent years, firmly adhering to green and low-carbon development. In the manufacturing sector, the company strengthens packaging recycling and recycling utilization, reduces the production of solid waste, and promotes green procurement and supply chain construction at the same time. Promoting recyclable packaging and coordinating delivery equipment can further reduce the environmental impact during production. Regarding clean energy utilization, Wahaha uses electric forklifts instead of oil forklifts and utilizes the roofs of factory buildings and warehouses to build photovoltaic systems to reduce unit energy consumption continuously. At the same time, through equipment automation upgrades, technical noise reduction, and dust removal measures, the company continuously improves the operating environment and reduces safety risks [4]. These undertakings are a testament to Wahaha's unwavering commitment to environmental protection and demonstrate the company's initiative-taking approach to fulfilling its social responsibilities.

2.1.2. Sustainability of Finished Product Logistics and Packaging

Vancai Xinkai is a direct supplier of Wahaha Group and its subsidiaries, mainly producing the relevant packaging for beverage bottles for Wahaha. As a representative enterprise of bottle-grade PET "Made in China", Vancai Xinkai actively responds to the national "dual-carbon" target call and uses renewable energy to generate electricity and steam. It develops and applies new low-carbon production processes, strictly controls pollution emissions, minimizes greenhouse gas emissions, and implements green marketing strategies to strengthen the recycling of production product resources

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[5]. The Hexing Packaging Company, which provides packaging services for Wahaha, is committed to developing and promoting environmentally friendly materials. They have adopted new eco-friendly materials such as water-based inks, water-based adhesives, and replaceable water-based coating varnishes to replace traditional materials, thereby reducing the usage of packaging materials [6]. With the continuous increase in China's logistics economy, Chinese enterprises will inevitably carry out green logistics sustainable development reform [7]. Logistics and packaging suppliers have always adhered to the environmental protection concept of Wahaha Group's green logistics. While complying with China's green development policies, they have also provided important impetus for enterprises to explore the green market.

2.1.3. Environmental Governance and Green Intelligent Factory

Wahaha actively responds to the government's call, deeply participating in environmental governance activities, such as "Integrated Management of Five Types of Water Issues" (Water Pollution Control, Flood Prevention, Waterlogging Drainage, Water Supply Security, and Water Conservation), and cooperates with the community to carry out garbage classification and environmental protection publicity [4]. Upgrading its Wencheng intelligent beverage production base improves the level of automation and intelligence and progresses towards a "future factory". The base will upgrade the centralized control system to realize global monitoring and management and promote the production line's modularization, automation, digitization, and sustainable development by integrating a flexible batching center and information and video systems [8]. In addition, Wahaha's personalized customization strategy aims to effectively capture the needs of Gen Z consumers and balance strategies in lower-tier and urban markets. The plant operation has gradually shifted from extensive to intensive, considering the product's whole life cycle and the supply chain's overall benefits. These efforts not only enhance the enterprises' competitiveness but also contribute to the sustainable development of society.

2.2. Patagonia

2.2.1. Supply Chain Environmental Responsibility Plan and Environment-friendly Production

Patagonia has been dedicated to minimizing the environmental impact of its products and material production. They have implemented a global environmental production plan that covers environmental management systems, chemicals and water management, energy use, and greenhouse gas emissions. The program is based not only on strict internal standards but also uses industry tools such as the Higg Index and recognizes third-party certification programs such as blueprint®. Patagonia encourages suppliers to go beyond the smallest requirements and demonstrate environmental excellence through best practices to build environmentally responsible supply chain partnerships. The company is committed to reducing the carbon footprint of manufacturing through energy efficiency, renewable electricity, and low-carbon fuels and is looking to partner with suppliers and other brands to drive supply chain improvements. They collaborate with partners such as the Sustainable Apparel Alliance's Higg Index and the Textile Exchange to drive industry benchmarks and collaborative improvements. With a deeper understanding of the suppliers' facilities, Patagonia will collaborate with them to train and improve as necessary to reduce environmental impact. At the same time, some facilities have successfully eliminated hazardous chemicals and implemented safe chemical management procedures [9]. Patagonia is also actively exploring environmentally friendly production methods, reducing dependence on native petroleum fibers, increasing the use of organic cotton, and simplifying product design to reduce carbon emissions. By combining environmental assessments of supplier production facilities with company supply chain decisions, Patagonia strives to ensure that the supply chain is green and operates sustainably.

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2.2.2. Raw Material Procurement and Resource Utilization Optimization

Since 1996, Patagonia has been passionately committed to using only organic cotton in all its raw cotton products. It continues to expand the proportion of its preferred eco-friendly materials, from 43% in 2016 to 88% in 2022. In 2016, Patagonia also took an innovative initiative to replace neoprene with Yulex natural rubber. This change has successfully reduced the use of petroleum-based materials in the company's diving suits by 85 percent. Patagonia is actively working to reduce its carbon footprint to the level necessary to meet the 1.5°C temperature control target. Patagonia is funding energy audits to address emissions in its supply chain. It is committed to investing in climate solutions to achieve net-zero emissions while minimizing emissions from a product and its supply chain. Nearly 87% of Patagonia's product production currently uses organic and recycled organic cotton, recycled polyester, and recycled nylon as preferred environmentally friendly materials. Patagonia plans to eliminate virgin petroleum fibers by 2025, aiming to reduce environmental impacts further. Patagonia is fully aware of climate change's threats to its business [10]. As a representative enterprise actively fulfilling social responsibilities, it has always been committed to improving production methods, reducing environmental impacts, and contributing strength to sustainable development.

2.2.3. Sustainability of Finished Product Logistics and Packaging

Patagonia has been working to achieve 100 percent renewable energy use in its stores, operating stores, offices, and distribution centers worldwide. For tags and packaging, they use eco-friendly materials such as seaweed ink to reduce the use of plastic, and they use QR code technology, reducing the amount of paper used on labels and product instructions by £100,000 a year. By 2025, Patagonia product packaging is expected to be home-compostable, renewable, or easy to recycle, resulting in 100% reusable packaging [10].

3. Evaluation of the effectiveness of sustainable supply chain management practices

In recent years, Wahaha has continuously increased its investment in safety and environmental protection fees. For example, by upgrading and renovating sewage treatment facilities, the group's sewage discharge indicators are generally lower than 30% of the national discharge standards; All coal boilers in the production base have been phased out and renovated, and the implementation of coal to gas, biomass, and centralized gas supply technologies has significantly reduced the emissions of exhaust pollutants; Increasing the use of clean energy has effectively reduced the unit energy consumption of water and electricity, reduced carbon emissions, and firmly responded to the national "dual carbon" policy [4]. The founder of the group, Zong Qinghou, once said that social responsibility and corporate responsibility should be one of the basic connotations of entrepreneurial spirit [11]. Wahaha's strict implementation of a sustainable supply chain management strategy has not only brought dual improvements in the company and environmental benefits but also established a model of green development for the industry.

Patagonia's comprehensive use of organic cotton is a revolutionary and significant initiative. The cultivation and use of organic cotton avoid the toxic effects of traditional chemicals on farmland and protect the surrounding ecological environment while ensuring a healthy working environment for workers and farmers in cotton gin and textile mills [12]. Compared to traditional cotton fibers, organic cotton fibers save water resources and reduce carbon dioxide emissions per kilogram by 48%. In the spring of 2024, 98% of Patagonia's styles use recycled materials. Recycling and reuse avoid generating 8500 metric tons of CO2, enough to provide electricity for over 1070 households in the United States for a year. In addition, Patagonia has been supporting the conservation of Tongass National Forest in Alaska since 2008, with 17 million acres of pristine spruce, hemlock, and cedar bearing billions of tons of carbon. Meanwhile, Patagonia proactively provides funding and equipment

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to suppliers to help their partners overcome transformation difficulties and achieve common green development. As a partner of Patagonia, Bureo specializes in collecting discarded plastic fishing nets and collaborating with Patagonia's supply chain partners to convert them into Net Plus ®. As of spring 2024, the company has cleared over 1400 tons of waste from the ocean [13].

4. Comparison of sustainable supply chain strategies

Wahaha reduces production costs through the improvement of technology and refined management. For instance, firms save resources and improve competitiveness by reducing packaging costs. In addition, Wahaha also actively engages in environmental governance, upgrades the water recycling facilities, and uses clean energy. These measures help reduce the negative impacts on the environment and waste of resources and also enhance the company's CSR and social reputation.

In contrast, Patagonia focuses on environmental protection as its core value, and the firms implement comprehensive environmental initiatives. For example, the business insists on using organic cotton and other eco-friendly materials. Even though the initial costs are higher, these actions can help Patagonia gain long-term economic benefits and brand recognition. Patagonia not only chooses environment-friendly options for operation but also supports recycling and promoting sustainable consumptions that minimize the negative impacts of chemical and carbon emissions. Patagonia also emphasizes social responsibility in its supply chain management. A strict supplier evaluation system ensures that its supply chain partners meet environmental and social responsibility standards. These efforts enhance the environmental attributes of its products and increase consumer loyalty to the brand.

Comparing the different strategies and outcomes of Wahaha and Patagonia in sustainable supply chain management reveals that both firms pursue sustainability in diverse ways. Wahaha focuses on improving resource utilization efficiency and reducing costs through technological improvements and management optimization. However, Patagonia prioritizes environmental protection and social responsibility, adopting eco-friendly materials and promoting recycling, even though there are higher costs, firms can earn long-term market recognition and brand loyalty. These differences reflect the distinct strategic priorities of the two companies in sustainable supply chain management and provide valuable references for other companies in formulating their sustainability strategies.

Patagonia and Wahaha demonstrate initiative-taking exploration and innovation in sustainable development and intelligent production. Patagonia practices environmental principles through eco-friendly materials and production processes, then by donating profits to environmental organizations, setting industry benchmarks through its practice. Wahaha achieves precise control and efficient resource utilization through safe and intelligent production lines and a recyclable supply chain. In addition, sustainable sales management provides it a competitive advantage.

For Patagonia, further development of eco-friendly materials and production processes, promoting sustainable supply chain construction, strengthening cooperation with environmental organizations, and increasing consumer awareness and acceptance of sustainable products are recommended. For Wahaha, continuous investment in digital intelligent production and supply chain management helps improve production efficiency and product quality, strengthen cooperation with distributors to expand sales channels, provide employee training, and motivate them to increase production efficiency. It is important to build the foundation for future development.

5. Conclusion

The analysis of Wahaha and Patagonia in sustainable supply chain management and green logistics shows differences between companies' unique strategies to achieve sustainable development goals. Wahaha focuses on improving resource utilization efficiency and reducing production costs through

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technological improvements and refined management while actively participating in environmental governance to reduce resource consumption and pollution emissions. Patagonia, centered on environmental principles, implements comprehensive environmental measures, using organic cotton and supporting recycling. Despite higher initial investments, it achieves long-term economic benefits and brand recognition. Although the strategies differ, both companies have achieved significant sustainable supply chain management results. Wahaha's technological improvements, refined management, and Patagonia's use of eco-friendly materials and social responsibility practices provide valuable experience and references for other companies in the industry.

However, this study has some limitations. Firstly, the study focuses on the companies' successful experiences without thoroughly exploring their challenges and shortcomings. Additionally, the study needs more extensive comparisons with companies in other industries and regions, which may affect the generalizability of the results. Future research could expand in the following areas: broadening the scope to include more companies from different industries and regions to provide a more comprehensive reference for sustainable supply chain management practices; delving into the challenges and solutions companies face in sustainable development to help other companies address similar issues; and combining quantitative analysis and model building to validate further and optimize sustainable green supply chain management assessment models.

Authors Contribution

All the authors contributed equally, and their names were listed alphabetically.

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