

The Study of Modern Emergency Products under the Direction of New Ergonomics

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Abstract. The rapid development of computer and internet technology has led to human beings' society into the era of information, and brought certain influence on the modern design and innovative design. Moreover, product design is now emphasizing on design ideology such as Humanisms, Culture and People-Oriented design. That is products serving for users and all their shapes, function, color, material and structure showing the respect and care for their users, furthermore, they are endeavoring in providing some virtual using experience including Humanities, History, Emotion, Joviality and Security. Recently, natural disasters such like earthquake, snowstorm, fire, typhoon, flood and drought always cost enormous casualties and economic loss. As a result of the government's popularization and promotion of disaster prevention and rising awareness of the meaning of safety, emergency products come up to exist in our daily life. However, emergency indications would send people a sense of fear, which should lower their life quality. New ergonomic, mainly based on researching methods as Physiology, Psychology and Anthropometry etc., and gives prominence to some interdisciplinary subjects, for example, Social Psychology and Economics etc. It is focusing on service system and ergonomic issues. On the topic of disaster emergency design, this paper suggests three researching methods for it: PDCA model, Quantitative Analysis, Semantic Differential. Then how could Emergency Products produce high life quality? The essay records the researching theorization which has been used before. They are based on the people-oriented ideology, through in four phases of the establishment of the design goals (design target selection and judgment), the preliminary design (understanding and analysis of the design goals, design concept engineering), deep design (product detail design) and design confirmation (completion of the design goals) to practice and research.

Keywords: Emergency Products, Modern Living Quality, New Ergonomics, Product Service Design.

1 Introduction

Thanks to the computer information technology and the rapid development of internet, human beings' society had been led into the era of information, which has also caused great impact on the modern design environment and innovative design ideology. Based on the traditional decor and modern functionalism, product design is

emphasizing on design ideology such as Humanism, Culture and People-Oriented design. That is products serving for users and all their shapes, function, color, material and structure showing the respect and care for their users, moreover, they are endeavoring in producing some virtual using experience including Humanities, History, Emotion, Joviality, Safety.

Recently, natural disasters such like earthquake, snowstorm, fire, typhoon, flood and drought always cost enormous casualties and economic losses. As a result of the government’s popularization and promotion of disaster-prevention policies and rising awareness toward safety, emergency products come up to exist in our daily life. While, their existing as the emergency indications (Fig. 1) must have sent people a sense of fear, which should affect their life quality.



Fig. 1. Emergency Indications

Design comes from life and it should always serve for life. When comes to the design of emergency products, designers need to feel their clients’ requirements so as to change the unreasonable elements in design, and make the products reach the rationality of function and structure as well as the harmonious relations of shapes, color and the environment. Thus the real **High Life Quality** experience can be provided to people.

If we describe the industrial age as the **Materialistic Society**, in which value is created from tangible products. Then era of information can be described as **Unmaterialistic Society**, a digital society of information or service where value is created from intangible information. Now we are upon the edge transferring from **Materialistic Society** to **Unmaterialistic Society**. People’s emotional requirements are changing from function to behavior and mentality as well. Design’s conversion from **Materialistic** to **Unmaterialistic** means after the basic function people are now pursuing **emotion**, an unmaterialistic request. And that is what immaterialized product design exactly is.

2 The New Ergonomic Researching Methods of Disaster Emergency Design

Apart from Physiology, Psychology and Anthropometry, the new ergonomic gives prominence to some interdisciplinary subjects, for example, Social Psychology and Economics etc. And it emphasizes the service system design and ergonomic issues. On the topic of disaster emergency design, here are the main new ergonomic methods I'd like to mention.

2.1 PDCA Model

PDCA model was evaluated from the PDCA model improved by American Quality Management Specialist. There are four steps: plan-do-check-act cycle model (Fig. 2). PDCA model is feasible for each emergency product design task. And the P stands for design working Planning, including the confirmation of directions, target and associated activities. The D, means Doing, is the realistic execution of design work and process to realize the design target. The C, indicates design Checking, is to find out the existing issues in design procedure or from the result. Finally A, representing taking action to the design issues, is the judgment to the design check. The successful design experience should be praised and modularization together with standardization that should be popularized. The failure should be summarized to avoid in the next design work. Then, the remaining issues will go to the next PDCA cycle. (Fig. 2)

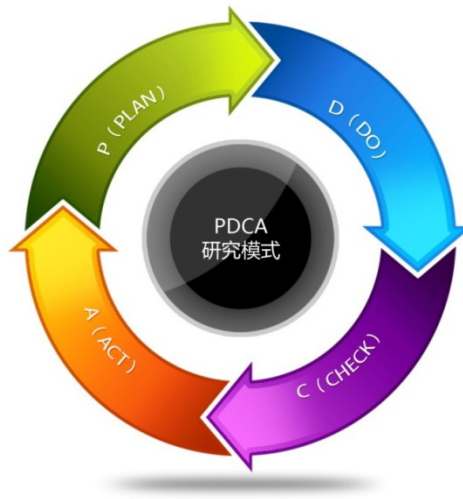


Fig. 2. PDCA model

2.2 Quantitative Analysis

The innovative activity of design should never leave the analysis towards data and information. Hence quantitative analysis claims its necessity. Associated with Kansei

Engineering, quantitative analysis means using quantified standards to measure things. And that might give people a better knowledge of subjects; therefore people could reveal the nature of things, the development patterns and the relationships between them scientifically. All in all, quantitative analysis focuses on the issues of Quantity, finds out traits and logical relation among all elements and finally computes and analyzes with the mathematical model. Quantitative analysis requires mathematical knowledge. And factor analysis, principal component analysis and cluster analysis are the most common models [5].

2.3 Semantic Differential

Semantic differential is one of the most useful means in researching consumers' perception. American Psychologist Charles E. Osgood invents the semantic differential in 1942. The method combines assessment procedure and association to study the psychological image of testers. It was originated from the study towards accompanying sensation. And the accompanying sensation is the feeling of some sense perception while others perception is stimulated. For example, music may transfer us images of mood and color. The SD contains subjects, testers, concepts and measurements. The subjects can be abstract or realistic either. The measurements are pairs of opposite adjectives. And to gain more stable data, it requires at least 30 testers. Osgood raised two adjective-collecting methods, association and documents investigation. The first one is to collect the testers' first impression of the given concept. And the other one is to exact vocabulary concerned about the concept from articles and dictionary. Usually, there come 5 to 7 selecting levels in each evaluation. Then testers are asked to choose, with their perceptual feeling, the level to reflect subjects [5].

3 The Design Procedure for Emergency Products under the Instruction of New Ergonomics

3.1 Establish the Design Task

The first task of design emergency products always comes up with potential design concept and requirements. At the end of the brain storm, market researching and new ergonomics methods, the final design target and directions would have been determined.

During the period confirming and selecting the design concept and requirements, suitable methods should be used to describe and sum it. To reflect some conceptual questions such as who will be the user of our products? What can they do for people? What issues will be solved? In which way people's life will be changed?

In the first phase in design of emergency products, for instance, we've found by research that many problems occurred in earthquakes hit the city. They vary from the amount and power of earthquakes, the hardship in forecast, the poor prevention, the lack of facilities, the importance of seismic design of building structures, the lack of family-use emergency products such as alarms and emergency kits, the poor connection between emergency products with daily commodities and the fact that

girder is stronger than the wall etc. After the refinement stage and brainstorm. A new concept born, it is a concept of self-help shower facility for Earthquake. The target users are family members. When an earthquake occurs, the facility might be capable to provide people with secure space. Thus it solves the dilemma of escape issues and the combination of seismic products with daily commodities. So High living Quality can be achieved.

3.2 Preliminary Design

The second phase is to further the design target and direction, using user-oriented ergonomics, in which the design concept and requirements will be translated into design property and standards. And in this period, the perception gap between market, designers and customers are required to be narrowed. Then we can gain some realistic elements by researching users’ habits, cognitive characteristics and combining the realistic users’ requirements and design concept.

Currently, emergency products design based on ergonomics includes these 3 aspects; 1, Discussing users’ feeling and requirements from the view of people’s factor and psychology; 2, Finding out the design traits of users’ Kansei image in the qualitative and quantitative level; 3, Rebuilding the ergonomic model and man-machine system for emergency products. The specific procedure can be separated into six parts (Fig. 3):

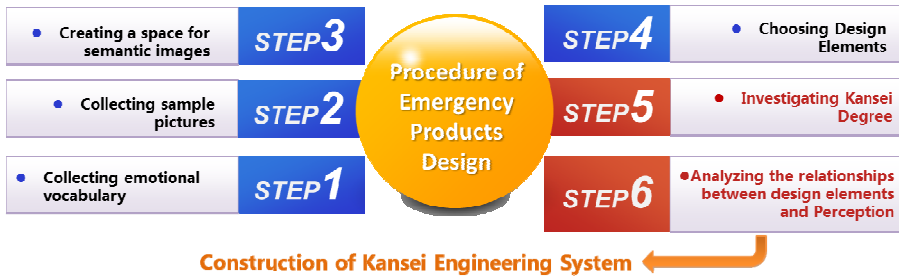


Fig. 3. Procedure of Emergency Products Design

Step6, the most time-consuming one, is usually launched in the method like to relative quantitative analysis. At this time, many scholars are using Fuzzy theory, neural network theory and genetic algorithms etc. to do the research.

After the design procedure under Kensai Engineering, design requirements and quantitative result of target can be affirmed, and it is going to be the design traits and standard for the design next phase.

During the qualitative analysis of representative customers, theories such as design consumer psychology, ergonomics, anthropology etc. can be applied to analyze user’s requirements and expectations. The researching content mainly includes these points: user groups’ features, products functional frame structure, users’ task model and psychological model, users’ character settings etc. From users’ basic status to their potential feelings, all of them can be the study objects.

Fig. 4 illustrates the concept of life guarantee demands different emergency products design requirements in different phase of earthquake.

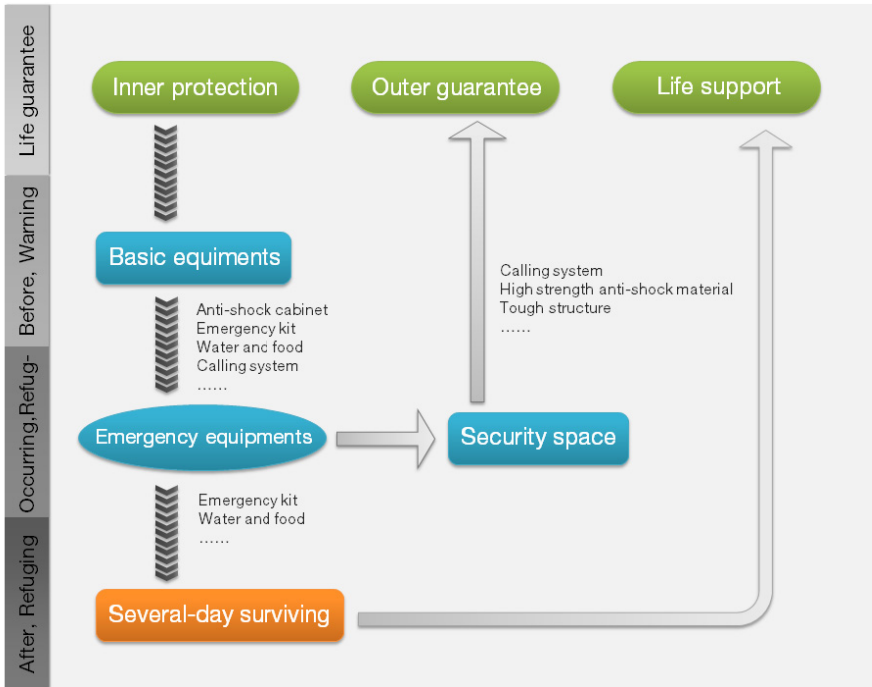


Fig. 4. Design requirements in different earthquake phases

3.3 Detail Design

The effective design methods and theory above are reliable ways improving design concept into realistic design elements. And designers will make detail design work with specific design elements and definite users' requirements.

In detail design phase, external shapes and function structure comes first. Then modern science technology is used to analyze and build conceptual models. After the repeated checking scale, ergonomics, manufacturing feasibilities, and material costs, the final scenario will be born. Designers using CAD to render product images and conduct 3D model fabrication. During which the detail, color format, surface process and craft issues will be raised and solved. In the end enormous elaborations and test will be carried out to ensure the final model meets the target visual shapes. (Fig. 5 to 7.)

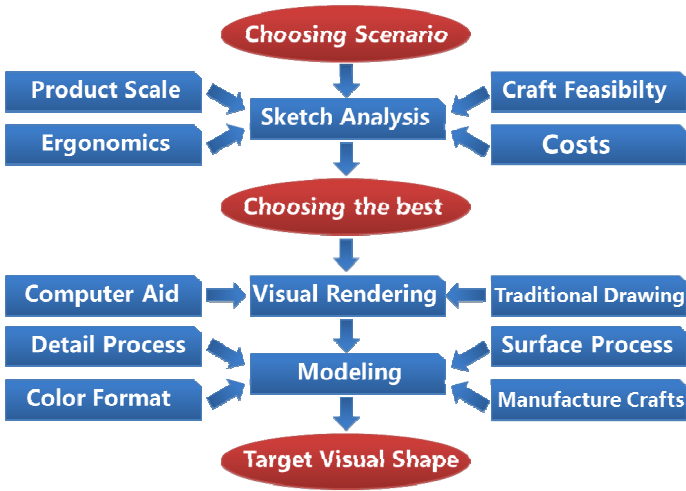


Fig. 5. The design procedure for emergency product design under the instruction of new ergonomics

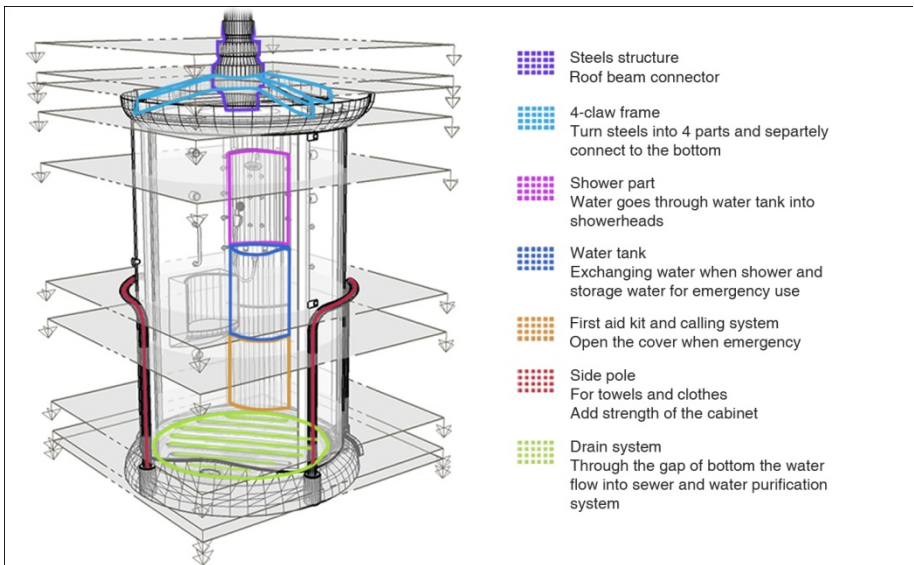


Fig. 6. The detail of the design



Fig. 7. The final rendering

3.4 Design Verdict

After the last phase, the models have been tested and edited, which further to perfect the design scenario, manufacture the sample model and verdict the rational relationships between their shapes and functions. Meanwhile, manufacturing plan and initial market strategy have also been made and affirmed.

In this phase consumers' feedback needs to be consulted frequently as well as the detail of shapes are refined elaborately, so as to meet the standards of products property and style. To realize the design target scheduled and make fine feasible working and manufacturing model, detailed instruction and informative manual is necessary, which includes structure, mechanic units, materials selection, color format and crafts concerned. Furthermore, patent should be applied to protect the image intellectual property rights of products function, technology, manufacturing innovation, external shapes and brand image.

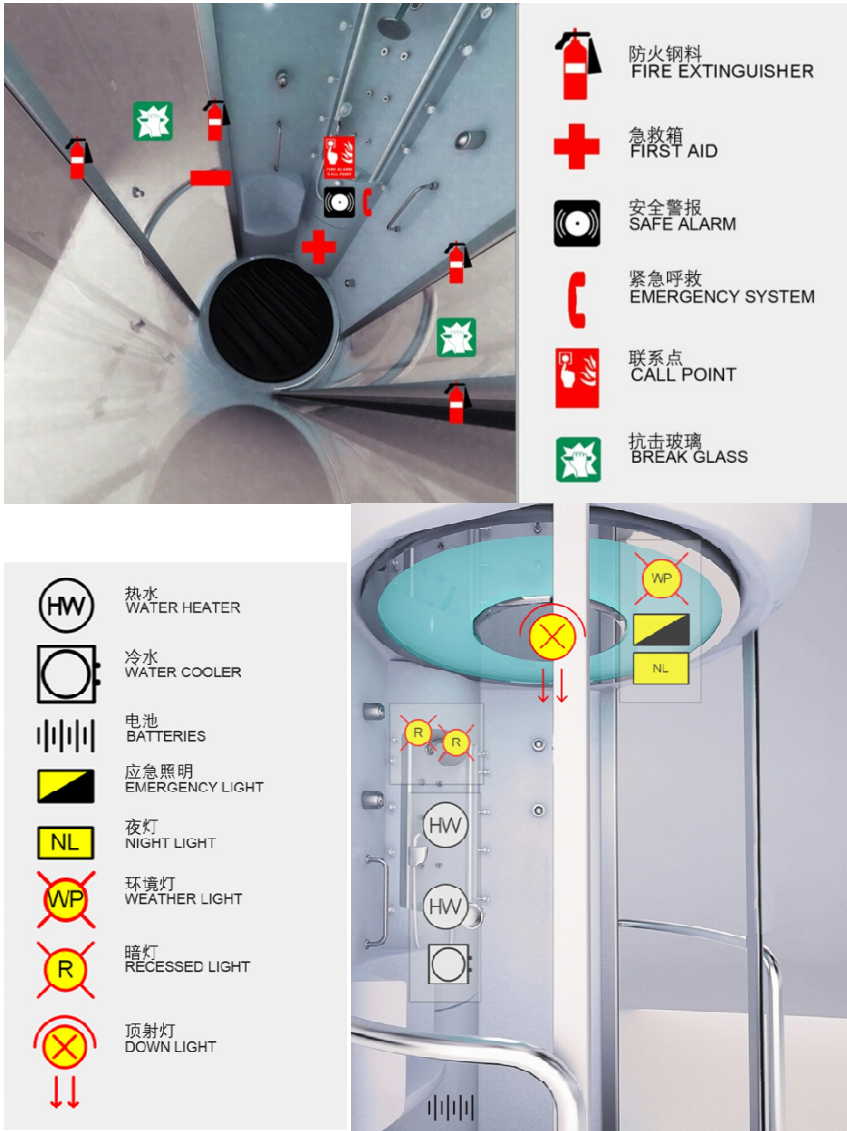


Fig. 8. Explanatory instruction of function and power supply system

4 Conclusion

With the development of maturity and popularity of modern scientific technology, people's life quality keep rising, so as their requirements in spiritual level of products. The society desires new Kansei forms. Nowadays new ergonomics has become a solid foundation in design development, how to combine the emergency products with daily commodities effectively and finally bring people with High Life Quality

experience and security will be a new topic, and our designers and scholars will take any efforts to think, research on that topic.

This essay discusses the application of New Ergonomics into modern emergency products design and makes an example with the concept of self-help shower facility for earthquake. What has been confirmed is that New Ergonomics can be utilized in the whole design procedure of a product and qualitative and quantitative analysis method are compatible with each other. However, the massive data analysis in the design procedure took considerable research time, whether it is suitable for the high efficient modern products design remains to be argued and researched by future designers.

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