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Design in Context: Ecology, Economics and Politics

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ABSTRACT. *As the world pays more and more attention to sustainable development, different industries are pursuing reliable sustainable progress methods. Especially electronics companies. Because the manufacture and use of electronic products need to consume more energy. The production, recycling and disposal of electronic products are a serious threat to the safety of human and ecological environment due to the use of various heavy metal substances and other chemical substances in product production. Two electronic service systems - Haier and LG Electronics both claim to be sustainable. This paper analyzes and demonstrates the sustainability of these two systems, finds out their ecological, economic or political advantages and disadvantages, and proposes design interventions to demonstrate what can be improved in parallel systems.*

KEYWORDS: *Sustainable design; Ecology; Economics; Politics*

1. Sustainable product and service system

Sustainable product and service system is required to not affect and destroy the environment under the premise of providing services and needs for human beings, also can regulate human behavior and improve human awareness of environmental protection. It aims to achieve harmonious and unified development of economy, society, resources and environment. On the other hand, all behaviors need to consider the possible future consequences and minimize the consequences for the benefit of future generations.

1.1 Haier

Haier claims that the design, production, sales and service of its products have always implemented low-carbon and the company is committed to develop sustainable products for society and consumers. Haier energy-saving refrigerators have also won the highest five-star energy efficiency standards in Australia, Singapore, South Korea and other countries. This section will use Acaroglu's life cycle thinking to specifically analyze Haier’s fluorine-free air conditioning (Fig1) and determine whether Haier is indeed sustainable.

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Figure.1 Haier's fluorine-free air conditioning

Haier has been determined to develop low-carbon technology for its products, and successfully innovated and launched its own fluorine-free frequency conversion air conditioning products in 2000. Haier fluorine-free frequency conversion air conditioner designers claim that this air conditioner can not only achieve green environmental protection, but also thoroughly solve the industry's slow cooling and heating, low efficiency. In terms of energy consumption, Haier fluorine-free frequency conversion air conditioner can heat up in 2 minutes, cool down in 1 minute and start at ultra-low temperature of -20℃, 50% more energy saving than ordinary refrigerators.

However, in the fluorine-free air conditioning used to replace the Freon environmental refrigerant R410A in the use of the process does not contain ozone destroying Chlorofluorocarbons but is still the "greenhouse effect" culprit. This new refrigerant is only a transitional alternative refrigerant. In reality, the heartfelt "fluorine-free air conditioning" should be using natural refrigerants. So, fluorine-free air conditioners, though more energy efficient and environmentally friendly, will still produce pollution.

On the other hand, Haier has cooperated with eight suppliers to jointly establish the world's first "fluorine-free inverter air conditioner low-carbon industrial chain". In order to achieve the ultimate sustainable development goal, Haier integrates the supply chain, selects efficient and low-energy suppliers, and sets common goals to ensure the lowest cost, highest quality and lowest energy consumption of raw materials. Through such a strategy to ensure the advantages of suppliers, help both sides to achieve a balanced and coordinated development. However, there are no effective measures to improve Haier's processing process. Haier still produces a lot of noise pollution, water pollution and air pollution in the process of processing.

From the perspective of packaging, Haier group chose honeycomb paperboard as the raw material of packaging module, which is taken from a plant straw and can be recycled and disposed easily. The production process is efficient, low cost and has a good protective effect. However, the honeycomb cardboard prominent, will wear different degrees of surface, because the product wear and the probability of being returned will increase. Simultaneously, under the premise of guaranteeing the quality of transportation, Haier reduced the packaging height and realized the goal of

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putting two layers of refrigerators up and down. Greatly improve transport efficiency and reduce transport consumption.

1.2 LG

In LG's view, environmental protection is under the responsibility and obligation of every enterprise and individual. In addition to the state controlling pollution through administrative means, every enterprise should also integrate environmental awareness into the production and manufacturing of products and make efforts to provide consumers with eco-friendly products. This section analyzes LG electronics' strategies to determine whether LG electronics is truly sustainable, from product development to procurement, production, sales and after-sales service.

According to strategic directions, LG has integrated sustainability into all aspects of enterprise products. (Fig2)

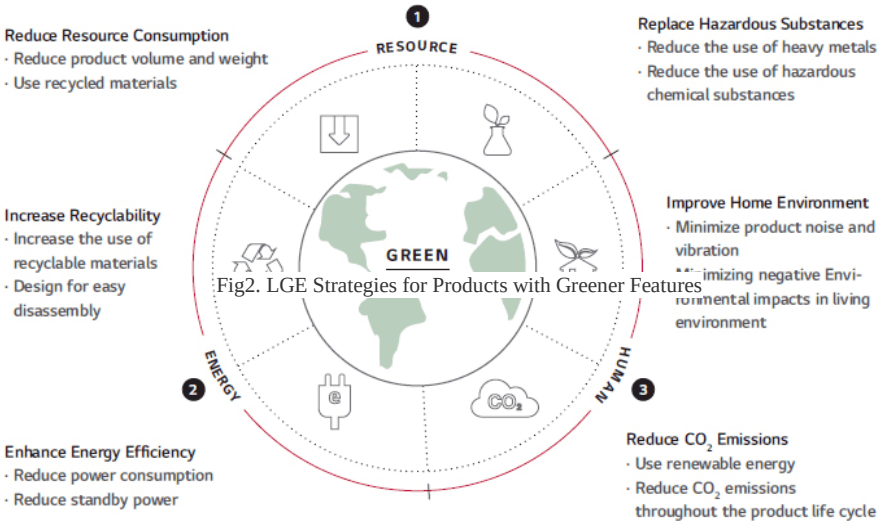

Fig2. LGE Strategies for Products with Greener Features

Figure.2 According to strategic directions, LG has integrated sustainability into all aspects of enterprise products.

Taking the LG washing machine (Fig3) as an example, the improved FR6WPW type washing machine is reduced by about 12% compared with the original washing machine plastic material, and the dematerialization design strategy is used to reduce the environmental impact by minimizing the weight, size and parts of the washing machine. Efforts have also been made to develop and improve the use of recyclable materials. However, it cannot be denied that reducing the volume of such household electronic products will probably increase the frequency of use of products, thus reducing the service life of products and increasing energy consumption. In response,

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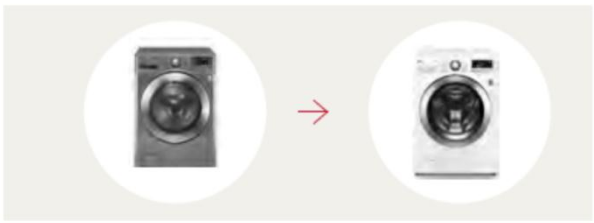
LG has developed a technology roadmap to reduce the power consumption of various usage modes.



Product Weight (kg)	Types of Plastic Materials (ea)	Number of Components (ea)	Reduction Rate of Plastics
Old Model : FR46C5MCNH			12%
99.7	8	374	
↓			Reduction Rate of Part
New Model : FR16WPW			4%
98.1	7	360	

Figure.3 LG washing machine improved before and after comparison chart

However, LG's high procurement, raw material and scientific research costs lead to higher product prices, which directly reduces sales volume and market coverage. LG ultimately missed its sales target. LG electronics' one-year earnings growth was negative, not comparable to its five-year average. As a result, LG cannot achieve sustainable and coordinated development of economy and environment.

Figure.4 LG mosquito-repellent air conditioner

In addition, LG has an insight into different cultures and develops products according to the needs of regional consumers. LG, for example, has launched a new mosquito-repellent air-conditioner (Fig4) for the malaria-prone African market. The air-conditioner uses ultrasonic technology to ward off mosquitoes, thereby reducing

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the level of malaria transmission. The air conditioner was allegedly a 64 per cent success rate in tests. In addition, the air-conditioner also has a built-in voltage converter designed to deal with African countries voltage instability and other damage to the air conditioning components. But with this ultrasound technology, the product needs to be fitted with a special rear shell before it can be used to repel mosquitoes. This undoubtedly increases the use of synthetic materials in products.

1.3 Compare

Both of these system strategies have their pros and cons. Comparing the two can promote mutual learning and discover the advantages to find better intervention strategies. Haier and LG have worked to develop sustainability. In particular, LG, which has developed a complete sustainable system, can be seen as a leader in the industry.

As electronics companies, both companies are focused not only on product innovation and technological improvement, but also on reducing child carbon dioxide emissions of their products. Unlike Haier, which only focuses on improving product emissions, LG helps improve consumers' low-carbon awareness by detecting the product life cycle, checking every link and actively communicating with consumers.

In addition, LG pays more attention to stakeholder feedback and pursues impeccable product quality through analyzing and investigating after-sales feedback, so as to improve brand value and influence. Different from LG. In recent years, due to the special national conditions, in order to keep pace with the rapid changes in the global economic environment, China's household appliances industry has carried out and advocated a series of environmental protection measures, such as home appliances to the countryside, home appliances replacement, energy conservation and consumption reduction. How to recycle household appliances is a huge issue. As a leading household appliance enterprise in China, Haier established a large number of old household appliance bases before implementing the policy of “exchanging old household appliances for new ones” in 2005.Haier has made a perfect performance by recycling resources, which not only improves the brand image and consumers' trust and support, but also protects the environment and reduces product pollution and energy consumption, setting an example for most Chinese enterprises.

Meanwhile, in order to improve, LG launched the global sustainable development report in 2012 and announced the five-year plan of ecological protection and green development. In the plan, LG electronics will transform its entire product line into an environmentally friendly one and conduct in-depth product research and development in water treatment, solar cells, smart grid and other business areas. Green transformation and low-carbon green growth has been identified as a new transformation of LG electronics, which will become a new source of market competitiveness of LG electronics. LG electronics have invested more than 20 trillion won in its green business since 2010 and are expected to generate 10-15 percent of its profits from environment-related activities.

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2. The Design Intervention

Strategic design interventions take into account the ecological, political, and economic contexts and try to combine the strengths of both to avoid repeating the same shortcomings.

Firstly, inspired by LG's focus on stakeholder demand strategies and combined with user centred design strategy. the stage of product development, combined with consumer feedback to improve the function and efficiency of the product, extend the service life of the product, and pursue different regions to develop different functional products without increasing environmental pollution.

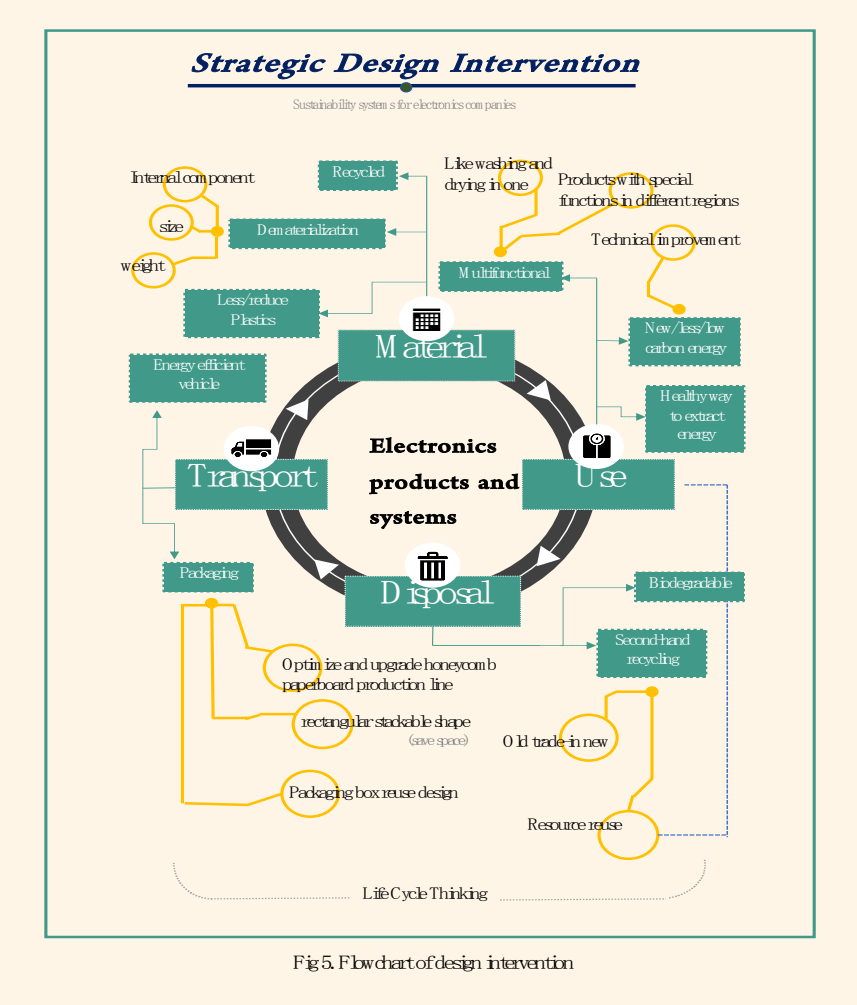

Fig 5. Flow chart of design intervention

Figure.5 Flow chartofdsign intervention

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Secondly, according to the Ecological Principles for Design of Energy Literacy, in the stage of resource collection, enterprises need to adopt more sustainable methods or develop cleaner Energy resources, which are particularly important for electronic companies. Inspired by Haier's strategy of building a large number of old home appliances bases, the company encourages consumers to trade in older ones or reuse them through second-hand recycling. Combined with the product service system design strategy, the company is responsible for handling and improving the recyclability of the product. Meanwhile, according to Acaroglu's Life Cycle Thinking, the company should reduce the energy consumption of products and reduce pollution and waste until the end of Life of products. (Fig5)

Finally, there are also many strategies in packaging that can reduce the impact on the environment. First of all, the honeycomb paperboard packaging material production line is optimized and upgraded to make it efficient and low-cost. Then change the packaging into a rectangular, stackable shape to save space and reduce transportation time and frequency. Last, with a simple design, the box can be used for other purposes such as storage.

3. Conclusion

Both Haier and LG Electronics argue that their products and systems are sustainable. This paper focus on the advantages and disadvantages of sustainable development policies and strategies promulgated and implemented in the two cases. And compare the pros and cons of the two companies in the ecological, economic and political background. Finally, based on the analysis results, this paper proposes a series of strategic design interventions to promote the improvement of the environment as well as reduce energy consumption and pollution of the products.

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