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Application of Sustainable 3D Visual Elements in Graphic Arts

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Abstract: In the field of design, graphic design plays an important role. Graphic design is a very complex and systematic process. Modern graphic design contains many optimized elements. Different aesthetic elements show obvious diversity and difference. On the one hand, they improve the overall effect of modern planning and design; on the other hand, they enhance the cost-effectiveness of the design. However, there are few visual elements used in the current graphic art design, and the three-dimensional sense and shape sense of ordinary elements in the design are obviously inferior to Three Dimensions (3D) visual elements, so how to use 3D visual elements for art design has become the focus of current research. Therefore, this paper first analyzed the connotation of 3D vision, design means and visual expression situation, and then studied the significance and application of 3D visual elements in art design. Finally, it analyzed the impact of 3D visual elements on art under sustainable conditions. The information transmission speed of graphic art design with different visual elements was gradually increasing with time. Among them, the average speed of information transmission under 3D visual elements was about 1.83, and the average speed of information transmission under traditional visual elements was about 1.26. On the whole, the information transmission speed of 3D visual elements was always higher than that of traditional visual elements, and the information transmission speed of 3D visual elements was 45.2% higher than that of traditional visual elements. The visual impact of graphic art design integrated with 3D visual elements was about 8.8% higher than the original graphic art design, and the order aesthetic sense was about 11.1% higher than the original graphic art design. In a word, 3D visual elements could improve the visual expression ability of art.

1. Introduction

Graphic design is an important part of design. It requires the design and placement of elements in two-dimensional space, as well as printing and batch production of graphic works. In graphic design, designers use specific forms of expression to display the main features of works and convert them into printed materials. In addition, the visual effect of graphic design is more eye-catching, which to some extent meets the personal aesthetic needs. At present, the main content of space visual effect

research in graphic design is how people perceive the visual effect of special three-dimensional images.

The most important thing in graphic art is graphic design. Sukerta Pande Made considered the relationship between art and environment. Through internal research or internal wandering, creators could find triangles, circles and lines as the main motivation of abstract expressionist models [1]. Mirhoseini Azalia proposed a deep reinforcement learning method for chip layout planning. Chip layout was considered as a central learning problem, which led to rich peripheral neural network structure and could be represented by mobile learning chips [2]. Walker Sue put forward a more positive view on graphic design research and determined a diversified and unique research field [3]. Motley Phillip gave students the opportunity to practice the habit of graphic design. Criticism helped students become keen observers of relevant discipline standards, and was good at providing meaningful feedback to peers [4]. Zheng Xinru studied the problem of content aware graphic design layout generation, and proposed a depth generation model for graphic design layout [5]. Zhao Nanxuan proposed a deep learning framework to explore the impact of various design factors on graphic design perception personality, and estimated the personality score of graphic design by ranking the crawl data [6]. Frascara Jorge asked how this affected the design process by ignoring the complexity of human communication interaction, which reduced the applicability of methods and processes as a way to face complex business, cultural and social problems [7]. The above studies all described the application of graphic design, but did not combine visual elements for design.

Many scholars have studied the visual elements in graphic arts. Wenjuan Liu believed that designers should pay attention to visual communication and integrate visual elements of contemporary art into their design. In addition, they needed to make their works closer to people and let the public enjoy art, so as to improve the public's artistic accomplishment [8]. Wu Haotian analyzed the user interaction and model hierarchy from the visual form to the entire interface model and component space, and then to the visual elements of the smartphone interface [9]. Saris Brenda summarized and analyzed the literature in this art field, and highlighted the problems and common areas established, which promoted the theory and methodology of future creative design process research [10]. Haishan Z. H. U analyzed the problems of visual communication in the teaching of decorative arts, and proposed strategies to adapt to the teaching content, change the teaching mode, and update the teaching concept. In addition, students should also be trained to apply decorative painting to visual communication design [11]. Bashirzadeh Yashar found that animation and hieroglyphs enhanced digital communication, which was mainly through increasing the perception of abundance. However, these elements also enhanced the sense of clutter. This interaction might not only destroy the information results, but also spread to the downstream behavior results [12]. The above studies all described the role of visual elements, but there were still some deficiencies in the application.

Graphic design not only meets the requirements of information sharing and information recognition, but also improves the threshold of visual perception and modernization. In the work of graphic design, designers must have good professional qualifications. On the one hand, they must have complete qualifications. On the other hand, they must have the ability to analyze and handle different aesthetic relationships. The combination and interweaving of different aesthetic elements create sensitivity to different patterns. Graphic design includes many visual aesthetic elements that directly affect the formation of 3D visual aesthetic elements. Therefore, designers need to increase the application frequency of 3D visual elements to mitigate their impact.

2. Application Evaluation of 3D Visual Elements

(1) Connotation of 3D visual elements

Human perception objects exist in the form of three-dimensional. In addition to time, there are many external structures, such as color, luster, texture, material, complex internal structure and motion connection. The original energy of human discovery and creation is three-dimensional. The human retina is two-dimensional, and the perception of three-dimensional space mainly depends on the parallax of the eyes. The distance between the eyes of adults is about 65mm. When the left and right eyes look at the plane image matching the visual image on the retina, the left and right vision of three-dimensional objects are different. The brain can process and synthesize eye information to generate three-dimensional visual images, and people can also distinguish distance and depth. 3D is the development trend of modern visual design, which is widely used in animation, video, architecture, environmental design and other fields. Now 3D visual elements are gradually infiltrating into graphic design. In fact, 3D visual elements are not 3D spaces, but 3D visual effects represented by 2D planes. Through perspective, shadow, projection, etc., the distance depth ratio is set according to the three-dimensional structure, light shadow coupling, brightness, purity and temperature of the object. Therefore, the spatial effect has the characteristics of three-dimensional perception and depth in two-dimensional plane vision.

(2) Design method of 3D visual elements

There are two ways to design and create visual effects elements to implement 3D attributes, as shown in Figure 1. The first is created using traditional representation methods. It is usually through forward-looking communication and technological changes such as color, shadow, black and white, and gray to create three-dimensional visual elements, such as ink painting with the most national characteristics. This painting shows the affinity with painting, abstract and delicate colors, and is full of landscape forms and technologies. The second is to use 3D art support to design and create 3D style visual elements. With its powerful works of art and design functions, it is possible to create virtual objects and scenes with 3D perception to enable virtual 3D objects to move freely as required, and reasonably combine virtual cameras with virtual lighting [13]. In a built virtual studio, visual 3D images can be perfectly presented in a virtual computer environment for the virtualized scenes that cannot be completed by traditional studios. Producers can edit and modify it at any time and make full use of their imagination and creativity. Finally, the design goals and requirements would be constantly reviewed and improved to achieve the ultimate goal of innovative design.

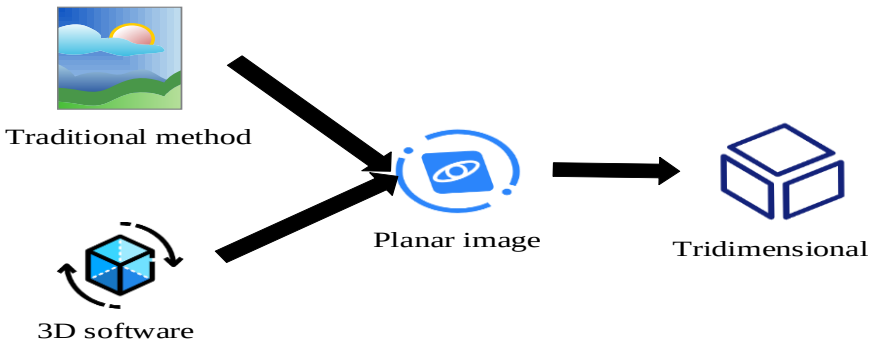

Figure 1: Method of realizing 3D by visual elements

(3) Visual performance advantages of 3D visual elements

In the era of rapid updating of visual information, the public no longer lives in information poverty. Aesthetic fatigue is formed by actively or passively accepting various visual data. The traditional layout design cannot arouse the two-dimensional aesthetic sense, while the three-dimensional visual elements undoubtedly enrich the visual programming language, which

creates three-dimensional effects and makes the visual image more complete and real. As shown in Figure 2, three-dimensional visual images accurately and vividly convey information, and enhance recognition ability. They also awaken people's association and imagination, and improve visual perception, so as to adapt to the aesthetic performance of modern audiences. Digital printing improves the performance of color details and realizes the effect of 3D graphic design. As the vector of layout design, network breaks the traditional graphic printing on some information transmission barriers, which makes the 3D layout effect more mature, perfect and active than before. Many graphics processing, image processing and software development are constantly developing and improving, which promotes the development of 3D graphics design. Therefore, both the innovation of traditional printing technology and the development of computer network and software provide strong support for designers. In addition, the update of the design concept has led to the large-scale use of 3D visual elements to design the floor plan, which makes the current design lacking hierarchical structure and dynamic more dynamic and gives people a new visual sense. Therefore, people are also full of more curiosity and desire for 3D visual performance.

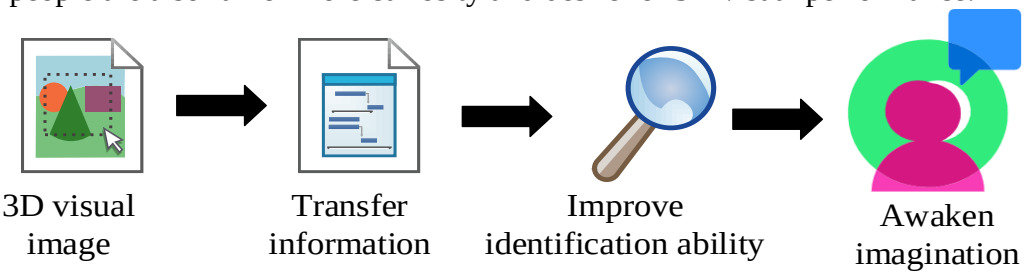

Figure 2: Function flow of visual image

3. Application Evaluation of 3D Visual Elements in Sustainable Lower Plane Design

(1) The significance of 3D visual elements in graphic design

3D visual elements have three meanings in graphic design, as shown in Figure 3. The first is to transmit information. Text, color and pattern can be the information contained in the graph, or the theme value of the work of the same audience as the designer. In culture, visual elements often have the same meaning, so the information conveyed is more accurate. The second is to improve emotional resonance. As a symbol, the structure of visual elements is very simple, including only points and lines that can express profound meaning. In graphic design, simple dotted line combination is used to express rich internal meaning. The audience can continuously experience the essence of design and fully understand the meaning of graphic design. At the same time, they can enjoy the works and leave a deep impression on them. The third is to emphasize cultural characteristics. Visual elements have deep cultural roots. In addition to their understanding of ancient nature and society, their cultural identity is also very clear, which can reflect the unique cultural charm of the nation. In short, visual elements are indispensable aesthetic elements in graphic design, and the use of flexible graphics, text and color is an important tool for each designer to evaluate his design level. In the process of planning and design, different attributes of different geographical elements must be combined, intelligently selected and sequenced to bring the audience visual perception with impact and connotation, so as to achieve the purpose of information transmission.

(2) Application of 3D visual elements in graphic design

3D visual elements are mainly applied in four aspects in plane art, as shown in Figure 4. The first is the application in posters. Posters can provide valuable information and reflect people's views. They have a very artistic and expressive force and can be seen in people's lives. Poster design also includes a lot of graphic design, so it is necessary to enhance color contrast through visual effects,

and emphasize the most important elements, so as to let people pay attention to the visual feeling and content of the poster. In addition, the poster design should be concise to emphasize the most important moment. By applying 3D visual elements and billboards, people can acquire new knowledge, which can not only improve the performance of posters, but also create visual effects. The second is web applications. In the past, computers were too slow to process large amounts of information. Nowadays, computers provide fast speed and rich functions. The use of three-dimensional elements in website design enriches the visual impact and aesthetic sense of products. In the advertising and design of specific clothing brands, 3D elements can be used to improve the level and color of clothing, so that people can see the details and styles of clothing more clearly and consume [14]. The third is the application in packaging. The use of packaging is also the most important way for enterprises to improve their cultural and raw material advantages. The product packaging design uses 3D visual elements, which can highlight product information to help customers understand products for the first time, and facilitate purchase. The fourth is the application in the brand logo. Logo is a special symbolic expression, which reflects the important elements and information that enterprises want to express. In addition, corporate identity also gives consumers the opportunity to understand the characteristics and image of the enterprise, and can learn a lot from the brand. Taking national symbols as an example, the changes of symbols can reflect different stages of economic development and people's different aesthetic tastes, so as to understand art. In the information age, 3D visual elements can emphasize the concept of brand standards.

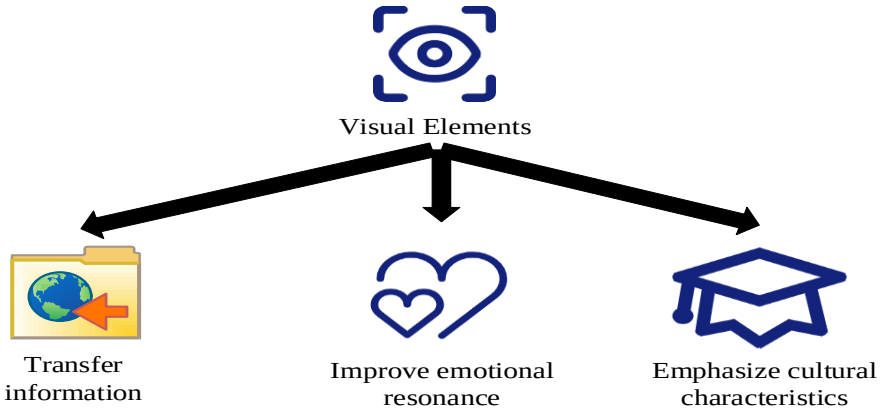

Figure 3: Significance of visual elements in graphic design

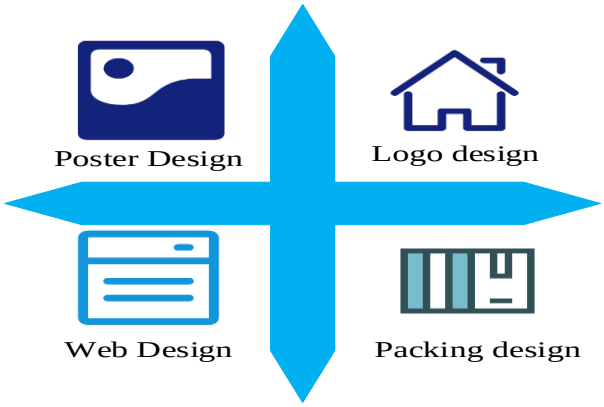

Figure 4: Application of visual elements in design

(3) Aesthetic characteristics of the elements in plane art

The aesthetic characteristics of graphic design elements are very obvious, which is mainly in the

visual impact, aesthetic order and the economic impact of the works. The first is visual impact. Graphic design is a unique aesthetic construction, which shows the design concept through color text, and brings a visual impact to people. Designers must fully consider these factors in the design process. They should respect the aesthetic needs of the audience and deeply study people's emotions and psychology. The purpose of design is not to express one's own artistic thoughts and feelings, but to express the audience's psychology in works and create different visual experiences for them. The second is the aesthetic order. Paradigm is an important tool to deal with aesthetic objects in graphic design. Designers take full account of the artistic image generated in the design process. Under the influence of various aesthetic factors, it makes the audience feel comfortable and balanced in the process of appreciating graphic design by abstracting the concrete. It is also an important means of spreading culture and forming aesthetic level among residents. Strategically ambiguous work encourages designers to understand more about how messages are structured and be more proud of their work [15]. It shows the economy of the work. High level layout can enjoy aesthetic feeling. Under the condition of fierce market competition, in order to effectively improve the market competitiveness of works, designers must fully combine it with product layout design and product characteristics to design works that meet the needs of consumers.

(4) The influence of 3D visual elements on graphic art design in a sustainable way

The sustainable use of 3D visual elements would have three specific impacts on graphic art design, as shown in Figure 5.

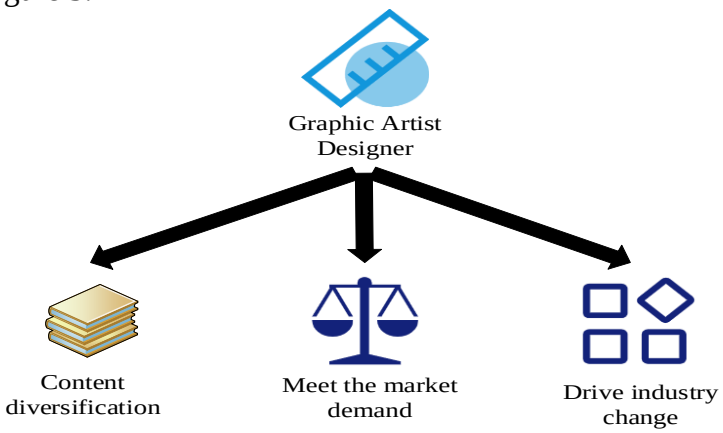

Figure 5: Analysis of the impact of visual elements on graphic arts

1) Content diversification

Art planners should constantly innovate the ideal of design optimization and constantly develop attractive new methods. Therefore, the integration of 3D visual elements represents a breakthrough in traditional design concepts and provides new shapes and concepts for layout design. In the past, most mobile interfaces used by people were simple to meet the basic needs of the business. However, the function and style are relatively simple, which cannot meet the needs of more people. The appearance of 3D visual elements makes the content and operation of mobile phone interface more convenient and three-dimensional, which can meet the needs of mobile phone users of different ages, and undoubtedly injects new power into the design.

2) Meeting the market demand

3D visual elements enrich the structure, form and content of art design. In modern practice and research, the amount of information increases rapidly. However, aesthetic fatigue can persist in the same cultural environment, and there are different factors in the quality and form of the content. The use of three-dimensional visual elements in graphic design enriches the details and concepts of graphic design, and emphasizes the importance and overall significance of the theme. The public's deeper understanding of the use of three-dimensional visual elements in graphic design would

undoubtedly bring greater economic benefits. Planning and design would also promote economic development, and provide people with rich elements, which also improve aesthetic quality and create economic benefits.

3) Driving industry change

The innovation and application of 3D visual elements in structural design can not only promote the development of surface content towards innovation, but also promote people's acceptance of various graphic arts. Integration and integration of 3D visual elements can help people accept the transformation of 3D visual elements in life. At the same time, people would also find and understand the features and related technologies of 3D visual elements in practice. In order to better display the theme and characteristics of layout design, the use of 3D visual elements in the future would be of great significance to relevant enterprises and funds, and would promote technological innovation, enrichment and optimization.

4. Experimental Evaluation of the Application of Visual Elements in Graphic Arts

In order to study the specific application effect of 3D visual elements in plane art, this paper analyzed the specific impact of visual elements by analyzing the functionality and economy of plane art works incorporating visual elements, and optimized the use of visual elements by comparing their visual impact and order aesthetics with the original plane art works. First of all, this paper investigated the satisfaction of designers from three design companies with art design incorporating 3D visual elements. Each design company investigated 50 people, as shown in Table 1.

Table 1: Designer's satisfaction with art design with 3D visual elements

	Satisfied	Commonly	Dissatisfied
Company 1	38	8	4
Company 2	36	9	5
Company 3	40	7	3
Total	114	24	12

According to the data described in Table 1, the designers of the three companies were generally satisfied with the art design incorporating 3D visual elements. Among the satisfied designers, Company 3 had the most satisfied designers, accounting for 35.1% of the total; Company 2 had the least satisfied designers, accounting for 31.6% of the total. Among ordinary designers, the designers of Company 2 were the most, accounting for 37.5% of the total number of ordinary designers; Company 3 had the least designers, accounting for 29.2% of the total number of ordinary people. Among the unsatisfied designers, the designers of Company 2 were the most, accounting for 41.7% of the total number of unsatisfied designers; the designers of Company 3 were the least, accounting for 25% of the total number of dissatisfied people. On the whole, 76% of the total number of designers in the three companies were satisfied. The average accounted for 16% of the total, and the dissatisfied accounted for 8% of the total. Satisfied designers believed that 3D visual elements could strengthen the visual expression of graphic art works and make graphic design more three-dimensional, which could satisfy consumers' psychology. Unsatisfied designers thought that the process of integrating 3D visual elements into surface art was more complex and a waste of time. The work functionality and work economy of graphic art integrated with 3D visual elements were analyzed. The visual effect of graphic art was analyzed according to the changes of the two, as shown in Figure 6.

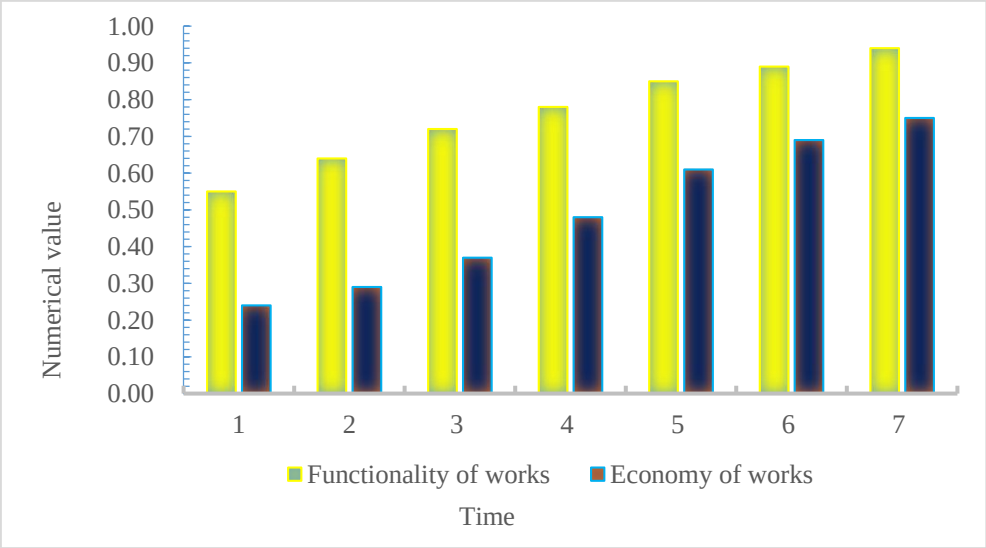

Figure 6: Functionality and economy of graphic art works integrated with 3D visual elements

It could be seen from the data described in Figure 6 that the functionality and economy of the works of graphic art integrated with 3D visual elements were gradually increasing over time. Among them, the average value of the functionality of the works of graphic art was about 0.77, and the average value of the economy of the works was about 0.49. On the whole, the initial value of the work functionality of graphic art was 0.55, and it increased to 0.94 on the seventh day. In the whole process, it increased by 0.39; the initial value of the economy of the work was 0.24, which increased to 0.75 on the seventh day. In the whole process, it increased by 0.51. The economic and functional growth of the works showed that 3D visual elements could enrich the expression forms of graphic art, and also make the logo of the works more prominent, which could capture the psychological characteristics of consumers. The development of economic benefits could also be promoted through visual elements. The change of information transmission speed of graphic art design with different visual elements was analyzed. Traditional visual elements and 3D visual elements were mainly studied, and the specific comparison is shown in Figure 7.

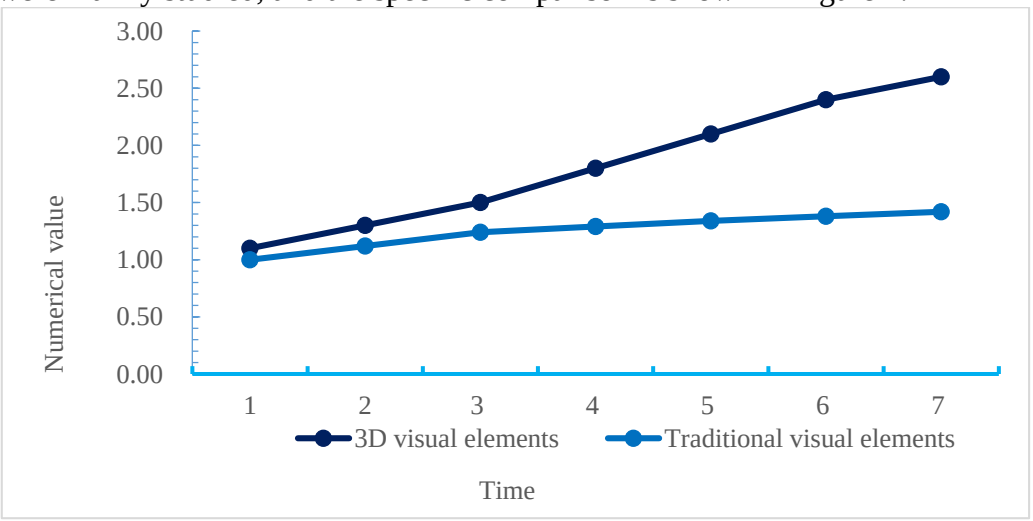

Figure 7: Changes of information transmission speed under different visual elements

According to the curve described in Figure 7, the information transmission speed of graphic art design of different visual elements was gradually increasing with time. Among them, the average

speed of information transmission under 3D visual elements was about 1.83, and the average speed of information transmission under traditional visual elements was about 1.26. On the whole, the initial value of information transmission speed under 3D visual elements was 1.10, and it increased to 2.60 on the seventh day. In the whole process, it increased by 1.50; the initial value of information transmission speed under traditional visual elements was 1.00, and it increased to 1.42 on the seventh day. In the whole process, it increased by 0.42. The information transmission speed of 3D visual elements was always higher than that of traditional visual elements, and the information transmission speed of 3D visual elements was 45.2% higher than that of traditional visual elements. Finally, the visual impact and order aesthetics of graphic art design integrated with 3D visual elements were analyzed and compared with the original graphic art design, as shown in Figure 8.

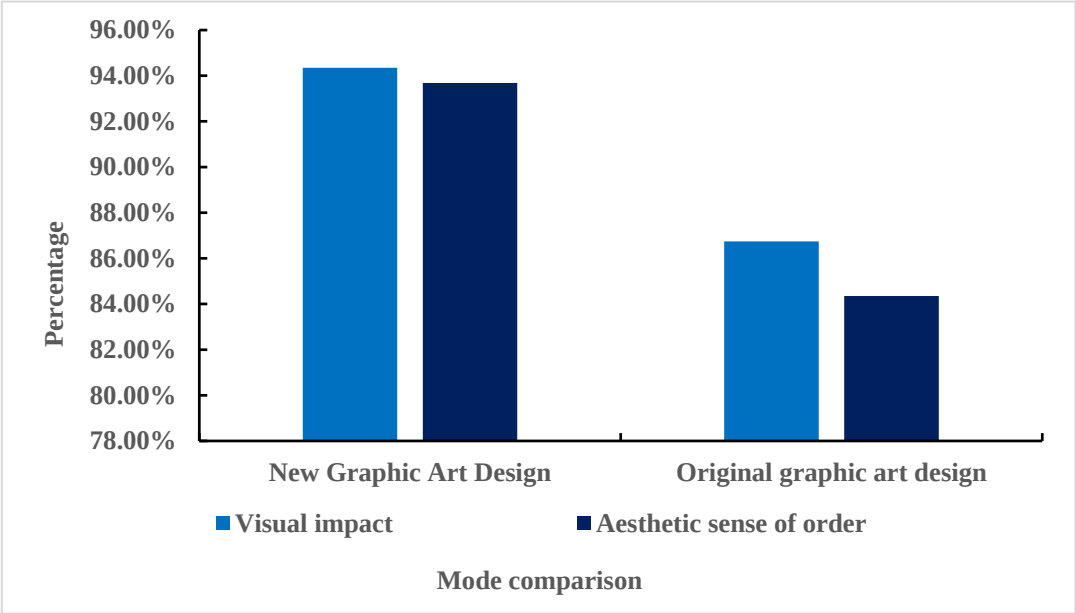

Figure 8: Visual impact and order aesthetics of graphic art design with 3D visual elements

According to the comparison diagram in Figure 8, the visual impact and order beauty of graphic art design with 3D visual elements were better than the original graphic art design. Among them, the visual impact of graphic art design integrated with 3D visual elements was about 8.8% higher than the original graphic art design, and the aesthetic sense of order was about 11.1% higher than the original graphic art design. The plane art works under the 3D visual elements not only had a strong three-dimensional sense, but also made it easier for people to obtain psychological satisfaction and rich visual experience. In addition, 3D visual elements could also improve people's access to product packaging and enterprise information.

5. Conclusions

The combination of 3D visual elements and graphic art could provide people with a variety of artistic features, and improve aesthetic skills, which could also help enterprises achieve economic benefits and promote the development of human culture. 3D visual elements combined individual needs with people's cultural needs to enrich innovative practice and research. The combination of new design concept and planning design would change the traditional planning status quo, which would also enrich the design field and create new advantages. In graphic design, visual aesthetic factors should be used reasonably to promote products in an all-round way. On the basis of meeting people's demand for visual aesthetics, the role of advertising marketing was played, which made

graphic design play the most valuable role in promoting market economy. In addition, the combination of graphic design and artistic aesthetic design would be deepened and improved by connecting the expression form of three-dimensional visual elements and the extraction and enhancement of ideological content, thus promoting the innovation and development of traditional planning industry.

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