A Study on Product Design Management and Its Trends

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Abstract: In China, it is usually understood that product design is a kind of scattered work, which includes the modeling of outward appearance of products, the beautification of product packaging, the promotion of demonstration or propaganda of products. All of these usually weaken the systematic characteristics of product design and then discount the overall effect of product design greatly. This paper has combed the development vein of design management, introduced the development process of design management in Chinese enterprises, and then elaborated the development trend of design management emphatically.
Keywords: Design management; Product innovation; Management strategies; Risk transmission

1 Introduction

Product design management is the result of the development of industrial design. The industrial design was originated in the Industrial Revolution, and developed on the basis of the industrialization production in enormous quantities. If we divide the industrial design into the traditional industrial design and the modern industry design, it is not difficult to find that the core of traditional industrial design is the product design. However, along with the development of time, the traditional design already could not satisfy the need of enterprises and social development. Therefore, the modern industry design or the generalized industrial design is defined as that, in order to achieve some specific goals, a practical and feasible implementation plan is established from the idea, and expressed with a series of behaviors, which contains all use modernization method to carry on the design process of production and the service.

For many western countries' enterprises, the cognition and the development regarding design is an evolution process. Bauhuas, Ford, Das Auto, paid more attention to production technique and manufacturing procedure of products. Ulm and Braun concerned and developed product design from the points of the design methods, design systems and their construction. So design management was given birth gradually in this process. In the 1970s, the London Business School proposed the concept of design management. In the 1980s, enterprises like Sony and Samsung started to pay great attention to their brands, markets, plans, consumers and design management. As a result, design management is taken as a tool to effectively reorganize the resources of enterprises, to coordinate the relationships of various departments in design process and to safeguard the product innovation smoothly, and its importance is highlighted day by day.

The concepts of design management are relatively diversified from different aspects. Design management is one kind of multi-dimensional executive program that can guide the images and cultures of enterprises to combine as a whole; Design management is the highly unified method that can realize the development strategy and the management plan of enterprises, and then combine the vision images of products with the technology; Design management is to take the product development design as a main item, to adjust enterprise's activity and organizations correctly and then create more and more concretive product forms. But the more accurate definition of design management is: according to users' demand, R&D activities should be carried out in an organized way, the creative thinking of designer should be transferred effectively, and the understanding of market and consumer should be transformed in the new products. All in all, enterprises should affect and change people's life in more reasonable, scientific ways and put out a series of design strategy for the profit maximum of enterprises limit carries on. Design management is an emerging discipline due to its short development process. But it has been concerned more and more because it is of great importance for product innovation of enterprises.

2 Systems of Product Design Management and Its Connotation

If we take the product innovation as the starting point of design, the contents of design management should include: design decision-making, design organization, design project management. The product innovation is the goal of product design and the core of design management(shown in Figure 1). In design management activity, the design strategy management can safeguard the establishment of project objectives, and provide the solutions to these projects, which instruct

enterprises about innovative activities directions. So design strategy management is at the most important position in design management activity. Design organization management can solve the question of "how to do" because design organization is the foundation and guarantee of carrying out design strategy. Scientific and reasonable design organization can guarantee that various levels of project objectives can be realized. Following the formulation of design strategy and the distribution of design organization, design project management is to deal with the practical questions in the process of product design. Considering the links involved in product innovation, the actual contents of design management should cover the management of strategies, goals, processes, systems, quality and the intellectual property in the process of product innovation.

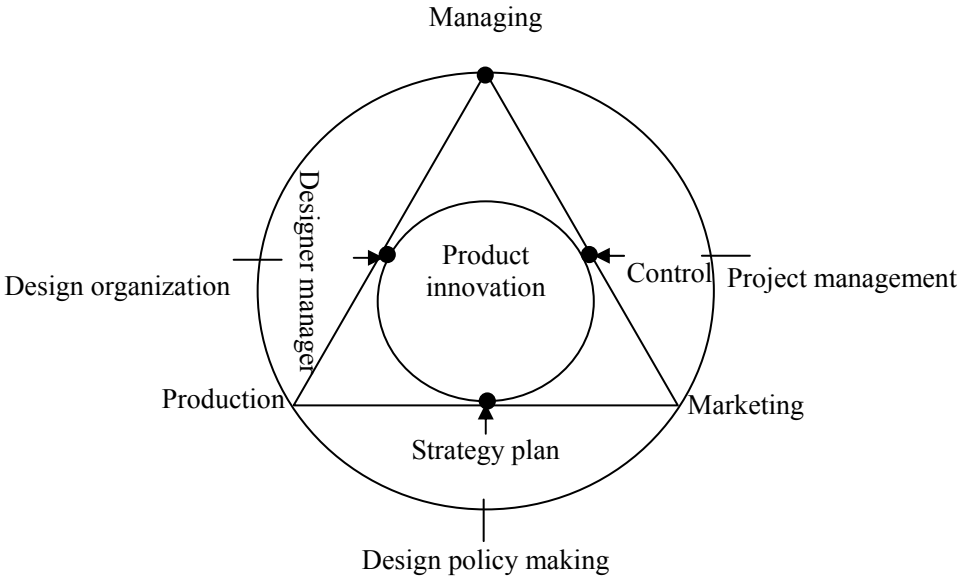

Figure 1 Structures of Product Innovation

3 Development of Product Design Management in China

Different from the western developed countries, the Chinese economy and the development of enterprises in China are not proceeding in an orderly way. Its development model is the spanning type, which leads to the evolution of design management in China appear along with the leap of economical development rather than in a gradual path.

In the early stage of reform and open up policy, China only paid great attention to the heavy industry and introduced the production and the design ideas of western countries by purchasing production equipment and assembly line and so on. In the mid of 1980s, some Chinese enterprises started to duplicate and intimate the popular western products. From 1990s few business enterprises studied the development procedure of western products, and started to follow up the western enterprise's development model. In the late 1990s, some modern enterprises such as Haier and Lenevo, emphasized the international connection with foreign markets, started to utilize the industrial design and independent innovation, and then design management began to be accepted by the Chinese Enterprises. Attracted by the giant Chinese market, the massive international brands enter China in abundance. More international brands started to establish the R&D bases in China. This act proved that China not only has the condition as the manufacturing center of the world, but also has the ability to combine R&D with production in an organic way, which has created the good condition for the development of design management in China.

But this kind of economic development also appeared many malpractices, such as environment problems, massive enterprises depending upon labor-intensive industries, lack of the independent innovation ability and the core competitiveness. In the long run, these problems are disadvantageous to the competitive power. Under this case, the construction of "the innovative country" arose. The problem is exacerbated by China's lack of successful innovation and its reliance on stitching and welding together products that are imagined, invented and designed by others. A failure to innovate means China is trapped paying enormous amounts in patent royalties and licensing fees to foreigners. China's government has responded in typically lavish fashion, launching a multibillion-dollar effort to create

brands, encourage innovation and protect its market from foreign domination. Through tax breaks and subsidies, China has embraced what it calls "a going-out strategy," backing firms seeking to buy foreign businesses, snap up natural resources or expand their footprint overseas. Domestically, it has launched the "indigenous innovation" program to encourage its companies to manufacture high-tech goods by forcing foreign firms to hand over their trade secrets and patents if they want to sell their products there.

4 Studies on Trends of Product Design Management

4.1Design management based on the high technology and new technology

The concrete manifestation is the CAID, Computer Aided Industrial Design. The whole CAID is a huge computer system (see Figure 2). The main goals of this system include: one is to organize the resources of design reasonably, and to use each kind of new technology, new material, new energy so as to realize the design innovation fully. Second is to make the improvement on the traditional product design and manufacturing process in order to achieve the effective network of product design by fully using the high technology and new technology. Third is to realize the uniformity between industrial design and engineering design. Finally the man-machine integration and the integrated design management system is formed. This system is carried on according to following flows: firstly, the shapes, the colors, the material quality design is presented on the basis of full consideration of man-machine technology; secondly, the hypothesized assembly is designed in the digitized virtual system in order to test the confirmation product mix to be reasonable or not, and be advantageous for the production processing or not; thirdly, with the aid of the quality synthetic evaluation system, targets such as esthetics, semantics and engineering mechanics of this product should be appraised, further adjusts the design target. By means of comprehensive evaluation system for the product design, aesthetics, semantics and engineering mechanics index evaluation, further adjust the design index; the process will end design output to the processing equipment, and production on the market; to collect market for this product information feedback, the feedback input to CAID system again, further enrich, update index, for the next round of design to provide coordinates.

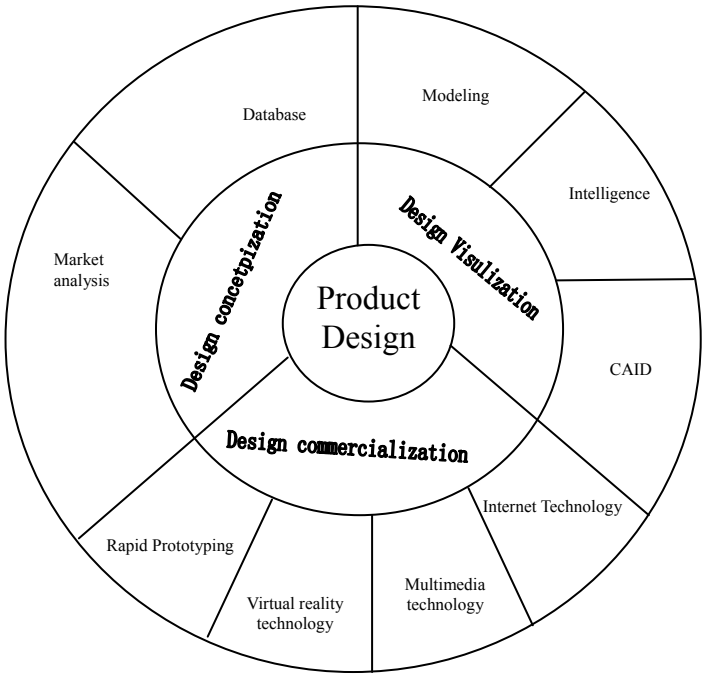

Figure 2 Structures of CAID

The method enables a designer in mind from the beginning to the product life cycle, all the links, to design, manufacture, use, evaluation, feedback and other aspects of a reasonable organization. At the same time, with the establishment of recycling product information feedback mechanism and information base, in favor of products in large quantities production, the virtual assembly can find out quality problems, find user acceptance problems through the evaluation system, effectively avoid unnecessary design risk, improve management efficiency, and strengthen design management effect.

4.2 Integrated design management system based on Internet technology

In the vigorous development of the network technology, network technology in design management status is more and more prominent. CAID factors are in the network as a bridge, to the product design management center for total control, forming a complex and orderly organic whole (see Figure 3). Virtual product development (VPD) is based on network system construction of the official of another kind of design management mode. VPD is also based on integrated products and data management, the integrated benefits of product development process for all personnel, can be quickly reused, access to information. VPD was designed by means of computer simulation, instead of the original model demonstration and pilot demonstration, thereby saving development time; reduce the investment of research and development. At the same time, because of the development of network technology and computer simulation is perfect, the past through the model and the trial cannot be exposed the problem can be solved more easily also, experimental data collection and storage, thereby improving the forecasting and decision-making level, made out of product development mainly depends on the experience of traditional pattern, development to the all-round and accurate prediction of the new stage.

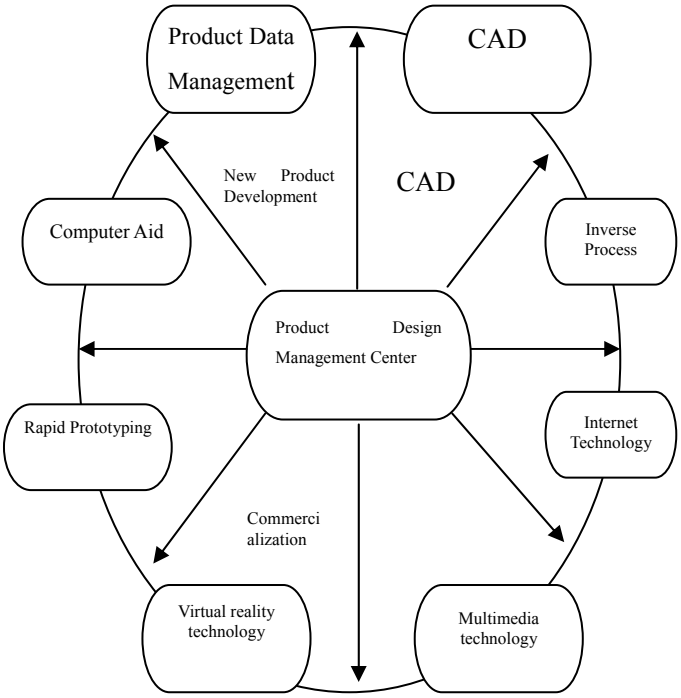

Figure 3 Structure of Integrated Design Management System Based on Internet Technology

4.3 Design management system based on risk transmission

Risk transmission is appearing in recent years in the field of Management Science in the emerging theory, domestic and foreign scholars mostly concentrated on the transmission of monetary policy, financial market, financial transmission knowledge transfer etc. The author thinks, transplanting risk transmission theory into the design management has its unique character, namely from the angle of the risk management to improve the connotation of design management, to improve the success rate of product innovation has positive significance. The author tries to define product innovation design risk transmission as: in product innovation design process, it is inevitably affected by the objective and subjective uncertainty and the impact of interference, resulting in product innovation design risks, when the risk of exceeding the risk threshold, then depends on certain carrier, through certain routes or channels, spread to the innovation design of product in all aspects of its business flow, resulting in product innovation design actual reached a deviation from the established objectives and suffer a loss process.

Product innovation design risk in the transmission process, generally along the business process chain, value chain, profit chain, supply chain, i.e., its correlates directly or indirectly associated with the path for transmission, has strong direction and path dependence (see Figure 4). Product innovation design risk is not generated from the start of transmission, but in product innovation design in the initial

stage of aggregation, when accumulated to a certain extent, to meet or exceed the threshold (the threshold), will cause its transmission. It is because that each product innovation design of individuals or groups, have certain exclusions or dissolve objective uncertainty or subjective uncertainty influence and interference ability, therefore, product innovation design risk can be eliminated or resolved in the bud, under the control of the critical value (threshold), cannot be transmission. Only when the objective or subjective uncertainty to the interference and impact strength, greater than the product innovation design of individual or groups of exclusion or dissolve ability, innovative product design risk will help some risk carriers to follow a certain path for transmission.

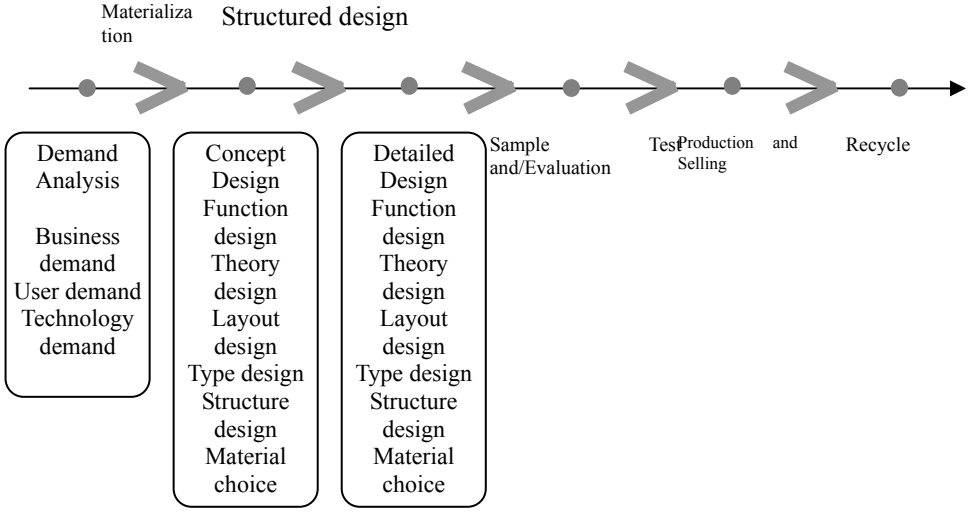

Figure 4 Measures to Manage Design risks

Research on product innovation design risk transmission aims at recognizing product innovation design risk, improving product innovation design risk threshold, maintaining risk transmission carrier, cutting the risk transmission path and controlling the risk or risks to improve the success rate of product innovation design management approach. The specific implementation process is the most important measure to improve all aspects of product innovation design of buffer ability, ability and creative ability.

(1)Buffer ability

Buffer ability is a kind of" to the same strain" ability, which is the system against environmental change. Product innovation design of buffer ability, refers to the product innovation design system with the design thinking, design ability, design method, design means the surplus level. It usually has a physical buffer, buffer and buffer time. Physical buffer is product innovation design system to deal with external uncertainty of the various physical reserves; ability to buffer means to prevent external uncertainty in product innovation design system the elements the surplus ability; buffer time refers to deal with various uncertainties and at the time of setting of the period of insurance. Continuously improve product innovation design of buffer ability, it is better to resist environmental change on product innovation design system of erosion, in order to prevent, control, and dissolve all sorts of risks.

(2) Adaptation ability

Adaptation ability is a kind of" changeable" ability. Product innovation design ability, refers to when the environment changes, product innovation design system without changing the basic features of the premise, to make corresponding adjustment, with the ability to adapt to environmental changes. The ability to adjust the size depends on the strain of this change speed and range. "Variable" speed depends on the environmental changes" uncertainty" information can be turned for product innovation design instruction needed time and product innovation design instruction is issued and implemented the time needed to" change"; the range depends on the product innovation design principle, method, means, ability changes the equilibrium degree. In biological community the existence of" survival of the fittest", innovative product design is facing the problem of adapting the change of the environment, using live, making good use of human, material and financial resources.

(3)Innovation ability

Innovation ability is that the system adopts a new act, new move, influence of external environment and internal conditions change ability, which is a kind of" take the initiative to change" ability. The

innovation design of product innovation ability, refers to the product innovation design should not only response rapidly, but also take the initiative to change, affect the environment positively, so that the environment is in favor of its own side of change and development.

Buffer ability, adaptation ability and innovation ability of product innovation design are the key factors to control the risk transmission of product innovation design. Buffer ability is the product innovation designs on the absorption or reduction of environmental change effect on system ability; adaptation ability has varied with the environment and adapted to change; innovative ability has a positive effect on internal and external environment ability.

5 Conclusions

China's reforming and opening up policy has constantly improved the establishment of market economy, and enterprises are confronted with increasingly fierce competition. China has put forward to build" innovation country", at the same time, industrial upgrading of the urgent need for Chinese enterprise own development raised higher requirement. The art, science, design of the macro definition has been controversial, causing social design for one-sided understanding and misunderstanding. The discipline system is not perfect, the design of talent training mode is not standard, which seriously influence Chinese design level, restrict the Chinese enterprises' independent innovation ability and the success rate of product innovation. The design idea should realize the establishment of an organic system of design management system, can undoubtedly enhance the design level by effective means and guarantee independent innovation of enterprises, which requires the joint efforts of researchers and practitioners in design industry.

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