Digital Enabling Visual Communication Design: "Turn", "Integrate", "Rise"

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Abstract—The rapid development of digital intelligent technology makes its application in the design industry increasingly extensive and in-depth. Every design field is experiencing profound changes and transformations. Visual design, as a discipline that blends art and technology, is taking the lead. This paper discusses the transformation and development of digitally-enabled visual communication design in the three key dimensions of "transformation", "integration", and "ascension". Through the analysis of the "transformation" from two-dimensional plane to multidimensional three-dimensional, the "integration" from digital technology to innovative thinking, and the "upgrading" from traditional paradigm to digital innovation, this paper expounds the new trend, new characteristics and new path of visual communication design under the background of digital age.

Keywords—digital intelligent technology, visual communication design, change, and development

I. INTRODUCTION

The rapid development of digital technology has broken the static design mode of visual communication in the past, making it set the pursuit of individuation as the goal, introducing new visual elements to build new visual effects, and transmitting all kinds of visual information quickly and changeably. Digitalization has not only changed the form of expression and communication of design, but also profoundly affected the thinking mode and creation method of design. This change makes the visual communication design urgently need to find a new design direction. "Transformation", "integration", and "upgrading" are the urgent tasks for the development of visual communication design in the digital era, which covers the transformation from the spatial dimension, the integration of technology and thinking and the innovation of paradigm, which is of great significance for promoting the progress of visual communication design.

II. "TRANSFORM" — FROM TWO-DIMENSIONAL PLANE TO MULTIDIMENSIONAL THREE-DIMENSIONAL

A. Limitations of Two-Dimensional Graphic Design

"Graphic design is a kind of visual media as the carrier, through printing and completed to the mass dissemination of information and emotion modeling activities." [1] The traditional visual communication design has long been focused on the two-dimensional plane field, such as poster design, book binding and print advertising, and other classic forms. These traditional two-dimensional graphic designs do show their unique advantages in accurately conveying information and creating visual beauty. Designers use clever composition, rich colors, and refined text to create eye-catching visual effects.

However, two-dimensional graphic design also has obvious limitations. Its form of expression is relatively simple, the way of expression is too flat, some designers do not fully apply the new media technology, nor expand the channels of information transmission, the content and form of the works produced by this design concept do not meet the needs of the current market and audience, resulting in the visual communication design can not play a wide spread effect [2]. And limited to two-dimensional space, it is difficult to fully show the richness and three-dimensional sense of the three-dimensional world. As a result, when receiving information, the audience is often unable to obtain a comprehensive and immersive visual experience. In the modern society of information explosion, this problem becomes more and more prominent. Massive information is flooding in, two-dimensional graphic design is often difficult to quickly stand out in a large number of information, to attract the attention of the audience. Take poster design as an example, although a well-designed poster can convey a wealth of information, it may only be a drop in the ocean among many posters, which is difficult to be captured by the audience at a glance. Similarly, book binding and print advertising face similar challenges.

B. The Characteristics and Advantages of Multi-dimensional Design

First of all, with its unique charm, multidimensional three-dimensional design can highly simulate the real space environment, so that the audience can feel the depth, volume and delicate texture of the object in the visual experience. This kind of immersive space creation greatly enhances the visual authenticity and immersion, making the audience feel as if they are in the world built by the design. This kind of feeling not only makes the information transfer more intuitive and vivid, but also helps the audience to understand and accept the core content conveyed by the design more deeply. In many museum exhibition design, multi-dimensional design is widely used. For example, the Palace Museum, National Museum, Suzhou Museum, National Art Museum of China, and other major museums have used advanced virtual reality technology to create 3D museums and create immersive Spaces. Through the application of multi-dimensional design, designers are able to create three-dimensional environments that are highly similar to historical scenes or cultural relics. After wearing VR devices, the audience can enjoy ancient buildings, explore historical sites, and even touch and rotate the exhibits with their own hands, thus obtaining a more real and profound

experience. This design not only makes information transfer more efficient, but also greatly improves audience participation and interest.

Secondly, compared with two-dimensional graphic design, multi-dimensional design shows significant advantages in terms of interactivity. It can be said that technology is the necessary means to realize the creative essence of human beings. On the one hand, technology changes people's design and creation activities from potential consciousness to material reality, and the creative consciousness can only be realized through technology. What kind of technology we master will produce what kind of creation and what kind of design form. The creativity determined by technology will inevitably abandon the various creative consciousness and make the design tend to be single and lose the richness. The modern industrial production leads to the design modernism style is an example [3]. Art design, as a perfect combination of science and technology, art and people's needs, is moving from plane to three-dimensional, expanding from a single visual experience to multiple dimensions such as touch, smell and hearing. The audience can interact with the virtual three-dimensional space through gestures, movements, sounds and other ways, so as to participate more deeply in the experience of design works. This interaction not only greatly increases the audience's sense of participation and fun, but also enables them to have a more comprehensive understanding of the connotation and significance of design. In advertising design, multi-dimensional design also plays an important role. Snickers launched the elevator interactive advertising, so that the audience can not only immerse in the creative content, but also by clicking the corresponding story button to dominate the direction of the story — you can choose to let the protagonist into a sleepy and hungry situation, or you can decide to let him "Snickers bar", so as to quickly return to the combat state. Designers can even use augmented reality technology to further transform two-dimensional print ads into three-dimensional scenes. Viewers can enter a virtual three-dimensional world by scanning a QR code on the AD via their phone or tablet. In this world, they are free to explore, interact with the product and even participate in the story of the brand. This kind of design not only makes the advertisement more lively and interesting, but also greatly enhances the brand's awareness and reputation.

Finally, multi-dimensional design provides designers with a broader space for creative expression. They are no longer bound by the two-dimensional plane, but can freely use their imagination in three-dimensional or even multidimensional space to create more unique and novel visual images and forms of expression. This creative expansion not only helps to enhance the artistic value and innovation level of visual communication design, but also brings a more colorful visual feast to the audience. Designers can try to transform the traditional two-dimensional web page into three-dimensional design in the field of web design. This kind of design can not only enhance the brand's memory points, but also give users a more immersive experience when browsing. At the same time, by adding auxiliary elements such as sound, it can also provide a barrier-free browsing experience for invisible groups, thus further expanding the audience range of the design.

C. Digitalization Promotes the Transformation towards Multidimensional and Three-Dimensional

Within the knowledge structure system, all research results are bound to be transformed into computer language, this transformation process will not only determine the generation of new research directions, but also means that those things that cannot be transformed and transmitted will eventually be eliminated, thus triggering a new exploration path. In the field of traditional visual communication design, due to the limitations of performance skills, there are often differences between design ideas and actual presentation effects in terms of design effect. In serious cases, it is even impossible to realize the complete display of design elements, which has a great impact on the quality of design works and the communication effect. Under the background of digitalization, visual communication design can present specific images to the public with the help of the Internet, design software, we-media and other tools, making the content conveyed more diversified and more in line with the actual needs of the public.

"It is not that art should adapt to technology, but that technology development should adapt to cultural and humanistic situations, which is required today." [4] In the face of new aesthetic requirements, visual communication can rely on new technical means to integrate abstract, dynamic, and concrete content into the design scheme. Virtual sounds, pictures, and images have become the elements of visual communication design. The expression of various forms can not only show the designer's thoughts and design concepts, but also help the public deeply experience the work, realize the interaction between the content of the work and the audience, and further improve the communication effect of the work. Through computer graphics technology such as HTML5, CSS3, JavaScript, Virtual Reality (VR), Augmented Reality (AR), designers can expand two-dimensional visual elements into three-dimensional or even multi-dimensional space, realize dynamic animation, 3D effect, and virtual reality, and create more rich and vivid visual effects. The application of these technologies not only greatly enriches the form of expression of design works, but also brings immersive viewing experience to the audience.

In the field of digital exhibition design, the application of VR technology is particularly striking. Designers use VR technology to build virtual exhibition Spaces, enabling the audience to enjoy the exhibits immersive, observe and interact from different angles. This unprecedented exhibition method greatly enhances the interest and attraction of the exhibition, allowing the audience to enjoy the visual feast, but also deeply feel the historical and cultural connotation contained in the exhibits. For example, the digital art exhibition "A Dream of Red Mansions" launched by Zhengzhou Museum in Henan Province is based on the picture book of the Dream of Red Mansions in the late Qing Dynasty, and cleverly integrates digital interactive devices and immersive light and shadow technology to build a dreamlike world of Red Mansions, allowing visitors to feel the magnificent historical years as if they were traveling through time and space.

In the brand promotion activities, AR technology also shines. Designers use AR technology to superimpose virtual

three-dimensional images on real scenes, giving consumers unprecedented visual experiences. This unique way of presentation not only improves the communication effect of the brand, but also enhances the emotional connection between consumers and the brand. Take IKEA as an example. The brand uses AR technology to allow users to virtually place furniture in their homes. This innovative experience not only helps users make more informed purchasing decisions, but also greatly enhances the interaction and fun between the brand and consumers. Samsung, on the other hand, has provided consumers with a new and interesting way to better understand its smart home appliance line by embedding products into the scenes of the popular animation Family Guy and using AR technology. This kind of cross-border cooperation and technological innovation has undoubtedly injected new vitality and possibilities into brand promotion.

III. "INTEGRATION" — FROM DIGITAL TECHNOLOGY TO INNOVATIVE THINKING

A. The Application of Digital Technology in Visual Communication Design

The popularity of computer-aided design software (such as Adobe Photoshop, Illustrator, etc.) makes designers more efficient in graphic and image processing, typesetting design, and other work. At the same time, the development of digital printing technology, dynamic graphic design, interaction design, and other fields has also opened up new means of expression and communication channels for visual communication design. In the era of new media, punctuation marks are gradually banned in the text design expression, instead, designers need to combine the display carrier and page format to design dynamic text, through the dynamic text changing performance order and rhythm to convey information [5]. Digital printing technology with its high precision, high efficiency characteristics, so that the design works can be more perfect on a variety of media; Dynamic graphic design through the addition of dynamic effects, so that the design works more vivid and interesting; The integration of interactive design makes the interaction between the design works and the audience closer, and further improves the communication effect of the design. In essence, design is a new product of the convergence of art and science and technology. Based on science and technology, it serves human beings through the creative expression of art design to meet our material life and spiritual needs. In this process, the innovation of science and technology has played a crucial role. It breaks the previous design mode of "going it alone" and pushes the visual communication design to a new stage of cross-integration, interdisciplinary, and cross-field. Today's design is no longer a single, linear, hand-drawn based model that can cover, but needs the team's fine division of labor and intelligent assistance, in order to create more wonderful and more creative works.

Specifically, technological innovation makes it more convenient for designers to share and exchange information, which promotes the collision and integration of design ideas. At the same time, intelligent design tools also enable designers to grasp the design elements more accurately, and improve the professionalism and accuracy of design. In this context, visual communication design is no longer a simple artistic creation, but the combination of art and science and technology is needed to jointly promote the development and progress of the design industry.

B. The Importance of Innovative Thinking in Digital Design

The respect for the concept of "form follows function" and "less is more" in the field of modern design not only reflects a profound insight into the nature of design, but also a positive response to the change of design language driven by technological progress. The transformation of visual art driven by technology has made the change of social aesthetic consciousness unstoppable. In the information age, the art of design is gradually crossing the barrier of postmodernism and entering a new stage of development with more diversity and inclusiveness. In this process, the rapid development of information technology has not only greatly enriched the material civilization of the society, but also profoundly improved the quality of people's spiritual life. The concept of "technology first" has gradually become the mainstream consensus in many industries.

The vigorous rise of digital virtual technology has brought unprecedented broad space for visual art design, and under this background, the public's visual aesthetic experience and perception are increasingly relying on the deep integration of new technology and visual art design form and expression. Different from traditional media, the content display of digital interface in the new media environment has the property of temporary stay, and the transmission volume and carrying capacity of digital information are far greater than that of traditional media [6]. Digital media breaks the physical restrictions of traditional design, enabling design works to be presented in an unprecedented multi-dimensional and immersive way, which greatly expands the boundaries and possibilities of design. As the public gradually gets used to the rich sensory experience brought by digital visual images, a certain degree of alienation is naturally generated for the visual form expression of static and two-dimensional images. Visual communication design in the information age is undergoing an unprecedented reconstruction of cultural value system. In the face of the massive emergence of dynamic visual design, interaction design, virtual reality design, and artificial intelligence design. Although the concept of "vision follows technology" reflects the design trend driven by technology to a certain extent, it can not comprehensively solve the fundamental problems involved in visual communication design, such as humanity, aesthetics, and emotion. However, the public's cognition and judgment of this change are not fully mature, and the pursuit and perception of visual aesthetic constructed by information technology are still in a state of ambiguity and exploration. This immaturity is not only reflected in the curiosity and confusion of the visual experience brought by the new technology, but also in the lack of cultural connotation and value judgment of the design. In his monograph, *Theory of Digital Design*, American designer Helen Armstrong proposed "Shaping the Future" to summarize the significance of technology for the development of future visual communication design. He put forward: "Bionics, nanotechnology, emergent behavior, ubiquitous computing,

the specter of superhumans — this is the current practice environment for designers, and there is no turning back. We have changed our course in the face of exponential technological growth." "Today's designers' walk at the boundary of knowing and not knowing, 'after all, isn't giving shape to things that don't yet exist what designers do best?" [7] In the coexistence of rapid progress in the field of practice and relatively lagging theoretical framework, designers' innovation and creative inspiration are often prone to a "hollowing out" dilemma. On the one hand, the root cause of this "hollowing out" phenomenon lies in the fierce confrontation and profound divergence between different concepts at the time of the change of the new and old design cultural system; On the other hand, it comes from the confusion and search in the transformation path of design culture under the rapid change of technology. In this context, we must clearly recognize that relying solely on the application of digital technology cannot ensure the continuous innovation and development of visual communication design. Although technological upgrading has brought unprecedented convenience to design activities, it may also weaken designers' sense of innovation. While speeding up the design process and improving the design efficiency, this double-edged sword may also breed the psychology of dependence, leading designers to over-rely on technical tools and neglect the exploration of creativity and inspiration when facing the complex and changeable design needs. If this goes on for a long time, the core competitiveness of designers, namely, those innovative thinking and humanistic care that can not be replaced by machines, may gradually fade, and eventually make designers become mere technical practitioners, losing the soul and vitality of design.

"I think, therefore I am," emphasizing the importance of innovative thinking, for designers, is at any time can not be ignored. Innovative thinking is the key for designers to break through the traditional design framework and realize the differentiation and uniqueness of design works. It requires designers not only to master digital technology, but also to have profound cultural heritage and humanistic care, and to be able to skillfully integrate technology and creative inspiration to create design works with both technical beauty and humanistic value. The ultimate goal of technology development is to serve human beings, and innovative thinking is the key to make technology more humane and warm. Designers should always keep a keen perception of new technologies and critical thinking, constantly explore new paths of integration of technology and art, lead the design trend with innovative thinking, and make technology not only a tool, but a bridge to convey emotions, express thoughts, and enrich the spiritual world of human beings. Only in this way can visual communication design maintain its unique charm and value in the flood of the information age, and continue to promote the prosperity and development of design culture.

IV. "ASCENDING" — FROM TRADITIONAL PARADIGM TO DIGITAL INNOVATION

A. Characteristics and Limitations of Traditional Visual Communication Design Paradigm

Traditional visual communication design paradigm has long regarded formal beauty and accuracy of information communication as the core elements, and attaches great importance to the standardization and systematic construction of design. Under this paradigm, designers follow a set of rigorous design principles and processes, from conceptual conception to final presentation, and strive to be accurate in every step to ensure that the design works can present the best visual effects and accurately convey the expected information. However, while this traditional paradigm has played an important role in guaranteeing design quality and effectiveness, it has also exposed some limitations that should not be ignored.

Specifically, the traditional paradigm appears to be conservative to some extent, and its acceptance of innovation and change is relatively limited. In the face of rapidly changing market demands and social and cultural environments, it is often difficult to adjust itself quickly to new design trends and audience preferences. In addition, when it comes to information dissemination, traditional paradigms tend to adopt one-way communication methods and lack effective interaction and feedback mechanisms. This one-way communication model is particularly inadequate in the digital age, as audiences are increasingly focused on a sense of participation and personalized experience, eager to be able to participate in the design process, express their opinions and ideas, and expect tailored information and services.

B. The Impact of the Transformation of Design Forms on Visual Communication

Design As a social and cultural phenomenon, the evolution of design cultural forms is influenced by many factors, including technological progress, human environment, artistic changes, and aesthetic concepts. Therefore, this kind of innovation will inevitably show a trend of coexistence and iterative development in a certain social space and time. From Bauhaus period to postmodernism to modern design, point, line, surface, and other modeling principles are still important, but the physical design has been gradually replaced by virtual vision. The development of digital technology makes the creative means and forms of design more diversified, and designers can give full play to creativity more freely to achieve design innovation and breakthrough. On the other hand, the transformation of design forms has led to profound changes in the way of information dissemination and the needs of the audience. Visual communication design itself needs the help of corresponding media to complete the exchange of visual information. Design scholar Liu [8] once mentioned: "The relationship between media and visual communication design is interactive, media not only embodies design, but also brings limitations to design; Design is not only subject to the media, but also one of the driving forces generated by new media." Therefore, the development of media technology and the transformation of design form complement each other.

Guided by the concept of "big vision" at the macro level, visual communication design is facing broader prospects and opportunities for development. As an innovative behavior leading social progress, design is bound to integrate the advanced science and technology and culture of social development, and become an important driving force to

enhance the material and spiritual civilization of society. And every social change caused by the progress of human science and technology has profoundly changed people's lifestyles and ideas. As Japanese designer Hara [9] said: "Human beings and the environment are equally palpable, and the comfort and satisfaction we feel is based on how we understand and cherish our communication with the world through various sensory organs. In this view, the fields of design, technology, design and science are all oriented in the same direction."

C. A New Paradigm of Visual Communication Design Driven by Digital Innovation

Of course, media technology and form changes in each era carry unique advantages, and its iterative process is accompanied by changes in each period, and new media and old media usually coexist for a long time. At present, compared with the digital media in the information age, the printed media and electronic media in the industrial age are slightly inferior. The digital virtualization of new media is not only reflected in the innovation of visual forms, but also in a transformation of artistic and cultural concepts. Under this change, designers no longer pay attention to the appearance and form of design works, but focus on the interactive process and emotional experience between users and design works. By creating rich interactive scenes and immersive experience environments, audiences can be more deeply involved in the design works, thus enhancing the communication effect and influence of design. The application of dynamic graphic design in visual communication design is more and more extensive. Compared with the traditional static design, dynamic design can attract the audience's attention better and convey more abundant information. The dynamic visual communication effect is more attractive to the audience and will not cause visual fatigue. The audience can feel the information intended to be conveyed by the design work in multiple dimensions, and obtain information from multiple senses to achieve the purpose of rapid transmission and memory [10]. The visual communication design driven by digital innovation advocates dynamic design. Through animation, video, interactive interface, and other forms, the design works have stronger vitality and expression. Digital media has entered the era of artificial intelligence, which not only brings subversive expression methods and unprecedented display space, but also comes with the generation of a large amount of data. These data provide a very valuable reference for visual communication design. Through in-depth analysis and mining of user data, market data, and behavioral data, designers can more easily understand user needs and market trends, and then establish a comprehensive database. The essence of creation lies in the transformation of procedures and instructions, and even the establishment of control mechanisms and action guidance. The computer plays an important role in this process. It can imitate not only the laws of nature and the forms of everything, but also the forms and laws of the art world. Only by following the application rules of new media can we truly adapt to the changes brought about by the evolution of media, so as to continuously promote the innovation and development of design.

V. CONCLUSION

Cultural diversity, as a driving force, will inevitably promote the diversified development of design forms and concepts, and any "single cultural tendency" will not last long. Design, as a cultural form, does not exist in isolation, but is deeply affected by many social and cultural factors, and constantly shows a new trend of development of design culture. Therefore, in order to improve the current situation of visual communication design, designers should actively welcome changes, constantly improve personal digital literacy and innovation ability, and integrate the concept of "transformation", "integration", and "ascension" into design practice, and strive to create design works rich in characteristics and values of The Times, so as to better meet people's growing visual culture needs. With the rapid improvement of science and technology and productivity, especially the wide popularization of network technology, information technology has gradually replaced the traditional industrial technology production mode, and become a new driving force to promote social development. This change breaks the regional barrier, realizes the seamless docking of time and space, promotes the integration of culture, and then gives birth to the "general" of visual communication design form. Although modern visual communication design has developed a relatively mature ideological and cultural pattern and system, it still needs to face this new situation. Designers must keep up with the pace of technological development, keenly capture the social and cultural changes, and constantly explore and innovate, in order to solve the contradictions between globalization and nationalization, diversification and modern science and technology culture and traditional culture, so as to better adapt to the development needs of The Times.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHOR CONTRIBUTIONS

Yuhong Dai made revisions and provided guidance on this paper; Yulan Peng conducted the writing and polishing; both authors had approved the final version.

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