
Integrating ESG Pillars into Product Design Innovation:

Path discussion and Perspectives

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1.Introduction

Due to increasing pressure for achieving the objectives of sustainable development, the concept of ESG (Environment, Social responsibility, Governance) is no longer nice to make brand-building and PR images; it has become a business imperative, especially a vital indicator in the stock market. Over the years, as China has put forward the goals of "3060", "carbon peak, carbon neutrality", ESG has gradually become an important factor that cannot be ignored in the development of enterprises. Since ESG is an introduced discourse system and advanced organizational strategy (Martina K. Linnenluecke, 2022), China's ESG started relatively early compared to developed Western countries.

It brings many challenges and opportunities for designers who are desperate to create more value to the companies and the society. Lately, there are still a series of problems showing the shortage of specific implementation paths and the related product. Since Chinese enterprises are eager to find their own way to development products and services to fit in this world discourse system, how to better utilize product design implementing ESG is highly worthy of research.

2.Literature Review

Traditional product design starts from meeting the needs of consumers in the

market, but neglects the public's demand for reducing carbon emissions. In this phase, capture of customer requirements is a vital process (Shamraiz Ahmad et al, 2018). In the 1970s, the sustainability-oriented design had emerged and become a hot-debated issue in product design field. Since then many researchers accept the concept of ecological design(Eco-design) and design for Environment (DFE), and development several models, tools and methods within these sustainable product design (Marita Sauerwein, 2019). The main focus of eco-design discussing life cycle assessment (production, manufacturing, consumption, and recycling). The similar thought can be applied to DFE concept. These sustainable product design solutions pay much attentions on recyclable material choice, product repair, upgrade, re-manufacturing, and recycling at the end of life.

ESG provides a new perspective for product design, which not only requires consideration of resource utilization efficiency, but also the protection of the interests of enterprise employees, suppliers, consumers, and other stakeholders. It helps enterprises establish reasonable incentive and constraint mechanisms to optimize strategic models, promote sustainable development, and maximize the generation of enterprise and social benefits. Therefore, it is very necessary to open up an ESG perspective in product design methodology.

3. Product Design innovation within ESG Mindset

Since the rise of ESG in China, various organizations have successively participated: the implementation of physical enterprises involves incorporating ESG into various enterprise work operations. In following part, two typical cases at home and abroad are explored. One is Apple, a typical and world-famous innovative giant

enterprise. The other is Runmi, a Xiaomi Ecological Chain Enterprise.

(1) Case of Apple

In 2011, a report titled "The Other Side of Apple" accused Apple's suppliers of using production methods that harm employees. Since then, under immense social pressure, Apple has begun to undergo ESG transformation. Apple's ESG issues are related to hardware include supply chain management, raw material procurement, data security, employee diversity and inclusivity, product cycle management, user privacy, data security, and competitive behavior, etc.

Firstly, Apple designs its products and manufacturing processes with the aim of reducing carbon emissions by carefully selecting materials, improving material utilization and product energy efficiency. Secondly, Apple seeks various opportunities to improve energy efficiency and reduce energy consumption in its facilities and supply chain. Apple has identified opportunities to reduce carbon emissions intensity in product design by mapping its carbon footprint. Especially strive to use materials from renewable sources or manufactured from low-carbon energy sources, and prioritize materials and components that account for a significant proportion of carbon emissions. For example, in terms of materials and material handling, Apple's design principle is "less is more". Therefore, as the amount of materials used in manufacturing products decreases, it can also reduce emissions caused by material transportation and processing, and constrain the resulting waste production. Moreover, Apple has gradually expanded the use of recycled aluminum in the selection of product materials through research on aluminum metal. Currently, Apple's Apple Watch Series 7, Macbook Air, Macbook Pro, iPad and other products

use 100% recycled aluminum metal for their body shells.

Obviously, Apple incorporates the ESG concept from the beginning of product design. Even invested a large amount of funds and manpower in the research and development of materials. In addition, the ability to support Apple's integration of ESG into product design strategies relies on its strong organizational management framework, supply chain management mechanisms, human resource allocation, and related global training programs. However, Apple is unique, as its position in the global industry chain determines its voice power in the system. It can treat itself as a platform that is externally compatible and incorporate the resources it needs. It has pricing power and initiatives, and can decide the timing of action, can construct system rules, can transfer risks through the system, and thus reap systemic benefits. In this context, product design is given a more leading mission, empowered by social responsibility and supported by organizational structure, and the directions that product design can explore are also more diverse.

(2) Case of Runmi

Runmi Technology (Xiaomi Ecological Chain Company) was established in 2015 as an internet brand startup. Runmi mainly produces high-tech and high-quality travel products to meet the diverse needs of different groups of people. Although Runmi is a company with little history, after several years of leapfrog development, especially with the help of internet dividends, it has quickly become a leading E-commerce enterprise in the luggage field.

After experiencing rapid iterations, Runmi gradually clarified the path of brand attributes through design driven approaches. Under the ESG discourse system,

designers at Runmi have also embarked on the work of searching for design opportunities through material ecology sorting. Runmi, through its research and development in materials with upstream raw material suppliers such as Costron, one of the world's leading producers of high-quality polymers and their components, attempts to jointly build a transparent and traceable recycling value chain while expanding the application market of sustainable material solutions. Runmi has modified and developed high-performance recycled polycarbonate products from buckets recycled from Nongfu Spring, and has developed multiple low-carbon and environmentally friendly travel boxes based on this. This move highly aligns with the travel lifestyle of the new generation of consumers of Runmi's brand, enriches Runmi's brand image, and helps Runmi open up a new track.

Unlike other travel cases made from recycled materials on the market, the shell of Runmi's travel case is made of recycled materials from discarded Nongfu Spring Water Buckets, with controllable and traceable sources and guaranteed quality. At the same time, Costron adheres to a strict quality control system in the manufacturing process of recycled materials after consumption, and has a certificate of post consumption recycling provided by an authoritative third-party certification agency. Recycled polycarbonate materials after consumption can significantly reduce carbon emissions compared to raw materials, bringing a lower carbon and environmentally friendly material solution.

The reason why this process can be achieved cannot be separated from several infrastructure. The first is the modular product design thinking, which is convenient for designers to select materials according to different modules. For example,

although the performance of PC materials recycled by Costron from Nongfu Spring is inferior to the original PC or PCR materials. However, its own performance can indeed become a unique form of the travel box, meeting the new and unique needs of its target customers. The second is the digital industry thinking and industry platform. Nongfu Spring, Costron, and Runmi all require the use of a digital discourse structure and system to achieve effective integration. The third is collaborative innovation between organizations. This product design involves three companies. Different enterprises have different organizational structures, rules and regulations, and codes of conduct, so when conducting collaborative research and development, a lot of communication and adaptation are required to reach consensus and feasible solutions. The key for product designers is to identify and guide relevant stakeholders to form feasible solutions regarding the origin of product development. Unlike Apple, Runmi cannot form a closed-loop system on its own. But it can build close cooperation with other top organizations to research and achieve the product design goals under the ESG concept.

4. Summary

ESG is a set of thinking tools, but the paths taken by different enterprises in implementing ESG for their own product design and development can vary greatly. According to the SCP theory of industrial economics, industrial structure determines corporate behavior and corresponding performance. Similarly, enterprises at different positions and stages in the industry chain cannot copy the so-called advanced experience when practicing ESG. They need to carefully analyze their own situations and explore methodologies that are suitable for their own enterprises.

For many Chinese companies, the environment is changing rapidly and there are significant differences in industrial foundations. There are many obstacles to implementing the ESG concept and adopting the method of independently building closed systems. Taking the path of collaborative innovation with other enterprises is a direction worth exploring.

Firstly, it is necessary to connect the professional knowledge of upstream and downstream participants, and achieve recycling strategies through necessary knowledge and technological transactions. At the same time, closely link the value-added pursuit of enterprise production management activities with sustainable development goals (e.g. resource efficiency, social responsibility, organizational governance, etc.), and construct a mechanism and a standard for the participation of various stakeholders by exploring sustainable value opportunities and value exchange relationships at different stages of the product lifecycle.

Secondly, accelerate the digital construction of enterprises. The digitalization of enterprises reflects their shared, open, and co-creative digital thinking. On this basis, the idealized mechanism can be utilized by connecting different digital platforms, sharing information among collaborative organizations, and facilitating consensus and decision-making.

Thirdly, modularization becomes the initial layout logic of the design. Through dematerialization and modular design, the standards for material selection, application scenarios, and traceability paths can be addressed at the source, and issues such as positioning and stance can be clarified at the design institute's location.

Overall, ESG can assist enterprises in re-establishing material supply issues for

product design from the source, and can also balance the rights of different departments through organizational discourse structure configuration, allowing design to receive due respect. In addition, the most important thing about ESG is that it can help companies identify industry chain resources through product design, prioritize layout, and build a cognitive path for the market, thereby forming a company's brand power.

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