

Research on Water-saving Product Design Based on Emotional Design Theory

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ABSTRACT

This paper explores the application method of emotional design theory in water-saving product design from the perspective of users' water-saving emotional cognition, to achieve the purpose of actual water saving with multi-level psychological guidance and to meet the needs of people's emotional interaction with water-saving products in daily life. Through the three-level theoretical framework of emotional design, this paper points out the intrinsic connection between emotional elements and water-saving product design, i.e., the emotional resonance formed by the user's perception of the shape and function of the water-saving product and the subconscious or spontaneous water-saving behavior. Water-saving products designed based on the three-level theory of emotion can build suitable water scenarios for different environments, enrich the emotional experience of users, enhance the use and emotional value of water-saving products, and help people to establish water-saving concept and the use of national water resources.

Keywords: Emotional design theory, Water-saving product, Product design, Experience level.

1. INTRODUCTION

Products based on emotional design allow users to experience the social value of the product at three levels: physical, psychological, and spiritual. The integration of the elements of emotional design theory in water-saving product design strengthens the physical and emotional communication between the product and the user, and also improves the user's experience while enhancing the performance of the product, thereby allowing people to feel every subtle pleasure in their daily lives, which accumulates into the pursuit of quality of life and a substantial happiness.

2. THE ROLE OF EMOTIONAL COGNITION IN DESIGN

The study of emotional design begins with an exploration of the meaning of "emotion" and the role it plays in design. Emotion is a subconscious psychological experience that occurs when humans are affected by something. It often changes and guides people's cognitive style and affects the human brain's processing of information in the outside world in a subtle way [1].

The information processing system includes the emotional system, which is responsible for quickly identifying the pros and cons of the surrounding environment and making timely judgments, and the cognitive system, which allows people to interpret and understand the world [2]. In daily decision making, especially the process of human-product interaction, it helps people to quickly make judgments when making choices and to better accomplish actions in their lives.

3. REVIEW OF EMOTIONAL DESIGN THEORY

3.1 Concept of Emotional Design

"情感化设计" is generally referred to as "emotional design" or "affective design" in etymological studies. The term "emotional design" has a neutral color and includes both positive and negative emotions, such as tension or emotions that produce joy, emotion, or happiness. "Affective design" refers to designs that bring positive emotions to the user [3].

At present, there is no unified definition of the specific connotation of emotional design. Japan and

South Korea define it as "sensual engineering", while some art scholars and American scholars adopt the concept of "emotional design" [4]. In the design process, it incorporates the understanding of users' emotions, from being a "useful" and "user-friendly" product to being a "wanted" product by users.

3.2 Three-level Theory of Emotional Design

The instinctive level precedes consciousness and thinking, and is the basis for the formation of appearance elements and first impressions. It reacts quickly to the sensory stimuli brought by the product and can quickly make judgments about good or bad, safe or dangerous, which is the starting point for emotional processing, and can inhibit or reinforce them by controlling signals [5].

The behavioral level is related to the use and experience of the product and is where most human behaviors are located. Experience encompasses functionality, performance, and usability. Functionality is the essential core and value of a product, defining what it can do, performance is how it accomplishes the product's function, and usability is whether users receive the image conveyed by the product and understand how to use it.

The design of reflective level covers many domains and is closely related to the message, the meaning and use of the product, and generates complex emotions that are interwoven by emotions, understanding, personal differences, cultural background, and other factors within the user [6]. This also illustrates the nature of reflective level design: Everything is in the mind of the viewer.

4. ANALYSIS OF THE CURRENT SITUATION OF THE EMOTIONAL DESIGN OF WATER-SAVING PRODUCTS

4.1 Emotional Level Classification of Water-saving Function

The water saving of instinctive level constrains the user's behavior by limiting the user's choice when facing the faucet to achieve the purpose of water saving, taking the atomized water faucet as an example.

The atomized water faucet, shown in "Figure 1", generally uses a separate nozzle connected to the faucet. The joint is provided with some waterstops of water blocking holes to increase the water pressure, and the flow of water is subsequently reduced, resulting in the formation of tiny water drops and eventually atomized water diffusion.



Figure 1 The atomized water faucet.

The water-saving means of behavioral level is designed to allow users to subconsciously develop autonomous water-saving behaviors by guiding them to reduce water flow through stronger visual illusions or more complex operations, as exemplified by the swirling faucet.

The swirling faucet, as shown in "Figure 2", forms a swirling shape of water flow through the multi-angle direction of the water discharge, with a larger diameter of the water column, giving the user the illusion of a large water flow, allowing the user to subconsciously adjust the amount of water.



Figure 2 The swirling faucet.

The water saving of reflective level is mainly through the visual effect of modeling bionics or the tactile perception of the operation method to let users produce the psychological implication of water saving, and the mandatory setting is weaker. There are few reflective-level water-saving products on the market, including water-saving signs in places or bionic faucet designs, as shown in "Figure 3". The shape of natural creatures such as coral, dolphin or bamboo pipe flowing water form makes the user reflective, thus achieving the purpose of water saving.



Figure 3 Natural biomorphic faucets.

4.2 Problem Analysis of the Application of Emotion to Water-saving Products

Based on the above examples of existing product emotional design by different level, it can be concluded that current water-saving products allow users to unconsciously regulate water-saving behavior at both the instinctive and behavioral levels. However, there is a lack of clarity on how to use the product, and users usually need to try to find the correct and water-saving way to use it.

The design at the reflective level is also deficient. The selection and evolution of the shape lack the expression of product image, and users can't receive the exact connotation of the product accurately. In the process of use, the reflective level is not unified with the other two levels of expression, further blurring the concept that the product wants to convey to users.

5. EMOTIONAL DESIGN KEY POINTS OF WATER-SAVING PRODUCTS





5.1 Instinctive Level Design Strategy

The experience brought to users by the instinctive level is divided into visual sensory and non-visual sensory experience. Visual sensory experience is the most direct way for users to get emotional experience and is the basis for generating the first impression of the product. Therefore, the visual elements of the product should be fully considered, and the emotional resonance with users should be explored in terms of color, shape and material.

The color of the faucet product is usually associated with the material, and the brightness and saturation of the color, the material surface treatment and shape and other factors set the tone of the visual senses for the product, so that users form a perception of the style of the product at first impression, as shown in "Table 1". Therefore, in the design of the instinctive level, it's needed to first establish emotional resonance through color and

shape to bring users a deeper emotional experience. Non-visual sensory emotional design refers to the tactile, auditory, olfactory and other emotional experience brought to users by products [7]. In water-saving products, tactile and auditory experiences are mainly involved, enriching the emotional communication between users and products at the instinctive level.

Table 1. The appearance emotion vocabulary at the instinctive level

Project Sample					
Color image	Color	Metallic silver	Matte black	Transparent color	Metallic copper
	Emotion vocabulary	Elegant, pretty	Aloof, mysterious	Transparent, dynamic	Classical, commercial
Material image	Material	Stainless steel	Zinc alloy plated black	ABS plastic	Copper
	Emotion vocabulary	Delicate, convenient	Steady, graceful	Avant-garde, fashionable	Retro, flamboyant
Modeling image	Modeling	Curve	Straight line	Bionic	Geometry
	Emotion vocabulary	Lively, soft	Plain, simple	Artistic, natural	Refined, stable

5.2 Behavioral Level Design Strategy

The usage and functional settings of the faucet are important components of the behavioral level design. Excellent behavioral level design is more usable and easy to understand, which will give users positive psychological emotions such as satisfaction and controllability [8], thus making it easier for users to develop subconscious water-saving behaviors in the use of water-saving products.

Users' behaviors are based on the way the product is used, as reflected in the way the faucet is opened, the way the water temperature is adjusted, and the way the flow is selected, as shown in "Table 2". In this paper, three subjective satisfaction scores are given of the degree of effort, controllability, and understandability, which are judged on a 5-point scale: very bad, bad, general, good, and very good, corresponding to a score of 1-5 respectively.

As can be seen from the table below, users can control the strength and water flow more precisely during the use of a higher force saving degree, and the operation symbol should match the modeling

language of the product. At the same time, in the process of operation, the digital timely feedback allows users to have a greater controllability and other positive emotions. Therefore, in the design of the behavioral level, the understandability of the function and the controllability of the operation are the most central parts to be considered.

Table 2. Assessment scales for different use methods

Sample project			Force direction	Force saving degree	Controllability	Understandability	Emotion vocabulary
Manual	Fixed shaft propulsion		Back and forth	4	3	4	Plain
			Left and right	3	3	4	Commercial
			Up and down	3	3	5	Fluent
	Press up and down		Up and down	2	2	4	Well-behaved
	Rotate and twist		Vertically rotate	4	4	3	Art
			Horizontally rotate	4	3	2	Geometry
Touch	Press		Rhomboidal	5	4	3	Quiet
	Slide control		Horizontally slide	5	5	4	Avant-garde
Induction	Infrared induction		Not have	5	2	5	Convenient

5.3 Reflective Level Design Strategy

The emotional design of the reflective level is based on the role of the first two levels and is the impact of the combined effect of awareness, understanding, and emotion generated by users during the product interaction. The emphasis at the reflective level is to make users generate autonomous water-saving ideas and behaviors, so as to achieve the educational purpose that can be generally accepted.

The design at reflective level in water-saving products is mainly achieved through biomimetic modeling design, such as the dolphin-form faucet design in marine life, as shown in "Figure 4", which aims to evoke water-saving behaviors through the motivation of protecting natural animals.



Figure 4 Dolphin-form faucet design.

And such a purpose has a very high demand on the design ability. The product has the correct image transmission function in the external appearance or operation mode, allowing users with different cultural backgrounds, education levels and life experiences find emotional consensus, which can also create a good use environment and emotional experience atmosphere for users, and make them spontaneously form the cognition of water saving in the future use process.

6. CONCLUSION

In recent years, national policies and regulations are committed to promoting the research and development of water-saving products, and faucet, as one of the water-saving products closest to users' life, is given more emotional need trust by users. This paper introduces the theory of emotional design into the design of water-saving products, and from the visual and non-visual sensory experience brought by the instinctive level design to the interaction experience generated by the user with the behavioral level design to the deeper emotional satisfaction and conceptual facilitation

given by the reflective level design, it systematically builds a methodological system for water-saving product design [9]. By enhancing the usability and controllability of water-saving products to promote the emotional interaction between people and water-saving products, the ideological cognition of water saving is generated in subconscious or spontaneous water-saving behaviors.

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