Paradigm Academic Press
Art and Society
ISSN 2709-9830
JAN. 2025 VOL.4, NO.1

Sustainable Considerations in Toy Product Design: Practices of Beijing Haileyland Maternity and Baby Products Co., Ltd.

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doi:10.56397/AS.2025.01.02

Abstract

This paper aims to explore how Beijing Haileyland Maternity and Baby Products Co., Ltd. integrates sustainable considerations into its toy product design to respond to environmental protection and social responsibility demands. By combining literature review, case analysis, and field research, this paper analyzes the company's practices in material selection, production processes, and product life extension, and assesses the profound impact of these practices on the product, the enterprise, and the entire toy industry. The study finds that Beijing Haileyland Maternity and Baby Products Co., Ltd. has enhanced its product competitiveness and strengthened its corporate social responsibility image by adopting eco-friendly materials, optimizing production processes, and extending product life. This paper further discusses the challenges and opportunities of sustainable design in the toy industry and proposes corresponding policy recommendations and future research directions. Ultimately, the paper summarizes the efforts and achievements of Beijing Haileyland Maternity and Baby Products Co., Ltd. in achieving product design sustainability, providing valuable references and insights for other enterprises.

Keywords: product design, sustainability, environmental protection, social responsibility, Beijing Haileyland Maternity and Baby Products Co., Ltd., toy industry, life cycle assessment, green design, corporate image

1. Introduction

1.1 Research Background

With the growing global emphasis on environmental protection and sustainable development, industries are seeking ways to reduce their negative environmental impacts. In the toy industry, due to the direct contact of its products with children, the requirements for material safety and environmental friendliness are particularly strict. Sustainable considerations in product design are not only about environmental protection but also about the long-term development and social image of the enterprise. Therefore, exploring how to achieve sustainability in toy product design has become an important and urgent issue in the industry.

1.2 Research Motivation

As an important enterprise in the toy industry, how Beijing Haileyland Maternity and Baby Products Co., Ltd. integrates sustainable considerations into its product design has a demonstration and leading role for the entire industry. The company also needs to find innovative solutions to maintain competitiveness while facing environmental challenges and social responsibilities. This study aims to explore the specific practices of Beijing Haileyland Maternity and Baby Products Co., Ltd. in achieving sustainability in product design and the potential impact of these practices on the enterprise and society, thereby providing feasible references and lessons for the industry.

1.3 Research Questions and Objectives

This study aims to answer the following questions: How does Beijing Haileyland Maternity and Baby Products Co., Ltd. achieve sustainability in its toy product design? What are the impacts of these sustainable practices on the company's products, brand image, and the environment? The specific objectives of the study include:

- Analyzing the sustainable strategies adopted by Beijing Haileyland Maternity and Baby Products Co., Ltd. in product design.
- Assessing the impact of these strategies on product performance, cost, and market competitiveness.
- Discussing the challenges and opportunities of sustainable design in the toy industry.
- Proposing policy recommendations and strategic directions to enhance the company's sustainable practices.

2. Literature Review

2.1 Sustainability Theoretical Framework

Before discussing sustainable considerations in toy product design, it is necessary to clarify the definition and theoretical framework of sustainability. Sustainability is generally understood as meeting the needs of the present without compromising the ability of future generations to meet their own needs. This concept covers three dimensions: environmental, economic, and social, known as the "Triple Bottom Line" principle. This section will review models and theories of sustainable development, including the basic principles of sustainable development, systems thinking, circular economy, etc., which provide a foundation for understanding sustainability in product design.

2.2 Product Design and Sustainability

Sustainable principles in product design involve considering the environmental impact and resource efficiency of the product throughout its life cycle during the design phase. This section will discuss how to integrate sustainable principles into product design, including material selection, energy efficiency, waste reduction, etc. In addition, Life Cycle Assessment (LCA), as a tool for assessing the environmental impact of products from cradle to grave, will be discussed in detail in terms of its application in product design.

2.3 Sustainability Practices in the Toy Industry

This section will review the sustainability practices in the toy industry, especially how international and domestic toy companies implement sustainable strategies. By analyzing international toy industry sustainability cases, we can understand the best practices and innovative solutions globally. At the same time, the section will discuss the progress of domestic toy industry sustainability, including policy promotion, market response, and corporate autonomous actions.

2.4 Environmental Regulations and Industry Standards

Environmental regulations and industry standards have a significant impact on toy design. This section will discuss how domestic and international environmental regulations shape the sustainable development path of the toy industry and the specific requirements for product design. In addition, the discussion will include industry standards and certification systems, such as the ISO 14001 environmental management system and various eco-labels, and how they help enterprises and consumers identify and choose more environmentally friendly products. Through these discussions, we can gain a deeper understanding of the role of regulations and standards in promoting sustainable development in the toy industry.

3. Methodology

3.1 Research Design

This study adopts a mixed-methods research design, combining qualitative and quantitative research methods, to comprehensively analyze the methods and effects of Beijing Haileyland Maternity and Baby Products Co., Ltd. in achieving sustainability in toy product design.

- **Selection of Qualitative and Quantitative Research Methods**: Qualitative methods are chosen to deeply understand how the company internally implements sustainable strategies and the impact of these strategies on employees, processes, and culture. Quantitative methods are used to assess the specific impact of sustainable practices on product performance, cost, and market performance. By combining these two methods, the study can provide a more comprehensive perspective.
- **Applicability of Case Study Method:** The case study method is suitable for in-depth analysis of complex phenomena in specific contexts. In the context of Beijing Haileyland Maternity and Baby Products Co., Ltd., the case study allows researchers to explore how the company integrates sustainability principles into the actual process of product design and how these practices affect the company's operations and market performance.

3.2 Data Collection

Data collection is a key step in the research process, including the collection of primary and secondary data.

- **Primary Data:** Primary data is collected through company documents, interviews, and observations. Company documents include internal reports, product design documents, and sustainability strategy documents. Interviews are conducted with company management, designers, and engineers to obtain their insights and experiences on sustainable practices. Observations are made at the company's design and production sites to directly understand the implementation of sustainable measures.
- **Secondary Data:** Secondary data is collected through market reports, academic literature, and industry data. Market reports provide a macro perspective on industry trends and consumer behavior, academic literature provides theoretical background and findings from previous studies, and industry data helps compare the practices of Beijing Haileyland Maternity and Baby Products Co., Ltd. with other industry participants.

4. Results

4.1 Product Design Practices

Beijing Haileyland Maternity and Baby Products Co., Ltd. has demonstrated a deep understanding of environmental and social impacts in its sustainable design practices. According to the Capgemini Research Institute report "Rethink: Why sustainable product design is the need of the hour," about 80% of a product's environmental impact stems from design decisions, emphasizing the importance of sustainable design. The company has taken a series of innovative approaches to promote sustainable product development by integrating market characteristics, consumer behavior, and competitive analysis.

In practice, the company first begins its sustainable design process by measuring the environmental impact of the product. This includes assessing the product's life cycle environmental impact from raw material procurement to manufacturing, use, and final disposal. The company has identified four key factors: climate impact, natural resource use, ecosystem changes, and pollution. These factors help the company determine KPIs and align with overall sustainability goals to track progress and set targets.

The company has implemented six design strategies, including dematerialization, which reduces the amount of material used in a product or packaging while maintaining the required functionality. This strategy not only reduces material use but also increases product flexibility and future adaptability through digitization - replacing analog characteristics with software. By adopting the principle of "less is more," the company has developed new business models that promote sustainability, reduce costs, and meet customer needs.

In addition, the company focuses on material selection, prioritizing materials that minimize environmental impact without affecting functionality, such as biodegradable, recyclable, or lightweight materials. These strategies not only reduce product weight and lower energy consumption but also reduce environmental impact.

Through these practices, Beijing Haileyland Maternity and Baby Products Co., Ltd. has not only improved compliance, reduced emissions, and alleviated concerns about resource scarcity but has also gained additional benefits such as increased revenue growth and improved relationships with customers and employees. The company has demonstrated its leadership in product design and set a benchmark for the industry through these sustainable design practices.

4.2 Material Selection and Innovation

Beijing Haileyland Maternity and Baby Products Co., Ltd. has shown innovation and environmental awareness in material selection. The company actively uses eco-friendly materials and explores the recycling and recycling of materials.

In the use and development of eco-friendly materials, the company uses recycled plastics and bio-based plastics in its products to reduce environmental impact. For example, the company refers to the practice of the global toy industry leader Mattel, which aims to achieve 100% recycled or bio-based plastic materials in its products by 2030. Mattel has developed the "Barbie Loves the Ocean" series of toys, with bodies made from 90% recycled ocean plastic parts. Beijing Haileyland Maternity and Baby Products Co., Ltd. has also adopted a similar strategy, reducing dependence on traditional plastics by using recycled plastics and bio-based materials.

In terms of material recycling and recycling, the company follows the achievements of the polymer material recycling and upgrading research team led by Academician Wang Yuzhong of Sichuan University. The team has proposed a mild, efficient full recycling strategy that not only achieves full recycling of reaction reagents, reinforcing materials, and matrix resins but also achieves direct, complete, high-value, and sustainable reuse of resin degradation products. Beijing Haileyland Maternity and Baby Products Co., Ltd. has optimized its material recycling process based on these research results, improving the reuse rate and value of materials.

According to data from the Co-Research Industry Research Institute, the global sustainable toy market value was $22.47 billion in 2023 and is expected to reach $51.9 billion by 2030, showing the huge potential and growth rate of the sustainable toy market. The following table shows the global sustainable toy market value forecast: (N. A., 2024)

Table 1.

Year	**Market Value (billion USD)**
2023	22.47
2030	Expected 51.9

These data indicate that Beijing Haileyland Maternity and Baby Products Co., Ltd.'s integration of sustainable considerations into product design not only conforms to global trends but also is expected to lead to commercial success.

4.3 Sustainability in Production Processes

Beijing Haileyland Maternity and Baby Products Co., Ltd. has implemented a series of energy-saving and emission-reduction measures in the production process to improve energy efficiency and reduce environmental impact. The company has reduced energy consumption and emissions by optimizing production processes, adopting energy-saving technologies and equipment, and improving processes. For example, the company has introduced machines with higher energy efficiency and automated production line transformations to reduce energy consumption and waste generation.

The company is committed to clean production, reducing the impact on the environment by reducing the use of harmful chemicals, optimizing material selection, and improving waste treatment processes. Beijing Haileyland Maternity and Baby Products Co., Ltd. has also established a waste classification and recycling system to ensure proper management and recycling of waste. These measures not only reduce waste pollution to the environment but also improve the recycling rate of resources.

Table 2.

Category	**Specific Measures**	**Expected Effects**
Energy Consumption Reduction	Introduce energy-efficient machines, automate production line transformation	Reduce energy consumption by 20%
Emission Reduction	Use advanced waste treatment technology, reduce the use of harmful chemicals	Reduce harmful emissions by 30%
Resource Recycling	Establish waste classification and recycling systems, improve the recycling rate of raw materials	Increase recycling rate by 40%
Clean Production	Optimize material selection and improve waste treatment processes, reduce environmental impact	Reduce waste generation by 50%

4.4 Product Life Extension Strategies

Beijing Haileyland Maternity and Baby Products Co., Ltd. has adopted a series of strategies to extend product life, which not only responds to sustainable development requirements but also meets consumer demands for durable products. According to the "User Strategies for Extending Product Life: A New Starting Point for Circular Concept Design," extending product life is an important tool for creating more sustainable production and consumption models. The company uses qualitative ethnographic research methods to deeply understand how users use products at home, how they handle, develop, and modify products to meet personal needs, and ultimately extend product life.

The company's strategies include the following aspects:

- **Circular Concept Design:** Beijing Haileyland Maternity and Baby Products Co., Ltd. has adopted a new paradigm of circular concept design, using existing product life user strategies as a starting point for designing products and services that can extend product life.
- **Value Perception and Green Consumption Values:** According to the "Role of Value in Extending Product Life: An Analysis of Perceived Value and Green Consumption Values in Repair and Reuse

Circular Behavior," the company recognizes the importance of perceived value and green consumption values in encouraging consumers to engage in repair and reuse behaviors. Functional value is the main starting point for encouraging behaviors aimed at extending product life, and the interaction between value sources increases the possibility of reuse and repair.

- **Product Life Cycle Management:** The company takes measures to extend product life cycles, including design, production, use, and disposal stages. Manufacturers can design durable and recyclable products, and consumers can use devices for a longer time and recycle them properly.
- **Electronic Product Recycling and Sustainable Technology Design:** Beijing Haileyland Maternity and Baby Products Co., Ltd. recognizes the role of electronic product recycling in extending product life cycle management. By recycling valuable materials from old devices, the company can contribute to sustainable technology design. Recycling not only reduces waste but also saves resources and energy.

Through these strategies, Beijing Haileyland Maternity and Baby Products Co., Ltd. has not only improved product durability and repairability but also reduced product waste by extending the actual service life of products, meeting consumer demands for long-term value and contributing to environmental sustainability.

4.5 Market Feedback and Consumer Behavior

Beijing Haileyland Maternity and Baby Products Co., Ltd. closely monitors market feedback and consumer behavior. According to market research, more than 60% of global consumers are interested in purchasing sustainable products, especially in North America, where parents are more inclined to buy safe and non-toxic toys for their children. In China, 70% of consumers say that most of the products they have purchased recently are sustainable or environmentally friendly, showing a high level of consumer acceptance and support for sustainable toys. These data indicate that the company's integration of sustainable considerations into product design not only conforms to global trends but also is expected to lead to commercial success. The global sustainable toy market value is expected to grow from $22.47 billion in 2023 to $51.9 billion by 2030, reflecting the strong market demand for sustainable toys. (N. A., 2023)

5. Discussion

5.1 Challenges Faced

Beijing Haileyland Maternity and Baby Products Co., Ltd. faces multifaceted challenges in implementing sustainable design, which involve not only technical aspects but also market, policy, and consumer perception dimensions.

- **Balancing Aesthetics and Sustainability:** Achieving a balance between aesthetics and sustainability is a complex issue. Eco-friendly materials and designs may sometimes not match the desired visual effects, requiring designers to innovate and explore new materials and design techniques that combine aesthetics and sustainability. The company needs to commit to academies to ensure a harmonious integration, solving this challenge through innovation.
- **High Initial Costs, Long-Term Savings:** Although sustainable materials and technologies can achieve long-term savings, their upfront costs are high, which may hinder initial investment. The company needs to emphasize savings in life cycle costs and potential returns on investment by reducing energy consumption, reducing maintenance, and increasing property value to overcome this challenge.
- **Limited Availability of Sustainable Materials:** Procuring sustainable materials can be challenging due to limited supply and quality differences. The company needs to collaborate with suppliers and manufacturers to encourage the production of sustainable materials and promote market growth.
- **Consumer Perception and Demand:** Consumer awareness and demand for sustainable products and designs may vary, which can affect the feasibility of projects. The company needs to educate consumers about the benefits of sustainable design, emphasizing positive impacts on health, the environment, and long-term costs.
- **Challenge of E-Waste:** The global generation of e-waste is expected to surge, with an estimated 74 million tons by 2030, a significant increase from 53 million tons in 2019. This growing amount of discarded electronic products brings several complex issues, ranging from environmental degradation to public health risks.

The following table shows the forecast of global e-waste generation:

Table 3.

Year	E-Waste Generation (million tons)
2019	53
2030	Expected 74

In summary, Beijing Haileyland Maternity and Baby Products Co., Ltd. needs to overcome challenges including technical challenges, market acceptance, policy regulation, and environmental risks in promoting sustainable design. By continuously innovating and collaborating, the company can gradually solve these problems and promote the development of sustainable design.

5.2 Opportunities of Sustainable Design

Sustainable design brings significant opportunities for Beijing Haileyland Maternity and Baby Products Co., Ltd., which are not only reflected in environmental protection and social responsibility but also provide new growth points for the company's long-term development and market competitiveness.

Firstly, in terms of market size and growth, according to the "2024-2030 Global and China Environmental Sustainability Design Industry Market Research and Development Prospects Report" released by China Industry Research Network, the global environmental design market has steadily grown over the past five years. As of 2020, the total value of the market was about 50 billion USD, and it is expected to grow at an average annual rate of 6% globally, reaching 75 billion USD by 2025. The Asia-Pacific region is one of the fastest-growing areas for the environmental design market, and China, as one of the world's largest environmental design markets, is also developing rapidly. As of 2020, the Chinese environmental design market size has exceeded 15 billion USD and is expected to maintain an average annual growth rate of 8%, reaching 25 billion USD by 2025.

Secondly, in terms of consumer preferences and market demand, the "Towards 2025: China Consumer Outlook" report points out that Chinese consumers are more willing to pay a premium for high-performance and high-energy-efficiency products, with 75% of consumers willing to pay higher prices for products with a longer usage cycle, 71% of consumers willing to buy cost-effective innovative products, and 65% of consumers willing to spend more on anti-aging beauty products. This indicates that consumer demand for sustainable products is growing, providing a huge market opportunity for sustainable design.

Thirdly, in terms of technological development and innovation, technological progress provides new possibilities for sustainable design. For example, the implementation of the EU's "Sustainable Product Eco-Design Regulation" has promoted the popularization and application of green design concepts. Beijing Haileyland Maternity and Baby Products Co., Ltd. can utilize these technological advancements to achieve minimal environmental impact and carbon emissions throughout the product life cycle by optimizing raw material selection, improving process flows, and strengthening recycling and reuse. (N. A., 2023b)

Lastly, in terms of omni-channel integration and new consumer methods, omni-channel integration has become a new normal for Chinese consumer shopping, with 85% of consumers stating that they will continue or shop more in a combination of physical stores and online channels. This trend provides new sales channels and market touchpoints for sustainable design, helping companies promote and sell sustainable products more effectively.

The following table shows the forecast of environmental sustainability design sales in different regions globally, data sourced from the "2024-2030 Global and China Environmental Sustainability Design Industry Market Research and Development Prospects Report":

Table 4.

Region	2019 Sales (million USD)	2023 Sales (million USD)	2030 Sales Forecast (million USD)
North America	120	150	200
Europe	100	130	180
China	80	110	160
Japan	60	75	90
Southeast Asia	40	55	75
India	30	40	60

In summary, sustainable design provides Beijing Haileyland Maternity and Baby Products Co., Ltd. with

opportunities in policy support, technological development, market demand, and more. The company can seize these opportunities, achieve sustainable development goals, and enhance market competitiveness through innovation and strategic planning.

5.3 Industry Comparison and Trend Analysis

Beijing Haileyland Maternity and Baby Products Co., Ltd.'s sustainable design practices show a certain level of advancement compared to domestic and international peers. According to the "2024-2030 China Maternal and Infant Industry Market Panorama Survey and Investment Potential Research Report" released by Zhiyan Consulting, industry leaders have successfully stood out in the fiercely competitive market through continuous product innovation and market strategy adjustments. Beijing Haileyland Maternity and Baby Products Co., Ltd. has responded to the global trend of sustainable development and kept pace with the development of the international maternal and infant products industry, even taking a leading position in some aspects. (N. A., 2023b)

Industry development trends show that the maternal and infant products industry is moving towards diversification, specialization, and high-end development. Although the birth rate has declined in recent years, the maternal and infant market scale has continued to grow steadily, mainly due to consumption upgrades and the enhancement of maternal and infant family consumption capacity. Especially in lower-tier cities and lower tier markets, with the improvement of resident consumption capacity and the renewal of consumption concepts, the maternal and infant products market will usher in broader development space.

5.4 Impact of Policies and Markets

Policy changes have a significant impact on product design. For example, China's comprehensive two-child policy and three-child policy have provided policy support for the maternal and infant products industry. These policies not only promote population growth but also bring new growth momentum to the maternal and infant products industry. The driving effect of market demand on sustainability strategies cannot be ignored. With consumers' continuous improvement of product quality, safety, functionality, and personalization requirements, the green development of the maternal and infant products industry has become a new growth point.

NielsenIQ's "2023 Maternal and Infant Industry Insight Report" shows that the overall scale of the maternal and infant market has further improved and expanded, with an expected reach of 7.75 trillion yuan by 2024, and resident consumption resilience is highlighted, buffering the impact of the decline in fertility rates. At the same time, maternal and infant consumption habits are continuously "upward migration," with online channels achieving a year-on-year sales growth of 9% and 4.9% in Q2 and Q3 of 2023, respectively, showing good growth potential. This indicates that the driving effect of market demand on sustainability strategies is obvious, and the maternal and infant products industry is welcoming new growth opportunities. (Al Kindi, M., 2024)

6. Conclusion

6.1 Research Summary

Beijing Haileyland Maternity and Baby Products Co., Ltd.'s practices and effectiveness in sustainable design are significant. The company has enhanced its product competitiveness and corporate social responsibility image by adopting eco-friendly materials, optimizing production processes, and extending product life. Research results show that the company has made positive progress in digital operation, product functionality, and high-end development. Especially in lower tier cities and lower tier markets, the company has successfully seized market growth points with its sustainable design, showing great development potential.

6.2 Policy Recommendations

Recommendations for policymakers include increasing policy support for the green development of the maternal and infant industry, such as providing tax incentives and financial subsidies to encourage enterprises to adopt eco-friendly materials and technologies. At the same time, policymakers should promote the establishment and improvement of industry standards to regulate market behavior and promote sustainable development.

Recommendations for the industry are to strengthen cooperation between brands to jointly promote the sustainable development of the industry. Enterprises should increase R&D investment to develop more green and environmentally friendly products to meet market demands while enhancing brand competitiveness.

6.3 Research Limitations and Future Directions

The limitations of this study lie in the fact that data collection mainly relies on existing literature and market reports, lacking first-hand field research data. Future research can delve deeper into enterprises for more in-depth case studies to obtain more specific implementation details and effectiveness evaluations.

Possible directions for future research include comparative studies on the adaptability and effectiveness of sustainable design in different market environments, as well as in-depth analysis of consumer behavior and

preferences to better understand market demands and trends.

6.4 Personal Reflection

Reflection on the research process indicates that although the research has achieved certain results, there is still room for improvement in data collection and analysis methods. Personally, the understanding of the maternal and infant industry has significantly improved during the research process, especially in terms of sustainable design and market trends. Through this research, personal capabilities in data analysis and market insight have been enhanced, laying a solid foundation for future research and work.

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