

# Research on Thinking Process Model of Technological Innovation in Product Design

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**Abstract:** Innovation plays an important role in product design. How to carry out product design innovation, the way is diversified, the purpose is to have creative breakthroughs, and in the process of seeking such breakthroughs, the divergence of thinking is undoubtedly an indispensable link. This paper first uses mind mapping to discover new problems in traveling, and then analyses creative thinking. The research results show that only by applying innovative design techniques and giving full play to creative thinking, can we design novel and advanced products to meet the needs of people in production and life to survive and develop. To quickly organize relevant thinking information and achieve effective innovation in product design, it is necessary to use the correct thinking divergence method and use the mind map to effectively divergence.

## 1. Introduction

The power of product innovation comes from the market profit, and only when it meets the needs of users more, can it make more profits. Therefore, it can be seen that the upcoming 21st century will promote the development of social economy with a faster pace of technological innovation. This is an indisputable reality [1]. As a revolutionary thinking tool, mind map can stimulate people's imagination and innovation potential, and its application is very extensive [2]. The key stage of achieving innovation is the conceptual design stage in the early stages of product design. It is both the first step in product design and the most innovative step [3]. In order for your products to occupy the market, you must constantly innovate products as your customers demand. People realize that good products are designed [4]. The aim of product design is to innovate products, and the essence of design is innovation. Nowadays, with the development of science and technology, culture and industrialization, the content of product design has extended from the appearance of products to a series of comprehensive designs, such as product performance, structure, maintenance and waste recycling [5]. Severe market competition makes it difficult for users to meet some of their needs technically. Therefore, technological innovation has become the key content of product innovation design.

Over the past 50 years, science and technology have developed at such a speed that it is unimaginable for predecessors to imagine. This is undoubtedly the result of the cross-development of various high and new technologies, the embodiment of promoting scientific and technological innovation on the basis of the accumulated achievements of high and new technologies, and the necessity of history [6]. Since the world famous psychologist and educator, the related research has never been interrupted, and it has exerted far-reaching influence in many fields, such as education, teaching, scientific practice and strategic planning [7]. Product innovative design technology has become one of the hot issues in the field of advanced manufacturing and automation technology [8]. Once launched, the product will always sell well in the short term and even become a worldwide commodity. Innovative products are designers who first use creative thinking to propose novel solutions in the conceptual design stage, and then carry out production [9]. A truly outstanding product design is actually a small "system" design. It is an integrated design of various related achievements in technology, art, culture, environment, human society and natural science [10]. Similar scholars believe that "all creation, whether it is the creation of nature or the creation of human beings, is based on a certain similarity." Therefore, the thinking of product innovation design has different characteristics and demands than other areas of design thinking.

## 2. Using Mind Maps to Innovate Product Designs

### 2.1. Product Design Innovation Overview

Product design innovation is based on the fact that traditional product design can not satisfy consumers' demands or create competition crisis with similar design. Designers need to seek new ways to break through the precedent of design in order to meet consumers and improve market competitiveness. Because a good product design plan needs not only reasonable functional structure, beautiful shape, simple operation, but also creativity. Once the technical model is completed, it should be used as a prototype for the product, but the product needs the whole technology. Design is one of the basic activities for human beings to conquer nature and transform the world. Therefore, product designers must have the social and natural, technical and artistic literacy qualities and new achievements, new discoveries, new ideas, and new things in all aspects of society, science and technology, and culture. High sensitivity. Microscopic contradiction refers to the opposite physical state/behavior that must occur under microscopic conditions/behaviors in operation time and space. This is also the essence of China's quaint philosophy "to innovate." The role of similarity thinking in innovation in engineering technology is self-evident. From the perspective of product development and design, many companies need to develop new market-compliant products in order to improve market competitiveness.

There is a clear correlation between technological innovation and the rapid growth of SME sales and exports (Table 1) among the smallest SMEs.

Table 1 Proportion of enterprises with sales and exports growing by more than 50 percent

Number of employees	Developing Technological Innovation Enterprises		Other Enterprises	
	Sale	Exit	Sale	Exit
Less than 20 people	45	64	14	44
20~99	15	47	24	37
100~499	17	49	13	29
More than 500 people	9	36	11	34

### 2.2. Using Mind Map to Find New Problems

From the point of view of product improvement design, there are all kinds of products in life. Users will have different problems when using them. Designers need to constantly find problems and find out design points. In the field of Engineering technology, although there are many categories and disciplines, there are also various similarities, but the similarities are different. In exploring solutions to specific problems, the specific principles of physics, chemistry and geometry needed to achieve certain functions are provided by the engineering application knowledge base of physical chemical geometry effects. And "variation" represents development, and the accumulation of variation to a certain number will cause qualitative changes, thus forming new things. In the process of conducting user research, careful analysis is needed to find new requirements blanks as much as possible, and to find user demands that are easily overlooked. The goal of conceptual design is to obtain the basic form or shape of the product. The corresponding product design is designed according to the total functional requirements of the product, and the conceptual design is a rather complicated process. That is to say, if any new product cannot be repeatedly produced or mass-produced, it is not a commercial product, and it can only be regarded as an art craft. Since the design task comes from people's needs, and people's needs are endless, the design will inevitably have no end.

## 3. Creative Thinking

### 3.1. The Concept of Creative Thinking

Creative thinking, also known as "transformational thinking", is a kind of materialized thinking activity that reflects the nature of things and their internal and external organic links, and has a novel and broad mode of thinking. It refers to the creative thinking process. In a word, the function of the

product is realized by the surface of the part, which is called the functional surface. Functional surface is the basic unit of product structure and function. Mind mapping runs through the whole process of analyzing users' demands. It divides and diverges the key words centering on users' life behavior, captures the details as much as possible, and finds new gaps in details. When we study the similarity between things, we must grasp the essential similarity. In the field of engineering technology, there is similarity between engineering equipment, engineering systems or engineering construction. The definition of a functional surface has a lot of information throughout the life of a product, including: design information, assembly information, management information, 3D simulation information, usage and maintenance information. Therefore, the adjustment work in a wide range of fields required for the productization of parts materials, production methods, test inspection, packaging and transportation has become indispensable for the entire development. Creative thinking is higher in nature than abstract thinking and image thinking, and is an advanced stage of human thinking.

Its forms mainly include: “hiring domestic or international experts for technical consultation”. “Get scientific and technological achievements through the introduction of talents”, etc. (see Table 2).

Table 2 Main Use of Technology Innovation Funds for Small and Medium-sized Enterprises

Main uses	Percentage of enterprises surveyed
Purchasing Technology	23.66
Purchase of Patents	4.54
Purchase of scientific research equipment	24.68
Engage experts	26.64
Technical Personnel Training	54.35
Entrusting research projects of colleges and universities or scientific research institutions	10.68

### 3.2. The Training Method of Creative Thinking

More than 300 kinds of creative thinking techniques and methods have been summarized all over the world. Some of them are summarized according to different ways of thinking and national conditions of different peoples. If it does not have certain functions, it will lose its significance of existence. In the design, the principle of innovation must be highlighted, and through intuition, reasoning and combination, the principle scheme and structure of innovation should be explored, so as to make inventions, creations and advanced choices. The system will open the case parts library and search automatically according to the database index. From the perspective of market research, after establishing the design project, we need to visit the market to understand the existing products. In this process, you can use the mind map to focus on similar products and similar products, diverging its advantages and disadvantages, and laying a solid foundation for the project product update. Secondly, different forms of thinking should be used for innovation, and the use of mind maps to effectively evoke the characteristics of divergence. With the image thinking, logical thinking, re-thinking and creative thinking, the design points of the products are considered from different sides, and the design ideas are found. Therefore, the basic characteristics of innovative design are novelty and advancement.

## 4. Conclusions

The core of the technological innovation thinking process model is contradiction, including the source of contradictions, the formation of contradictions, and the resolution of contradictions. Everything in nature, whether created by nature or created by man, is achieved by following the similar laws of objective existence. As a product designer, drawing a map with design thinking, through this method of radioactive thinking and concrete, enhances the designer's thinking flexibility. The knowledge acquisition function, that is, the process of refining and summarizing knowledge, is the key to the entire design process. Only when enough information is obtained can the high-quality

product be designed, and it is a prerequisite for establishing and supplementing the knowledge base. We know from the highly competitive environment of modern enterprises that innovative design of products is an indispensable condition for enterprise management, and the research and development of manufacturers must start with new products. Product design innovation is the lifeline for enterprises to survive and develop. This innovation comes from the cultivation of Designers' keen observation of life and creative thinking. Product innovative design comes from product innovative design thinking. The acquisition of product innovative design thinking requires that product innovative designers follow certain thinking rules and requirements. At present, our country is undergoing an unprecedented transfer of national development strategy. Independent innovation highlights its important position in various disciplines, and becomes the backbone to support the rise of a country.

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