Brand Visual Design of New Energy Industry Based on Energy Big Data Analysis

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Abstract. Enterprise brand design is to make people remember enterprise products through a relatively easy-to-remember form, and the visual expression content related to enterprise brand belongs to enterprise brand design. Visual image design is an important component of enterprise brand construction and expansion, and brand is the sum of intangible assets and spirit of enterprises. The design of corporate visual identity plays an important role in the survival and development of enterprises and the construction and accumulation of corporate culture. Under the background of the continuous development of visual communication design, the brand design of enterprises also presents various forms, and the concept of consumers is different from before. Through the application of visual communication design, more business opportunities can be created, and enterprises can obtain corresponding benefits. Combined with energy big data, this paper analyzes the use of visual communication design in brand design of new energy enterprises and an updated application of their ideas with progress, so as to show the importance of visual communication design for enterprise development.

Keywords: Brand design, Big data, Visual communication, New energy enterprise.

1 Introduction

With the rapid development of today's world economy, the competition among enterprises is increasing. If enterprises in various fields want to occupy an advantage in the competition, they need to have their own enterprise characteristics, and the brand has become a good display of the enterprise image [1]. Under the background of the continuous development of visual communication design, the brand design of enterprises also presents a variety of forms, and the concept of consumers is different from before [2]. Audiences pay more attention to visual enjoyment, so visual communication design needs special display in brand design. How to catch the attention of consumers and realize the income of enterprises is what enterprises need to pay attention to [3]. Every brand has its unique personality. The cornerstone of a successful enterprise is built by brand image and brand strength. The brand has a certain degree of trust and follow-up. Therefore, enterprises can set relatively high prices for the brand and obtain higher profits [4]. Brand strength determines and affects brand image. At the same time, brand image shows brand strength. The two complement each other, so as to meet the material and

psychological needs of the audience and create a first-class corporate image [5]. In enterprise management, brand design plays a vital role in both hard and soft dimensions of brand management [6]. The brand design of an enterprise involves many aspects, not only the business logo of the enterprise itself, but also the packaging design of products [7]. Through the application of visual communication design, create more business opportunities and enable enterprises to obtain corresponding benefits.

Society is developing and the times are progressing. With the continuous improvement of people's living standards, people's dependence on energy is gradually increasing [8]. The massive consumption of traditional energy, such as coal, oil and natural gas, has brought serious deterioration of the ecological environment on the one hand, and the impact of air quality and climate environment on the other hand restricts the sustainable development of the economy [9]. On the other hand, due to the non renewable nature of traditional energy, a large amount of consumption will inevitably lead to tension between supply and demand and intensify the competition for energy between countries [10]. With the deepening of urban coordinated development and changing market demand, the research on the promotion method and promotion path of brand visual image design of new energy enterprises lags behind, so it is impossible to provide theoretical guidance in the practice of brand construction [11]. New energy enterprises attach great importance to the enterprise brand influence of the technology undertaking party. Therefore, there is a great exploration space for the relevant research on the brand visual image design of new energy enterprises. As one of the pillar industries of the national economy, energy enterprises also have the nature of service industry, and more and more have contacts with other enterprises and social individuals [12]. The reform of state-owned enterprises has transformed them into marketization, which involves that as an enterprise with strong regional characteristics and group characteristics, energy enterprises urgently need to improve their corporate image system design to better cooperate with the service content and create the golden brand of state-owned enterprises [13].

The research on brand image visual design of new energy enterprises not only focuses on the combination of design methods and promotion paths, but also emphasizes the dominant position of the concept of "ecological public welfare" and strengthens brand awareness [14]. With the rapid development of information technology, the amount of information shows a sharp upward trend. More and more information is filled in people's life. At the same time, people also rely more and more on using the Internet to obtain information [15]. There are many aspects involved in the brand design of an enterprise, not only in the business logo of the enterprise itself, but also in the packaging design of the product [16]. With the further deepening of energy enterprise system reform and the development of national new energy industry, how to improve the marketing and service level of energy enterprises and establish a modern enterprise image to adapt to the development of market economy has become an urgent issue for every energy enterprise manager [17]. This paper studies the use of visual communication design in brand design of new energy enterprises, and an updated application of their ideas with the progress, to show the importance of visual communication design for the development of enterprises. Combined with energy big data analysis, through analyzing and mining the user's behavior data and attribute data, the time-varying characteristics affecting the user's brand purchase were found, and the purchase prediction model was established to predict the user's brand purchase.

2 Relationship between brand design and visual communication design of new energy enterprises

2.1 Creating brand image through visual communication design

Brand design refers to the design that distinguishes one product from another. In fact, it refers to an intuitive visual feeling. There is a close relationship between brand design and visual communication. A good brand design requires designers to focus on visual communication design and show a good visual effect. In enterprise brand design, enterprise logo is the most recognizable design element. If an enterprise brand wants to remain invincible in the highly competitive market, the brand design should have unique and distinctive personality characteristics [18]. Different enterprise brands represent different products and services. Enterprise brand design is conducive to effectively distinguish different enterprises. The information conveyed by brand design will have a strong visual impact and strongly express the characteristics of the enterprise itself, which is equivalent to making the enterprise products produce unique product identity and promoting consumers' inner identity. This is a successful brand design.

The brand has the core culture and enterprise emotion of the enterprise. This unique advantage can quickly grasp the psychological needs of consumers, so that it can rank first when purchasing products.

Enterprise brand image can generally be composed of internal image and external image, and internal image is usually only product image and corporate culture image. The external image refers to the brand visual image recognition system, the brand's reputation in the market and the brand's impression in consumers' minds. The initial evaluation of brand by consumers comes from the visual image of brand, and it is the quickest way for enterprises to pass the brand image to consumers through perfect visual identification design [19]. Including corporate logo, trademark design, standard color, product packaging and brand appearance design. It is one of the basic characteristics of enterprise brand design that enterprises distinguish their products from those of competitors by brand design. In the current fierce market competition, enterprises must rely on their own unique and creative brand design and long-term brand planning to effectively strengthen their own competitiveness and finally make them stand out.

2.2 Visual communication design guides consumption trend

Brand intention mainly refers to consumers' inclination to the brand of a product when purchasing it. A good brand design will use visual communication design technology to get consumers' recognition, so that it can stand out among many related industries and guide the trend of consumption. Visual communication design also serves the enterprise brand design. Through visual communication design, the enterprise brand concept is transmitted to consumers. The visual communication design of a good brand design should be constructive, its design concept should keep pace with the times, and it should contact the economic development of the real society, actively cater to the needs of the society, and on this basis, keep up with the trend of the times [20]. Visual communication design can guide the audience's psychological feelings, and the main purpose of brand is to establish its own good image, so that enterprises can occupy

a favorable position in the competition. There are many factors involved in brand design, and the expression of a good visual communication design should be in line with public psychology and social needs.

Design conveys that the brand image created by design has its own uniqueness, which can meet the visual needs of the audience, so it also needs to put forward high requirements for designers. If corporate brand design lacks personality characteristics, corporate brand obviously cannot attract consumers effectively, and ultimately lacks market competitiveness. The competition between enterprises will be manifested as the competition of different brands, and brand image design is actually the primary factor of brand competition. Consumers can know and be familiar with enterprise products through enterprise brands, and consumers finally choose enterprise products according to brand identification. Designers should have a green design concept when designing, so that people can fully enjoy the beauty of nature and the harmony of society in their designed works [21]. The concept of green is not only in line with social needs, but also conducive to establishing the image of the enterprise itself. With the help of this design concept, new energy enterprises can open up their own markets, and at the same time, the state will give certain policies to point out that such visual communication design can mainly play its own unique advantages and form brand effect.

3 Brand visual design of new energy enterprises based on energy big data

Nowadays, successful marketing of enterprise products depends on brand influence, and corporate visual image design plays an important role in corporate brand strategy. If a modern enterprise's visual image is mediocre, it means that its image will be submerged in the sea of business, its products and services will have no visual image at all, and its enterprise spirit and ideas will appear to be lax and not cohesive. All new energy enterprises are doing a great and promising business. However, entrepreneurs in the new energy industry are mostly from technical background, and lack professional understanding of brand and market, which will become increasingly obvious after the enterprise develops to a certain stage [22]. At present, there are no prominent brands in the terminal market of new energy industry, and consumers have little awareness of brands. In this way, consumers will tend to low-priced products, and the quality of such products is often not guaranteed, which will affect consumers' confidence in the new energy market.

The method of measuring the similarity between users and users is as follows. First, all items scored by users i and j are obtained, and then the similarity between them is calculated by different similarity measurement methods, denoted as sim(i, j). This article uses a modified cosine similarity calculation method:

$$sim(i, j) = \frac{E_{c \in I_{i,j}}\left(R_{i,c} - \overline{R}\right)\left(R_{j,c} - \overline{R}_c\right)}{\sqrt{\sum_{c \in I_{i,j}}\left(R_{i,c}\left(R_{i,c} - \overline{R}_c\right)^2 \times \sum_{c \in I_{i,j}}\left(R_{j,c} - \overline{R}_c\right)^2\right)}} \tag{1}$$

$R_{i,c}$ is the rating of user i on item c, and $\overline{R}_c$ is the average rating of item c. After calculating the similarity between users, for a user u, a set of "neighbors" arranged according to the similarity is generated, $N = \{U_1, U_2, \ldots, U_t\}$, 0≤t≤m, and u does not belong to N. From U_1 to U_t, $sim(u, U_i)(1 \leq i \leq t)$ is arranged from largest to smallest.

After the nearest neighbors of the target user are obtained, the unrated items of the target user can be predicted based on the scores of these neighbors, thereby generating recommendations. The target user u's predicted score for the unrated item i is:

$$P_{u,i} = \overline{R}_u + \frac{\sum_{v \in N_u} sim(u,v) \times (R_{v,i} - \overline{R}_v)}{\sum_{v \in N_u} |sim(u,v)|} \tag{2}$$

Among them, N_u represents the nearest neighbor set of the target user u, $sim(u,v)$ represents the similarity between the target user u and its nearest neighbor v, and $R_{v,i}$ represents the score of the user v on the item i. $\overline{R}_u$ and $\overline{R}_v$ respectively represent the average scores of the target user u and neighbor user v.

Brand is not only a name, but also a vivid embodiment of corporate culture and philosophy. We should be soberly aware that brand not only represents rich cultural connotation, excellent product quality, unique design and reasonable and thoughtful service, but also has the responsibility of guiding consumption and regulating the market, advocating a good corporate culture atmosphere, values and reasonable consumption concepts [24]. New energy enterprises should strengthen the construction of enterprise culture from three levels: spiritual culture, institutional culture and material culture, and integrate the concept and values of enterprise service brand. So as to enhance the service consciousness and team spirit of employees, and make their work behavior and attitude consistent with the service brand image of enterprises.

Visual communication design works will show different styles because of the collocation differences of color, text and other factors.

According to the new energy brand transaction data and the user's evaluation information, the user's preference for each product category can be calculated:

$$PC_{u,j} = \frac{\sum_{i \in I_u} PI_{u,i} \times \mu_j(x_i)}{\sum_{i \in I_u} \mu_j(x_i)} \quad j = 1,2,3\ldots \tag{3}$$

In the formula: $PC_{u,j}$ represents user u's preference value for category, $PI_{u,i}$ represents user u's rating value for product i, I_u represents the product set evaluated by user u, and $\mu_j(x_i)$ represents product i's membership degree to category j.

Enable users to participate in interactive color matching of brand visual image. After evolutionary operation, the output schemes have good satisfaction and consensus, and the

evolutionary process is terminated. Therefore, the maximum fitness value may decrease in the evolution process, but the average fitness shows an increasing trend, which has good global convergence and fast overall convergence speed. The change curve of fitness value is shown in Figure 1.
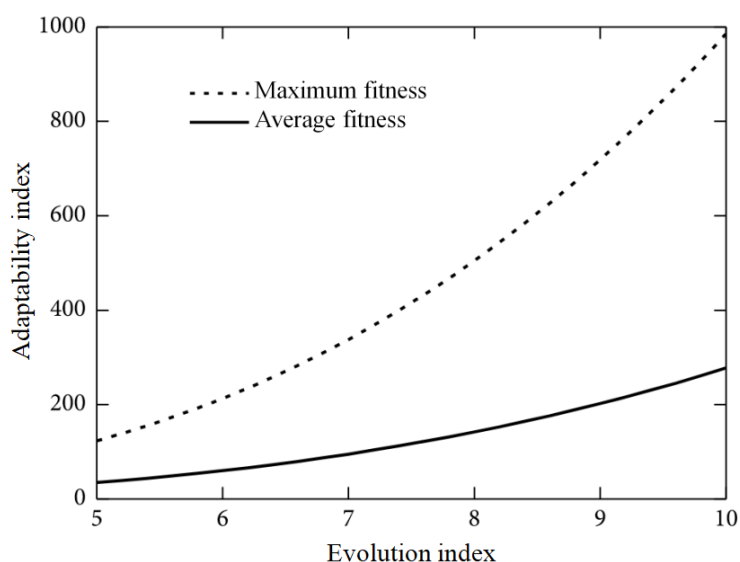

Figure 1 Changes in fitness value

Visual image design can express the unique business philosophy of an enterprise. Therefore, the business philosophy of an enterprise relies on the visual identification design system to spread and publicize, and it is also an important carrier of corporate culture and business philosophy. The speed of market change and the rhythm of consumption orientation change are very fast. Consumer behavior is obviously influenced by price and other factors. There are quite a number of industry markets, and brand loyalty is still very poor. These market characteristics of transition from disorderly competition to perfect competition actually reduce the brand building of enterprises from unattainable to within reach. Service brand building is different from general brand building, which pays more attention to the value of service in enterprise brand. However, the service is invisible, which requires more people to participate, and the service environment and objects are changeable.

The optimized performance parameters of brand image layout before and after optimization are shown in Table 1.

Table 1 Layout optimization performance parameters before and after optimization

	Before optimization	After optimization
Number of rows	33	39
Number of columns	11	19
Monitoring points	363	741

In terms of brand visual design for new energy companies, wavelet transform has the characteristic of adjustable time-frequency window to approximate any details of the signal, and uses multi-scale to gradually separate the edge signal and noise. First, the image is decomposed by two-dimensional wavelet:

$$f(x, y) = f_0(x, y) = f_J(x, y) + \sum_{i=1}^{J} g_j(x, y) \tag{4}$$

f_J is the projection of $f_0(x, y)$ on space V_J^2, and:

$$g_j(x, y) = \sum_{k,m} \left[d_{j,k,m}^1 \varphi_{j,k}(x) \psi_{j,m}(y) + d_{j,k,m}^2 \varphi_{j,k}(x) \psi_{j,m}(y) + d_{j,k,m}^3 \varphi_{j,k}(x) \psi_{j,m}(y) \right] \tag{5}$$

$j = 1, \ldots, J$ is the details in three directions.

Then establish the correlation coefficient $\omega_{j,k,m}^1$ and $d_{j,k,m}^1, d_{j,k,m}^2, d_{j,k,m}^3$ for dynamic comparison, select the three-direction wavelet coefficients to filter out the noise, and then perform edge extraction.

China's new energy industry is marching on the track of rapid development. With the joy of success, it needs more rational thinking and long-term planning to meet a new round of higher-level competition and leapfrogging. No matter what development strategy an enterprise adopts in its development, brand building is always a banner of enterprise development. Based on this understanding, at present, the elites in China's new energy industry begin to lead enterprises out of the stage of capacity expansion and gradually move towards the stage of "brand building". Enterprises can establish a good overall image through visual image design, convey the information of enterprises to the audience through visual symbols, and constantly strengthen the public's awareness, thus gaining consumers' sense of identity.

4 Development Countermeasures of brand image of new energy enterprises

4.1 Brand image design and promotion of new energy enterprises

New energy enterprises not only carry out innovative research on energy technology, but also pay more attention to the harmony between man and nature, strengthen integration and promotion strategies, adopt public welfare activities such as publicizing environmental protection concepts and sponsoring environmental protection undertakings, and realize the best psychological perception of the public on the brand image of new energy enterprises. After the brand positioning is made clear, it needs a carrier that conforms to the brand positioning and brand value to visualize it, such as the so-called corporate logo. A product with good quality, with a certain price advantage, coupled with appropriate marketing strategies, will be concerned by consumers [25]. At the same time, the perfect service solves all the doubts of consumers in the process of using, and such a brand will leave a good impression in the minds of consumers. The development of brand image design is the re-excavation of corporate culture, not merely the

imitation and creation in form. A good brand image design should reflect the organic combination of "sensibility" and "rationality" in the integration of people, people and society, and people and nature. Grasping the quality is the basic construction for enterprises to establish brands and strive for famous brands, and it is an urgent task for the whole industry at present. The birth of excellent industry brands is a complicated systematic project, which requires operators to seek truth from facts, adapt to local conditions and keep pace with the times in the process of enterprise branding.

4.2 Promotion and dissemination of brand image of new energy enterprises

Brand positioning must reflect uniqueness, difference and irreplaceable market value. New energy enterprises should not only undertake the transfer and innovation of new energy technologies, but also seek a win-win model of coordinated development among enterprises, society and environment, and establish a corporate image with green development concept. The visual communication design of a good brand design should be constructive, its design concept should keep pace with the times, and it should contact the economic development of the real society, actively cater to the needs of the society, and on this basis, keep up with the trend of the times [26]. Using the concept of modern corporate image design to integrate image resources, standardize corporate core concepts, visual symbols, etc., has become an important means for new energy to improve brand competitiveness. In today's world, it has entered an era of brand competition. For the fierce market share competition, the promotion of corporate image is not an ethereal thing, but a sharp weapon, which is of great significance to the sustainable development of new energy enterprises [27]. Designers should have a green design concept when designing, so that people can fully enjoy the beauty of nature and social harmony in their designed works. The green concept is not only in line with social needs, but also conducive to establishing the image of the enterprise itself. Enterprises can open up their own markets with the help of this design concept. This kind of visual communication design can play its own unique advantages and form the brand effect.

5 Summary

Brand building is not the responsibility and obligation of any enterprise, but the common goal of all new energy enterprises with long-term development pursuit and vision. Individualized, differentiated and diversified innovative design can make the brand have lasting vitality. In the fiercely competitive contemporary society, new products and brands emerge one after another, and the original brand visual image may not be suitable for the present environment. Visual image design is an intangible asset and wealth of an enterprise, and a good brand visual image is a potential stock, which has the ability of maintaining and increasing value, and is an important component of consolidating and expanding the brand building of an enterprise.

When a brand is founded, enterprises should not only actively maintain it, but also look at the present through the future with design eyes. Because the brand needs to be continuously optimized with the progress of the times in order to go further, design plays a very important role in enterprise brand management. The concept of visual communication design in brand design is constantly being updated. It is necessary to keep up with the development trend of the times, carry out scientific and technological innovation, integrate modern scientific and

technological means and pay attention to the concept of green development, so that enterprises can maintain their own competitiveness and have brand effect.

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