

On the Analysis of Product Appropriateness Principles

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Abstract

The purpose of this study is to explore appropriateness of the various products presented in the market and the application of appropriateness principles to the product design. To obtain appropriateness principles, this study compares and analyzes a variety of products available in the market. After obtaining preliminary principles, many times convergence and analysis are operated for getting more accurate principles. Then, AHP method is used for evaluating importance of every appropriateness principles and appropriateness principles are obtained. And, the appropriateness principles are used to construct the design process of appropriateness product. Finally, some design cases are operated and appropriateness principles are evaluated for the products of design cases. The results of this study are obtained 10 appropriateness principles: freedom, demand, environmental protection, effectiveness, intuition, compliance, simplicity, optimal performance, simplicity, fault tolerance. And, weights of appropriateness principles get in this paper.

Keywords: appropriateness principle, AHP method, evaluation method

1. Introduction

More and more products are invented and manufactured in our daily life, but not any functions are used for users. Therefore, to design the product with appropriate functions for users is an important duty. Affordance is the theory for understanding user psychology [1], thus, designers could judge what are the important functions in development and design stage. Norman used the affordance theory into design field and made a great impact for designers. Norman thinks affordance is that the past knowledge and experience affect the user's feelings and judgments about the product [2]. Norman's perspectives are questioned by Amant [3], who thinks affordance is seen as a user's perception of the environmental symbolic meaning, rather than the nature of the environment, contrary to the principle of "direct perception" of ecological perspectives. However, the above mentions are the discussion about the relationship between environment and users or the relationship between users and products. The affordance does not describe clearly about the function of product is suitable for user or not.

The exhibition "Product Fitness 80" of MUJI proposed the concept of "product fitness 80," and reflects MUJI's willingness to educate users by reviewing our own "adequacy" (fitness). The introduction of this exhibition has remarks "We constantly question if we have used excessive materials; whether products are overpackaged, or are their sizes and weights too much; can we reduce waste in the ordering, manufacturing or transportation of products? Less is more." [4]

Therefore, the purpose of this paper is proposed the theory about appropriateness, and the appropriateness design process. By following this process, designers could design the product with appropriate functions for users.

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2. The Construction of Appropriateness Principles

2.1. The analysis of existing cases

For developing the theory of appropriateness, the product with appropriateness characteristics are collected and analyzed, and then the principles are summarized.

For examples, Fig. 1 is a tray made by rubber wood (recycled material), with arc side form and holes for holding easily [4].



Fig. 1 Rubber wood tray of MUJI

The holes for holding provide convenience for product and reduce the load for user body. Thus, the summary of appropriateness attribute for the tray is “**Reduction the load of user body.**”

Here, 46 products are collected. Every product is analyzed to describe the characteristics and to get the appropriateness attributes.

After finishing analyzing 46 products, 31 appropriateness attributes are obtained. By classified process, 10 appropriateness principles are obtained.

2.2. List of appropriateness principles

Here the explanations of appropriateness principles are list in the following mention:

- (1) demand: whether the function provided by the product has reached the main demand of the user;
- (2) performance: whether the product provides the maximum functionality;
- (3) freedom: if the product can provide the best degree of freedom, when using the product, function can be changed by personal will;
- (4) environmental protection: selection of environmentally friendly products;
- (5) compliance: make sure to use the dimensions for ease of use;
- (6) optimum: whether the material has reached the best effect;
- (7) easy operation: one hand can also be used;
- (8) simplicity: do not add extra features or decorations that you do not need to use;
- (9) simplicity: do not add extra features or decorations that you do not need to use;
- (10) fault tolerance: allow the scope of tolerance error.

3. Weights of Appropriateness Principles

For understanding the importance of appropriateness principles, this paper uses AHP method to get the weights [5]. The process of AHP method are following:

This study issued 243 questionnaires; got effective questionnaires 197, after screening to get 174 questionnaires. And, we divided the 10 principles into 3 fields as shown as Table 1.

Table 1 The fields of appropriateness principles

Fields No.	A. Function	B. Appearance	C. Additional feature
1	Demand	environmental protection	optimum
2	Performance	compliance	easy operation
3	Freedom		simplicity
4			intuition
5			fault tolerance

In the next step, we make a couple comparing matrix for calculating the weights. Here we need to compare the 3 fields with each other, and compare the principles with each other in every fields.

After questionnaire and results analysis, Table 2 shows the fields weights and Table 3 shows the principle weights.

Table 2 The fields weights

Fields	Field weights
Function	0.52
Appearance	0.27
Additional feature	0.21

Table 3 The principle weights

Principles No.	Principle	Principle weights	Rank
A1	Demand	0.24	2
A2	Performance	0.07	4
A3	Freedom	0.25	1
B1	environmental protection	0.19	3
B2	compliance	0.06	6
C1	optimum	0.03	8
C2	easy operation	0.02	9
C3	simplicity	0.05	7
C4	intuition	0.07	5
C5	fault tolerance	0.02	10

4. Conclusions

In this paper, the concept of appropriateness is proposed. And, the appropriateness principles are obtained by collecting and analyzing 46 appropriateness products. AHP method is used here for find the weights of principle. 10 principles are divided into 3 fields. The 3 field and their weights are function 0.52, appearance 0.27, and additional feature 0.21. 10 principles and their weights are demand 0.24, performance 0.07, freedom 0.25, environmental protection 0.19, compliance 0.06, optimum 0.03, easy operation 0.02, simplicity 0.05, intuition 0.07, and fault tolerance 0.02.

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References

- [1] J. Gibson, *The ecological approach to visual perception*, London: Houghton Mifflin, 1979.
- [2] D. A. Norman, *The design of everyday things*, New York: Basic Books, 1990.
- [3] R. S. Amant, "User interface affordances in a planning representation," *Human-Computer Interaction*, vol. 14, no. 3, pp. 317-354, September 1999.
- [4] "MUJI," <http://www.muji.net/lab/fitness80/en/>, Mar. 30, 2017.
- [5] T. L. Saaty, *The analytic hierarchy process*, New York: McGraw-Hill, 1980.