

# Structural Innovation and Functional Innovation in Product Design

— Product design for vulnerable people

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**Abstract:** product design for vulnerable people, this paper introduces the importance and necessity of structure innovation and function innovation in product design from two aspects: market value and market competitiveness. And exemplify the role of both in product design and the added value they can bring to the product. (Abstract)

**Keywords:** Product design; Vulnerable people; Structural innovation; Functional innovation

## 1. Introduction

The survival of enterprises depended mainly on the idea of innovation. In product innovation, we needed to understand customers' needs and the development of similar products, including the innovation of differentiated products, innovation of combinational products, innovation of technical products and innovation of compound products. Any product innovation strategy was finally reflected in the product's structural innovation and functional innovation. Product design should start from satisfying human needs. Products had their service life, they met people's different needs, let people enjoy various functions.

In the field of product design, we saw the different distribution of this continuous landscape. Typically, product designers had little knowledge of how people would actually use the product and even less about the end users' needs and goals. Some principles in humanized design of healthy person's product, children product, old man and old woman product, and disabled people product, were put forward on the base of humanization design theory. For example, physiological functions such as sensory systems, muscle and bone moving systems, and cognitive systems began to deteriorate as people age. In short, the design of the elderly care equipment was very important. The color design of children's products played an extremely important role in children's development. The embodiment modes of shape, material, and color design of children toys were analyzed with product semantics. The development of state and science and technology should use appropriate technology and products to convey information. Developers needed not do anything extraordinary to make a product usable for people with disabilities; all they should have done was to devel-

op the product to meet specified requirements. The physical and psychological characteristics of the disabled, the elderly and children should be discussed before designing the product.

The humanization design directions for different vulnerable groups were put forward. We have been making every effort to improve the living condition of the disadvantaged group.

## 2. Structural Innovation in Product Design

### 2.1. Structural Innovation

In a broad sense, the structure was the ordered collocation and arrangement of the components of things. The components of a structure were called artifacts. From the perspective of mechanics, structure was the form of objects that could withstand certain stresses, and the structure could resist forces that could cause changes in shape and size. From the perspective of product design, the interconnection and action of various materials in the product was called structure. The purpose of structural innovation was to better realize the function of products and information transfer of products and increase the value of products. Their importance to the disadvantaged was obvious.

### 2.2. Product structure innovation opens up new world

With the improvement of people's living standard, we gradually began to pay attention to the design of product structure in addition to the function of products. The product itself was to implement its functionality, or to deliver certain information. The structure of the product was the bearer of function and form design, and the existence of structure had certain influence on the product. In product design, we always saw similar products, they had

the same function, but the structure was different. The design structure of a function always had new, such innovation was necessary, it brought great convenience for us to use this product better. If a product insisted on the same structure, the market competitiveness of this product would gradually weaken and may eventually be eliminated. 1946 the world's first universal computer, the ENIAC, was born at the university of Pennsylvania. It was so huge that people began to simplify its structure to make it easier to use, so we had the tiny computers we now use.

### **3. Functional Innovation in Product Design**

#### **3.1. Functional innovation**

Function was the user's essential demand for the product, and the product was the realization form of function. The enterprise could meet the user's functional requirements through product design and manufacturing. The function innovation was to optimize, update and restructure the function of the product according to certain requirements, so as to meet the needs of some new market target and realize the process of market competition strategy.

Product designed for vulnerable people, not only need to realize the aesthetic feeling of its appearance, but also need to implements its auxiliary and convenience functions.

#### **3.2. Product function innovation have changed people's way of life**

The function of the product had always been the standard to evaluate the product. With our life more rich, our outdoor activities more and more, our life needs more and more products to meet our requirements, and product function innovation was the first thing we think of. Innovation was the driving force of development, and the innovation of product function was the driving force of enterprise development. Through the innovation of product function to improve the competitiveness of products, expand the market, establish a good brand. Functional innovation was the foundation of the product. There were a variety of products in our lives to meet our needs, but some products were becoming more and more popular, and some products had been slowly disappearing from our lives. More and more popular products had been pursuing the innovation of product function. In life, if we were sitting at home watching TV, also wanted to turn off the light or turn on the air conditioning, but we might only have a remote control or mobile phones, most of people didn't want to go to find another a remote control. If our household appliances could use the same remote control, we could control all appliances with one remote control, which would bring great convenience to our life. For example, when we wash our feet at home, we often need to get our own water. After washing our feet, we

dry our feet and throw the water away. Such a troublesome foot washing process made many people choose to simply wash their feet in the bathroom. If a foot washing machine could automatically pick up water, drain, massage, it would automatically dry our feet, so that we could enjoy the process of soaking feet easily and comfortably.

Product design for vulnerable people, its innovation of product function could change the way of life of the vulnerable people. For example, the design of automatic foot washing basin could replace people's labor and bring convenience to the disabled, children and old people.

#### **3.3. Functional innovation and market competition**

The key and core of design innovation was the function innovation, and the function of the product was the determining factor to realize the value of the product. If we thought of products as the source of value creation, then functional innovation was the starting point for providing the source. Functional innovation could keep the balance between the features and costs of the product, allowing the product to be superior to competitors in terms of its innovative and reasonable price. And the function of the product was to satisfy people's certain demand, without particularly attractive function, how could be competitive. A product that was not competitive couldn't survive long. Michael porter, Philip Kotler and other internationally renowned scholars had discussed the market significance of the evolution of product functions in their works. Porter pointed out that the development of product function in more complex products was actually competition through product innovation. Marketing expert Kotler put forward the concept of "market evolution" and "attribute competition", most of which were product function problems in market competition. It could be seen that product function was an important factor in strategic analysis. Therefore, functional analysis, design and innovation were important methods in the analysis, formulation and implementation of competitive strategies. The strategic significance of functional innovation was self-evident.

### **4. Product Innovation Gives new Value to Products**

The value of the product was of course its function, which represented the basic value of the product, but the different structure also brought more value to the product. The same product, which used a more refined structure, was more valuable. A good structure not only made the product more convenient in production, assembly and transportation, but also changed the product attributes. Its unique function could also be used as a work of art. For example, creative couch chairs could be shrunk and deformed. This chair was not only a chair, it could also be a sofa, its shape could be changed according to your needs. The feature of deformation and its structure are insepara-

ble, institutions could be as a carrying capacity of chair, for its deformation ability, it was not just a chair, and then the structure was given the value of the product. The influence of structure on the product was not only the change of appearance, but also the internal influence. In addition to supporting the implementation of product functionality, the structure of the product could be changed to better suit the user.

## 5. Conclusions

Product design for vulnerable people, its innovation of product function can change the way of life of the vulnerable people.

Product design for vulnerable people, the physiology and mental characteristic of the disabled, the elderly, and children were discussed. The humanization design directions for different vulnerable groups were put forward. Product design was the process of transforming a person's needs or purpose into a physical tool, and the inno-

vation of structure and function is the driving force for product design. It reflected the economy, technology and culture of an era. A good product must focus on the innovation of structure and function, so as to design products with low cost and unique features.

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