Application of Product Model in the University Industry Design

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Abstract — With the rise of industrial design, product modeling has become a professional industry. Model making is industrial product design from the plane to the stereoscopic conversion part of a practice, the model is designed to test whether beautiful and practical, in line with the important basis of man-machine relationship, and model making course is of great significance for the teaching of industrial design. At present, our country proposed the strategy of "the development of creative industries, the construction of innovation type countries", is committed to "made in China" to "designed in China" transformation, and in the process of the implementation of this strategy requires a large number of creative design talent. Under this background, this paper makes the research and application of product model in the teaching of industrial design in Colleges and Universities. The innovation of this article lies in the industrial design stage, independent, and model making teaching practice, to unify research, and then discusses the specific application.

Keywords - product model making; university industrial design; design teaching

I. INTRODUCTION

With the continuous change of the rapid development of science and technology and market demand, demand for products has not only satisfied with the function, for other emotional factors demand has become more and more prominent[1]. And product model production as a professional industry, its main content is the application of technology to produce the product appearance of the first version of the sample structure [2]. This requires that all kinds of colleges and universities, as a talent training base, can cultivate and export the industrial design talents of the product model [3-4]. Founded from the industrial design specialty in our country, although also arranged for a large number of hours and credits, but in content should also improve its pertinence [5].

In Contemporary Colleges and universities design professional, professional courses invariably offer the relevant industrial product design and performance techniques [6]. Teachers in teaching students a variety of scientific industrial product design methods and procedures at the same time, will encounter such a link; that is to ask the students will own or through group discussion with some specific forms of the design scheme obtained, for further in-depth study [7]. Finally let students using computer software for optimized design schemes of virtual modeling and rendering, to carry on the plan layout of display design, obtained by design of text description and a lot of exquisite renderings of the final design is finalized [8].

In the present computer technology, students from abstract thinking to concrete design expression display method in product model making already it is quite common for college [9]. On the surface this teaching method seems to be perfect, and the material resources will not cause too much waste, it is suitable for the current situation of Chinese. But as an industrial design is closely related with social production, science and technology discipline, focus on is the close combination of theory and practice [10-11]. Scientific, reasonable design methods and procedures for the perfect visual display are important, but more important are the practice of [12].

British famous industrial design master Payne John Mr. once said: "do not do kind model, how to do a good job in industrial design, how to do a good job in new product modeling? When designing new products, it is impossible to do the physical model of the product" [13]. As a special branch of industrial product design performance skills, is an important link in the process of product design in industrial product physical model to make, design conception of stereo image, is designers to express one of the design concept and idea of design performance skills [14]. The designers according to the idea of the idea of using the appropriate materials, tools and processing methods will be designed to show the concept of product with a three-dimensional shape entity.

II. STATE OF THE ART

As an important part of industrial design, model making plays an important role in the development of modern design. In the design, in order to improve the overall design level and promote the progress of design, designers must recognize model making the essence of the design process, understand the model content and the importance of the related knowledge, the model of multi angle and multi direction thinking and analysis, so as to promote model making and promote the development of the design.

With the rapid development of modern economy, science and technology, science, conform to the trend of the times
produced a computer technology for carrier model built form is today we say computer models, as shown in Figure 1. This technology breaks the existing model of the form of virtual model and virtual experiments as a form of expression, not people can use the body touch and feel. For example, a variety of virtual design and some numerical simulation, and so on, to a large extent, the development and enrich the method and content of manufacturing model. The traditional model is a 3D entity, which is made by hand. This solid object, we can see the solid, the design of the shape, color, material, structure and other aspects of clear and clear display, to give people the most intuitive real feelings. The advantage is that the emerging technologies, such as computer multimedia, cannot be replaced and irreplaceable.

Designers make product models have become one of the necessary skills, but also fundamentally changed their traditional way of thinking. The use of computer aided design to make the model in the future is bound to be a major trend in the development of a wide range of design. Therefore, in the industrial design, we need to combine the traditional model and computer model, both to strengthen workers to design the practical modeling ability, and improve the technology of computer modeling, combined to jointly promote the role of design development.

III. METHODOLOGY

Product design generally has 4 stages: clear tasks, conceptual design stage design stage and construction design stage. The different stages of the place, the need of product design information are also different. The process of the product design is clear; the product model reflects the requirements of the results also have the process, as shown in Figure 2. Corresponding to the product design process is different; there should be no product model to model. There were referred to as creative model, working model, prototype model. The characteristics of industrial products due to its function and form, and the design process are not the same, so the material, technology and applied range of comprehensive consideration involved in the production process to model. Moreover, different materials, different forms and different requirements for different process model, industrial design has a different role. Therefore, in each stage of product design, the practical significance of the model is also different.

A. The Analysis Methods of Comparison

In the model, the traditional research method is mainly reflected in the improvement of the material and technics. Production is mainly reflected in what kind of model to choose what kind of materials and processing technology and surface decoration processing method in the study of traditional physical model.

Through the former research and development are now applied in the product model of general material plaster, wood, clay, clay, thermal plastic, plastic foam, etc. In the way of making the model, there are two kinds of manual and artificial intelligence. Model making main material is the most important part, the ideal model of the main materials should have the following characteristics: first, the material must be easily molded and surface decoration, workload, time-consuming to short and can be stored for a long time; secondly, although the material model in the design of cost accounts for small proportion, but in the choice of materials or too much cheaper; main part modeling workload model mainly in production costs is the key factors in the choice of materials. Finally, models for the surface decoration...
processing performance are better. Therefore, in the selection of the main model are practical and economic principles.

The progress in the research of product model in addition to the traditional study on materials and processes, and is a new generation of computer aided modeling, the development of the computer in the graphics processing, make people to establish virtual model on the computer, figure 3 clearly expressed during the relationship. It can greatly improve the efficiency of modeling.

In the ease of use of methods of instruction, we fully integrated traditional modeling methods and the modern modeling methods, put the utility model has the advantages of powerful combination, abandon can get rid of the disadvantages of part of a set of practical significance of product design model is easy to use program.

B. Ease of Use of Product Design Model

Model in product design is a very special product, he is not only a need to make the product is also a need to use the product. So whether a model is easy to use need to consider from two aspects: first is easy to make; second is easy to use.

A physical model needs to be used in the traditional model of the production of materials and processes. Therefore, we need to spend a certain amount of money and time in the selection and processing of materials, but also need a lot of different materials suitable for processing a variety of equipment, the need to consume a large amount of manpower and material resources, and so on. Secondly, the production of the physical model requires a relatively fixed time and place, the product designers are usually produced in the model of the studio or laboratory, so the work place is relatively fixed. Because of the fixed location, cannot think about when to make it, so there is also a limit on time. So on the whole, the physical model is not comparable with the computer virtual modeling.

From the point of view of virtual model, computer aided 3D design is a kind of tool that is used instead of human. It is characterized by its high efficiency. Model is a representation of the system characteristics; in general, the model is not only used to replace the system, but should be simplified system, as shown in figure 4(a). Simplify the operation of the task to improve the ease of use of products; designers can simplify the operation of the task to simplify the operation steps to make the product with ease of use. As is known to all, the computer aided modeling technology has the function which cannot be replaced in the design. As shown in Figure 4(b), this technique is fully displayed. According to relevant statistics, if the product designs in the input 1 yuan, you can get 1500 yuan from the market return, therefore, the importance of the virtual model of the visible.

 Altogether, by way of science and technology and will operate task numerous for brief, can high improve product's ease of use, which reminds we not only attention art theory research, should also master more knowledge of technology. Integrated multi-disciplinary knowledge to simplify the operation of the product is difficult, so that people are very convenient to use the product, thereby improving the quality of our lives.

IV. RESULT ANALYSIS AND DISCUSSION

The advantages and disadvantages of the research from the last chapter a physical model of virtual model, we found that the combination is more effect. And currently in practical teaching design, the fundamental purpose of the
conceptual design often ignored, concept in the concept teaching is usually through hand-painted performance concept, computer aided concept, physical model of concept, as shown in Figure 5. To carry out the design concept teaching way is usually in a particular subject, in accordance with the requirements of a given target, to innovative design, almost all of the existence in the design competition, curriculum design, graduation design, this approach is difficult to achieve the purpose of training students. Also it is difficult to meet the culture known as the needs of the design concept of industrial design talent.

This chapter according to the conceptual design and creative design talent cultivation research questionnaire, to summarize the type requirements of the industrial design talent and innovative design ability structure and quality, each part of the curriculum system of industrial design cognitive differences.

![Figure 5 Three elements of computer simulation](image)

**A. Conceptual Design and Innovative Design Personnel Training Survey Questionnaire Design**

The questionnaire design uses the Delphi method, namely to the University industrial design professional teacher to carry on the opinion survey and the consultation. To develop a unified standard of the investigation process, to ensure all the respondents have plenty of time to fill in the questionnaire, respectively, with 5, 4, 3, 2, 1 five digital representation of the various items of questionnaire to "meet", "more in line with", "is in line with the", "not too conforms to" and "not in accordance with the" attitude.

In the course of the questionnaire survey, a total of 125 questionnaires were issued, and 82 valid questionnaires were recovered, as shown in Table I. Through the collection of data statistics, the demand for the type of industrial design talent, innovation and design talent ability structure and quality, industrial design professional system of cognitive and evaluation and other aspects of the analysis.

**TABLE I. QUESTIONNAIRE SAMPLE AND RECOVERY EFFICIENCY**

<table>
<thead>
<tr>
<th>Object of investigation</th>
<th>Distributed questionnaire</th>
<th>Recycling questionnaire</th>
<th>Effective questionnaire</th>
<th>Validity</th>
</tr>
</thead>
<tbody>
<tr>
<td>University expert</td>
<td>50</td>
<td>39</td>
<td>31</td>
<td>62%</td>
</tr>
<tr>
<td>Employing unit</td>
<td>75</td>
<td>62</td>
<td>51</td>
<td>68%</td>
</tr>
<tr>
<td>Total</td>
<td>125</td>
<td>101</td>
<td>82</td>
<td>65.6%</td>
</tr>
</tbody>
</table>

**B. Investigation on the Concept Design and the Cultivation of Creative Talents**

"Industrial design talent demand type" as the first part of the survey, the design company and university teachers and students of industrial design talent demand type differences were compared as shown in the table, starting from the macro level, research and design of the actual needs of the company and the University in the industry of design talent cultivation of disjunction of reason of the formation of this situation and try to put forward the preliminary solution to take to clear that industrial design professional talent training goal, that is, pay attention to cultivate well-known design concept of industrial design talents, as shown in Table II.

**TABLE II. THE STATISTICAL RESULTS OF THE NEEDS OF THE EXPERTS AND THE EMPLOYING UNITS IN THE UNIVERSITY**

<table>
<thead>
<tr>
<th></th>
<th>International design management talent</th>
<th>Cross cultural management talent</th>
<th>Foreign language talents</th>
<th>Creative design talents</th>
<th>Product marketing planning talent</th>
<th>Product customer service personnel</th>
</tr>
</thead>
<tbody>
<tr>
<td>College expert mean</td>
<td>4.5</td>
<td>4.3</td>
<td>3.5</td>
<td>4.8</td>
<td>4.6</td>
<td>4.5</td>
</tr>
<tr>
<td>The average of the employing unit mean difference</td>
<td>0.2</td>
<td>0.3</td>
<td>-0.6</td>
<td>-0.1</td>
<td>0.2</td>
<td>0.2</td>
</tr>
</tbody>
</table>

(Numerical value: 1: not necessary: 2: not necessary: 3: more necessary: 4: necessary: 5: very necessary)

As a training unit of colleges and universities and employers as a design company, for the creative design talent, this attitude is more uniform, the mean difference is very small. Thus it can be seen that the importance of innovative design talents, especially the concept design to the product innovation, is the. Product innovation has always been an...
important guarantee for the success of the product and the enterprise, and the remarkable characteristic of the excellent industrial designer who is familiar with the concept design is the product innovation design. To consciously in the teaching of industrial design professional focus on training a wide range of knowledge, nonconformist, good at communication and professional design talent.

C. Analysis on the Survey Results of the Ability and Quality of Creative Design Talents

Questionnaire on the second plate is "innovation design talent and ability and quality", in this part, the questionnaire will and divided into two parts. The first part is the quality of creative design talent, namely innovation design personnel should have the ability, motivation and value. The second part is innovation and design personnel must have the general ability, as a competent design concept should have the knowledge and skills. The two part of the design industry and the academic circles of the university are investigated to compare and analyze the cognitive differences of the ability and quality of innovative design talents:

- In order to cultivate the ability of innovation and creative thinking as the core; Have a wider range of knowledge, the importance of heuristic teaching; Pay attention to the design expression and communication, team spirit; Pay more attention to the cultural knowledge outside the professional skills; improve the level of foreign language;
- To grasp the latest information, update the knowledge with the times.

Colleges and universities is to carry out the implementation of the industrial design teaching units, not only to make the students learn to gradually meet the design practice in the requirements of the ability and quality, but also to the general law of development of in-depth study in the field of industrial design, for the industrial design degree in Southern Yangtze University on-the-job personnel on the industry growth and progress to provide theoretical support. While cultivating innovative design talents with the concept of knowledge, higher education needs a long-term strategic vision, cannot blindly follow the pace of the design company to adjust their own teaching mode. Altogether, colleges and universities to carry out implementation design teaching is not only to training students to master the related to the conceptual design skills and knowledge, to adapt to market demand, and attention should be paid to the necessary to design personnel's basic ability and quality training, so that students are able to adapt to various changes in the era of information economy.

D. Analysis on the Survey Results of Curriculum Setting of Industrial Design Specialty

The third part of the questionnaire, the professional course is divided into five levels, the collection of design industry and industrial design industry. The evaluation indicators of the curriculum system, after finishing the analysis as shown in Table III, discussion of the use of units and training units in the classroom performance. To find out the effective and reasonable course reform of industrial
design specialty in the process of setting up different cognition. Survey questionnaire. According to the different levels of teaching objectives, the different setting of curriculum content is divided into five levels. Industry theory, design foundation, professional skills, humanistic foundation and application practice.

Table III. The result statistics of the attitude of the employing unit and the University expert to the curriculum of the industrial design specialty

<table>
<thead>
<tr>
<th></th>
<th>Professional theory</th>
<th>Design basis</th>
<th>Research design capability</th>
<th>Humanistic Foundation</th>
<th>Application practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>College expert mean</td>
<td>4.4</td>
<td>4.5</td>
<td>4.8</td>
<td>4.1</td>
<td>4.6</td>
</tr>
<tr>
<td>The average of the employing unit</td>
<td>4.0</td>
<td>4.1</td>
<td>3.9</td>
<td>3.5</td>
<td>4.5</td>
</tr>
<tr>
<td>Mean difference</td>
<td>0.4</td>
<td>0.4</td>
<td>0.9</td>
<td>0.6</td>
<td>0.1</td>
</tr>
</tbody>
</table>

According to the employing units and experts on industrial design professional courses, design. The company as a unit of its attitude score is lower than the University experts, which shows the use of the unit to the professional. The arrangement of the curriculum system is not higher than that of the University in general. Although the University as a training unit. To make the arrangements that the reasonable curriculum system, but it still does not reach the industrial design company to mark. The curriculum arrangement further, to adapt to the design of the industry should be the design of teaching reform in Colleges and Universities as an important objective.

V. CONCLUSION

Paper to product design model as the research object, physical model and virtual model of the difference, from the product model making of product design model for analysis, respectively, and the physical model of material production process problems are discussed. In the field of the product model, the usability is explained, and the application and methodology of the product design is found. At the same time, through the investigation and study, in employer and University experts in industrial design curriculum set attitude of statistical results show a high degree of consistency is practical application in the category of teaching program, which also shows the design industry and University in recognition of the design practice is very important part of the and carry out practical applications related teaching activities should adhere to the long-term sustainability of the. Industrial design and teaching in Colleges and universities facing the society, facing the market not only superficial become professional skill training center, but also the market perspective, adaptability of students' professional ability of design research, design practice phenomenon in teaching of basic design for mapping thinking, outstanding creative teaching.
Product design has been in the process of innovation and exploration, the method and theory of product design is also the case. This paper to design the product easy to use model research in the hope that it can play a valuable role, so that product design model is making the research more and more by people's attention, so that more and more people to participate in the product design method of the study. In the contemporary successful product design, model making is an indispensable practice link, only through this link, can make the design of the product to obtain the best effect. Model making is the creative design activity of theory and practice, and it is the practical process of applying science and technology, social science, visual art, aesthetics and ergonomics to product design. In the process of new product development, the model can be developed to study the relationship between the product shape and its internal shape, the research of product modeling and the adaptability of the man-machine. Through an example analysis, further clarify the product design must be attached to the product's internal structure, and the model making and make the structure of the theoretical analysis to be further verified. Believe that with the gradual deepening of research, product design model of the production process will continue to be improved and expanded, waiting for it will be very broad prospects for development.

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