

## **ANALYSIS OF THE APPLICATION OF SYNAESTHESIA CONCEPT IN MODERN PRODUCT DESIGN**

**RuiKun, Yang (1,2);  
Abidin, Shahrizan Zainal (1);  
Vermol, Verly Veto (1)**

1: UNIVERSITI TEKNOLOGI MARA (UiTM);  
2: School of Arts, Lanzhou Technology and Business College

### **ABSTRACT**

**Objective** To analyze and discuss the application of synaesthesia theory in modern product design and emphasize the important position and necessity of synaesthesia in modern product design. **Methods** Based on the concept of synesthesia, the value, significance and design principles of synesthesia in modern product design were further analyzed and summarized through the study of concrete examples of shape, color, material and using methods. **Conclusion** When the concept of synesthesia is applied to product design, it can enhance the expressive force of products, realize users' synesthetic perception, mobilize users' senses to give psychological suggestions, meet users' various psychological needs, and bring users a richer physical and mental experience.

**Keywords:** Communication, Emotional design, Multisensory product experience

### **Contact:**

RuiKun, Yang  
UNIVERSITI TEKNOLOGI MARA (UiTM)  
China, People's Republic of  
838546055@qq.com

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## 1 INTRODUCTION

With the rapid development of information and technology, technical barriers to production are easily broken, and production processes and product functions are easily copied, resulting in serious product homogeneity (Smith & Keller, 2021). Therefore, it is necessary to give the product new vitality and competitiveness through the behavior of product design, so that the user can obtain the touching and distinctive new experience in the use process. In order to create this sense of experience, designers need to constantly explore new design methods, applied to product design practice, in order to construct experience elements (Warell, 2008). The construction of product experience elements depends on the product audience's sensory, psychological and other multi-dimensional grasp. "Synesthesia", as a clever literary rhetoric, has much in common with design thinking (Cross, Christiaans & Dorst, 1996). The phenomenon of synesthesia is not only applied to artistic creation and appreciation, but should break through the boundaries between disciplines and be applied to design activities, which can broaden ideas for creative product design.

## 2 THE CONNOTATION OF SYNAESTHESIA DESIGN

### 2.1 The concept of Synaesthesia

In 1962, Qian Zhongshu pointed out in the book "Synaesthesia" that "colors seem to have temperature, sounds seem to have image, cold and warm seem to have weight, and smells seem to have sharpness (Qian, 1994)." Synaesthesia is also known as "Sensation" means that the stimulation of one organ of the body will trigger the sensation of another organ. Synaesthesia is a complex psychological phenomenon. The English name Synaesthesia comes from Greek, "syn" means synthesis, and "aesthesia" means sensory perception. Synaesthesia is the interrelationship, mutual communication, mutual substitution, and mutual conversion between performance sensations. In the early days, it was used as a common rhetorical technique in the field of literature. It refers to using the impressions of things in the category of organ B to express the impressions of things belonging to the category of organ A in thinking or communication, so as to achieve novel and incisive expression effects.

The philosophical basis of synaesthesia is the principle of universal interlinkage in nature. Objective things do not exist in isolation, but are inextricably linked. The external attributes of objective things act on the reaction of human sensory organs in the human brain, which is sensation, which is an activity between psychology and physiology. People's perception and understanding of things is not a single sensory behavior, but cross. Synaesthesia is based on this characteristic of the senses (Gong, 2020). American musician Malion once said: "Music is the color you can hear, and color is the sound you can see." Musicians believe that there is a close relationship between music and color, which is the relationship between vision and hearing. Every visible object makes people feel its unique existence in its own way, which may be soft or sharp. Synaesthesia experience is also very common in daily life, for example: smelling the fragrance of lemon (principal sense) although not eating it, but can feel its sour taste (synaesthesia). The generation of synaesthesia is the interaction between the original sense and synaesthesia. The "intrinsic sense" of synaesthesia is the eliciting stimulus, and "synaesthesia" is the accompanying experience caused by the original sense (Guo & Zhou, 2019).

### 2.2 Synaesthesia in design

Synaesthesia design is a unique creative method and a special form of feeling. It is a feature of synaesthesia cognition for different people. It allows users to use, operate, feel and appreciate products, Touch, taste, smell and psychological cognitive experience products. In the long-term social practice, people supplement their own cognition and experience through imagination and association, transform the sensory experience of external cognition into sensory cognition in familiar fields, and finally form people's cognition of objective things at different levels. Generally, the transfer is from low-level senses to high-level senses (Zhang et al., 2013). Therefore, synaesthesia design will make the user experience have the characteristics of changing from shallow to deep. The superficial understanding of synaesthesia design is the direct sensory response of people under the action of objective things, which belongs to direct association. The deep-level synaesthesia design response is a cognitive phenomenon of multi-sensory mapping generated by external stimuli. The mutual conversion of multiple senses at different levels creates a synaesthesia experience. As a psychological phenomenon and sensory experience, synaesthesia will be affected by factors such as people's life

experience, thoughts and feelings, personality temperament, aesthetic taste, etc. We divide it into three types according to the different methods and characteristics of synaesthesia levels, that is, sensory shifting (single "synaesthesia"), multi-sensory superposition (multiple "synaesthesia"), and image intercommunication (psychological synaesthesia) (Tao, 2009).

### **2.2.1 Sensory transfer**

Sensory shifting is the most common and simplest behavior of human perceptual activities, and it is the primary level of synaesthesia. Sensory shifting is the transfer of one feeling to another or one feeling begets another. It is the direct response of objective things acting on people's sense organs, and it is the direct association that works. For example, in the design of food products, different food colors can affect the sensory experience of "vision-taste". Seeing lemon yellow is associated with "sour", red is associated with "spicy", and the synaesthesia of both vision and taste is significant. Vision and taste will produce a synaesthesia reaction under certain associations. Color is the first element that affects people's visual impressions. People can arouse the resonance of other sense organs in the body under the action of different color shifting sensations. Vincent van Gogh believed: "Color is not to achieve partial truth, but to reveal a certain passion." The performance of different tones can arouse people's synaesthesia (Zhong et al., 2021). For example, interior home design, green home will give people a sensory experience of freshness, life and peace. White furniture is associated with calm, purity, and cleanliness. Seeing yellow furniture will associate happiness, brightness and joy, so fast food restaurants will use yellow tables and chairs to create a happy atmosphere. Seeing blue is associated with relaxation, calmness, and depth. Therefore, coffee shops will use blue as the main color to create a calm and comfortable sensory experience for customers. The use of this kind of color has formed a pattern in the market, lacks new ideas, and the synesthesia effect it causes only stays at the initial stage of sensory transfer. It can be seen that sensory transfer is based on the user's basic physiological sensory response, and the process of establishing a connection between the senses through association to generate another feeling (Zhang & Hong 2018).

### **2.2.2 Multi-sensory superposition**

Multisensory superposition is a phenomenon in which multiple senses are blended and superimposed, breaking through the limitations of a single sense, and is a further deepened and enriched feeling of synaesthesia. It is based on human sensory experience, using associations to link various senses together to produce a chain reaction to form a "synesthesia" form that combines multiple senses (Chen & Jiang, 2019). In many graphic designs or packaging designs, designers will integrate the concept of audio-visual synaesthesia, mobilize the sense of hearing from visual pictures, and form the synaesthesia effect of "plane music". Take the outer packaging design of musical instruments as an example. In the past, the packaging of musical instruments was mainly based on static images of physical objects, but now the outer packaging is mainly based on static images of characters in dynamic performances. Consumers can feel the performer's melody playing from the static image on the outer package of the musical instrument, stimulating audio-visual synaesthesia. In fact, when the user sees this package, the complex synesthesia phenomenon of "multi-sensory superposition" has already occurred. Multi-sensation is superimposed on the basis of sensory shifting, adding the feeling of "heart sense", which is a relatively complex synaesthesia phenomenon that occurs in the individual (Lakoff, & Johnson, 1999).

### **2.2.3 Interconnection of images**

Image intercommunication is different from other sensory channels. It is the deepest synaesthesia effect. It is based on the translation of feelings. It emphasizes the use of emotions and objects to simulate emotions, thereby stimulating users' emotions and thinking, and forming meaningful images, Reflective deep emotional experience. In the study of synaesthesia, most of them are limited to the conversion and fusion between the five senses. However, for the person who receives the information, human emotions, emotions and thoughts will interact with external things, thus forming the communication of imagery. sense design type (Tao, 2019). For example, the nostalgic and retro styles in modern product design are to satisfy people's inner feelings. Words such as "mother's taste" and "the same old taste" appear on many packaging promotions, all in order to stimulate people's memory of taste and feelings of the past, thereby stimulating consumption. Image intercommunication can help designers and audiences establish emotional intercommunication and achieve the realm of "things and

I are the same", thus solving the problem that products have empty forms but cannot convey connotative charm.

Among the three types of synaesthesia design, sensory shifting, multisensory superimposition, and image communication are interpenetrating. Sensory displacement is the foundation; multi-sensory superposition is fusion; image intercommunication is the sublimation and reflection on the two Table 1. The classification is as follows:

Table 1. Different levels of classification of synaesthesia design

level	explain	feature	role in product design
sensory shift	one feeling causes another	Simple, Elementary, Intuitive	Work that serves as an opportunity and inspiration for product design
multi-sensory overlay	A sense of excitement and multiple senses respond to form a comprehensive image of multiple sensory representations	intuition, generality	Designers integrate their own imagination and emotion into the design
Image exchange	The communication of emotion and will, the combination and sublimation of subjective emotion and objective image	superlative	Reach the realm of the unity of things and me

### 3 THE APPLICATION VALUE AND SIGNIFICANCE OF SYNAESTHESIA IN MODERN PRODUCT DESIGN

Studies have shown that when people receive external information, the proportion of information received by sensory channels is significantly different. The basic parameters are as follows: 60% for vision, 20% for hearing, 15% for touch, and 5% for the rest. The visual proportion determines the design orientation of most products based on appearance (Zhong et al., 2021). It is not difficult to find that traditional product design pays more attention to appearance. However, if we only simply pursue the external visual sensory effect in product design, it will constrain the design method, restrict the design thinking, and make the product design only stay in the appearance. The content other than the visual appearance of the product is easily overlooked. The design only conveys information through a single sensory channel. As a user, in the process of using the product, he/she not only has one-sided sensory stimulation, but hopes to be able to communicate through multiple sensory and psychological levels. Stimulation, get more information about the product, and achieve the purpose of communicating with the product (Tao, 2019). Products that can attract users' attention are often those that satisfy users' physical and psychological needs at the same time. At this time, "synaesthesia" will play a very important role. Applying "synaesthesia" to the design can be a good mobilization. Consumers' sensory and psychological feelings, so as to cater to people's experience needs of emphasizing individual needs and spiritual pleasure. With the help of visual, auditory, olfactory, tactile and other perception systems, sense and match the real world, make different senses integrate with each other, and make a new interpretation of products through design, provide users with multi-level perception methods, and make product information quickly on the basis of accurate, timely delivery, it is more vivid and diversified, thus creating sensory paths and forms with "defamiliarization", "novelty", "interestingness" and "systematic". Due to the different sensory experiences of users, enabling users to obtain a multi-dimensional and unique experience (Xiong & Hua, 2018) Applying synaesthesia to product design has the following functions:

#### 3.1 Expand sensory channels

Synaesthesia design is to interact with the user's vision, touch, taste, and hearing, and apply its effects to product design, which can expand the sensory channel between users and products and enrich the expression of products. Appearance can directly convey product information. Synaesthesia design is

used in modeling to select some or all elements related to product information for appearance design, so that the two can be related, which will stimulate new user experience.

### 3.2 Improve user experience

In product design, through the use of synaesthesia design, the five senses of people are integrated and mobilized to make products more humanized and realize the "people-oriented" design concept. Users are more fit when using the product to improve user experience (Tao, 2019). The similarity in shape can trigger associations through vision, while the similarity in spirit can convey the inner spirit and symbolism of the product. When users use the product, they can arouse some special emotions towards the product in the subconscious.

### 3.3 Realize emotional resonance

By giving emotion to the product design and enhancing the appeal and affinity of the product, the product is endowed with emotion. Consumers have emotional resonance with the product during use, which enhances the consumer's sense of identity with the product itself and creates a unique human aesthetic activity. This emotion comes from the designer's own design creativity on the one hand, and the life experience of the audience on the other hand. Synaesthesia design makes products diversified and dynamic, and can evoke memory fragments similar to products in people's memory, and reproduce people's experiences and feelings to generate emotional resonance (Krippendorff, 1989).

## 4 APPLICATION OF SYNAESTHESIA IN MODERN PRODUCT DESIGN

Synaesthesia was initially applied in literary work with literary rhetorical techniques, and then gradually developed across disciplines to various disciplines such as art and design, philosophy, and musicology. The application of synaesthesia in modern product design mainly focuses on the three types of sensory shifting in which the five senses migrate to each other, multi-sensory superposition in which the five senses overlap and superimpose, and image intercommunication in which the five senses are mobilized and inspired. The three types of synaesthesia applications in the design complement each other, and all have the effect of shaping the new character of the product and enriching the product experience (Li, 2017).

### 4.1 Synaesthesia design in functional modeling

Functional form is the most intuitive part to convey product information (Chumiran., Abidin & Kamil, 2020). The general sense design from the functional form is to choose the similarity of product appearance. In the selection of design elements, we can choose both the overall appearance of the item and the local appearance to express the key information of the item. Different types of products also have different functions. The use of this similarity in appearance to create a connection between two different categories of items will produce unexpected effects. As shown in Figure 1, the garlic seasoning pot is modeled after the shape of garlic, and the material is made of two natural materials: clay and wood. The white terracotta mimics the white skin of the garlic head, and the six seasoning POTS are wrapped around each other like a whole garlic. This design achieves the perfect combination of appearance and function. When using and watching the seasoning pot, users can vaguely smell the taste of garlic by using the association of smell through vision and touch (Chen & Jiang, 2019).



Figure 1. Garlic seasoning jar

## 4.2 Synaesthesia design on color texture

In terms of vision, people have the highest sensitivity to color, and in some cases it can even exceed the shape of the product. Especially when there are a bunch of products of the same type, the color of the product is the first to attract people's attention. If the connection between vision and touch is used in products, it will create very interesting designs. As shown in Figure 2, Naoto Fukasawa designed a series of packaging with the theme of "juice skin". The juice has flavors such as banana, strawberry, and kiwi. The image itself is unified, which not only highlights the freshness of the taste, but also achieves the purpose of allowing users to recognize at a glance on various shelves (Zainal Abidin., Sigurjonsson, Liem & Keitsch, 2008). The most prominent feature of this package is the selection of the inherent color and texture of the fruit, through visual capture, to mobilize the familiarity and life experience of the fruit in the user's memory. Use visual imagery to inspire users to have a familiar sense of taste, psychology and touch, and vividly let users perceive the fresh information and brand concept conveyed by the product.

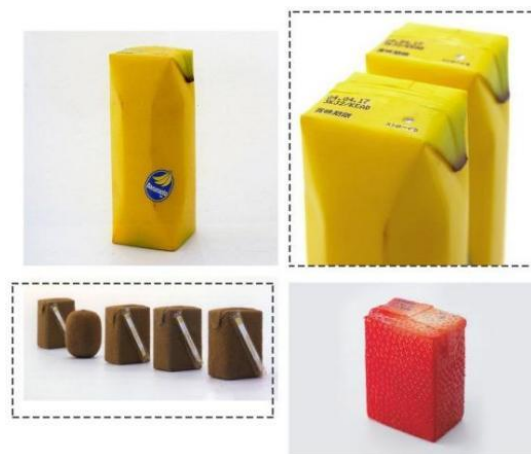


Figure 2. Juice skin

## 4.3 Synaesthesia design in usage

Resemblance is just a realistic shape, and similarity is to capture the distinctive features and inner essence of things. In addition to the synaesthesia design of the above aspects, the synaesthesia design of the product can also be reflected in the way of use. When users use the product, they will inspire Specific emotions generated by a person's subconscious towards an item (Zainal Abidin., Sigurjonsson, Liem & Keitsch, 2008). As shown in Figure 3, the mother's arms chair applies the principle of synaesthesia to the seat design, and the warmest and safest place in people's hearts is in the arms of mothers. The mother's embrace chair simulates the shape of the mother's embrace. When people sit on this chair, they will have a vague effect of being in the mother's embrace, which will make people feel comfortable, warm and have a feeling of déjà vu. The shape of the product induces the interaction between the five senses of the user through vision and touch to generate affection for the product, so that the user can relax and comfort physically and mentally.

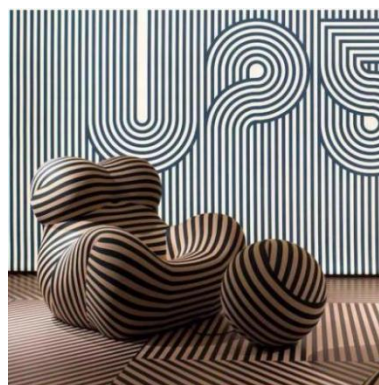


Figure 3. Mother's arms chair

## **5 APPLICATION PRINCIPLES OF SYNESTHESIA CONCEPT IN MODERN PRODUCT DESIGN**

Combining the above discussions and cases, the feasibility principle of synaesthesia concept in modern product design is summarized:

### **5.1 Close to the way of user's sensory perception to form a good user cognitive experience**

Gadamer believes that "wanting to understand means that the foresight of the expresser is consistent with the scope of knowledge of the receiver in a certain field." That is to say, designers need to increase their sensitivity to nature and things in daily life, break through the traditional experience and feelings, re-examine the existing perception of the product, try to break the general cognition of the product, follow the user's expectations, and carefully perceive from the perspective of the user. Understand life feelings and experiences, and conduct inner reflection and exploration of emotional meaning (Toyong, Abidin & Mokhtar, 2021). Establish the experience of multi-sensory perception and its corresponding connection with perception symbols to ensure that the product is close to the user's experience and cognition in the process of using the concept of synaesthesia, and the integrated sensory perception can be awakened to form the user's cognitive experience.

### **5.2 Focus on specific user scenarios to achieve the goal of emotional interaction experience**

User usage scenarios are the key to the process of applying the concept of synaesthesia. That is, how users interact with products that apply synaesthesia design in a specific scenario to meet the needs of use, and to achieve the goal of emotional experience is a problem that designers must pay attention to. In a specific experience scene, designers should combine user expectations, conceive the use situation and experience process, use the concept of synaesthesia to integrate interactive methods, effectively connect the emotions and experiences triggered by multiple senses in the scene, and carry out emotional experience around the scene. The design can moderately amplify the symbols that stimulate the senses, deepen the user's cognition of the product, establish a stable emotional relationship with the product, and achieve the goal of emotional interaction experience (Abidin et al., 2021).

## **6 CONCLUSION**

The homogenization trend of modern products is becoming more and more serious, and product design cannot be limited to new and beautiful appearance. It is important to achieve a profound impact when users interact with the product. It is incomplete to focus only on receiving information through vision. Synaesthesia design uses the interactive communication between the audience and the product as a design concept to make the product more interesting and humanized. Users can enjoy the product use process in an all-round way through vision, hearing, touch, taste, smell and psychology. The use and operation of the product are convenient, generate emotional resonance, and enhance the added value of the product. To truly realize the "people-oriented" design, it is an inevitable trend for designers to integrate the concept of synaesthesia into the design.

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