

Value of Science and Technology on Design

Zhi-Zhong Ding*
School of Art;
Soochow University
 Soochow, China
Institute of Industrial Design
Hohai University
 Changzhou, China
 dingzz7814@sina.com

Chao-De Li
School of Art
Soochow University
 Soochow, China
 lcd1962@sina.com

De-Ke Li
Institute of Industrial Design
Hohai University
 Changzhou, China
 lideke66@vip.qq.com

Abstract—Modern design produced by industrialization, the value of science and technology on design is no doubt. Rethinking development of science and technology by feature comparing, sort out the impact of science and technology to design creation in accordance with the scientific and technological revolution, analysis of design trend changes caused by science and technology based on European and American mainstream views of modern design, further studied the role and impact of science and technology on design. On the basis of the impact of design creation and design trend, demonstrates specific performance of the value of science and technology on design from expand horizons and change behavior affect the level of ideas.

Keywords—science, technology, design creation, design trend

I. INTRODUCTION

Design is material creation combining human science with art [1]. Design as the materialization of demand and experience, maintains the corresponding relationship between human beings and the real world, which is more obvious after entering the industrial society. And all categories of industrial products constitute the representation of society [2].

Design is not the arbitrary creative behavior of human beings, but follows the objective law. Design achievements embody the will of human beings, but design and creation cannot control the inherent change of the world. No matter how graceful the form of design achievements is and how elegant the taste is, they are both based on the objective material basis, and technology embodies the objective law of material basis intensively. Technology and design are symbiotic and develop together. Among them, technology is closest to the practical purpose of design [3].

Technology promotes the development of design, and then affects the society. Modern design germinates after the Industrial Revolution, which is deeply influenced by technological sense based on modern technology ideas and methods [4]. The development of design is inseparable from the development of technology, and it needs technology to play an important role in being a basic platform and expanding space [5]. Science and technology not only transforms the nature human live in, but more importantly, it redefines the nature of human beings [6]. With the wide application of science and technology in design, human's life is more and more comfortable, and human's control of nature is greatly enhanced. Besides, the contradiction between the backward productivity and the demand is gradually reduced. Technology is transformed into constantly improving human creation through design, building a

material world with abundant products and happy people, and causes social changes at the same time, which will establish fundamentally different systems, new directions for production development and qualitative changes in new ways of human's survival [7].

II. TECHNOLOGICAL DEVELOPMENT AND DESIGN CREATION

Technology is closely related to design, but technological application isn't regarded as the only goal of design, which because the impact on design is the result of multiple factors. Design has gone through the separation of technology from art to the integration of technology and humanities, and the role of technology in design has changed significantly.

Design acts as a bridge between technology and human beings, showing the convenience of science and technology, and conveying the spirit of science and technology. Design turned highly developed technology into something human beings can use more easily [8], which brings accessible convenience to more people. Design captures imperfections of material culture, constantly changes the realistic state that human beings feel, and improves the quality of daily life starting with necessary aspects of life. Design takes the industrial economy as its background, and takes the mass production as its symbol [6]. The changes of social condition before and after previous scientific and technological revolutions reflect the influence of technology on design.

Modern science took shape in the last three or four centuries. Before that, there are only the sprouting of science and the technology which has formed a limited system. Before the first revolution of science and technology, science has some theoretical achievements in the fields of data science, initial chemistry, mechanics, optics, botany, etc. However, it was not applied to practice. Technology was still dominated by craftspeople and it was shown by the direct utilization and simple exploitation of natural materials and natural forces. For example, men, animals, water and wind provided the main source of power for production and life, and animals, plants and minerals were the main source of materials. Material production was mainly made by hand, and concentrated in the field of household goods, which led to low productivity. The development of handicraft industry was based on the inheritance of experience, and technology had not yet been separated from art. Therefore, there emerged engineers specialized in technological research, and with the sustained development of technology, seeking new power had become an important area to explore. At that time, material supply was relatively scarce,

and most exquisite handicrafts were served for the social upper-class. Obviously, modern design had not yet appeared.

The first scientific and technological revolution started the age of machine. Design had been divided, and there had been new changes in the fields of machine production and manual production. Machine production provided a large number of cheap and inferior products to meet the urgent needs of the people at the bottom of the society. Consumers were immersed in material satisfaction from scratch and had not yet realized requirements to design. In order to pursue profit, machine products producers tried to expand the scale of production and tried to adapt to the development of science and technology, but there was no design consciousness in their mind. Machine products produced for production abandoned design and presented huge, crude features. Social elites were used to exquisite handiwork, loathed the ugly machine products which were made in a rough way. They did not accept the machine production, and they hoped to continue the fine design of the products with the handwork craft. So there had appeared the pretentious products. The change of the mode of production caused by the development of technology led to the attention to the concept of design, the separation of technology and art and the passive acceptance of the change caused by science and technology by producers and consumers. However, design had not yet found a suitable point with the machine production.

The second scientific and technological revolution started the electrical age. Technological progress was irreversible. The elite gradually felt the tremendous shock of technology and accepted the mass production by machine. The machine was constantly improved, and the motor and internal-combustion engine replaced the steam engine, evolving from squalor, clumsiness to fineness, neatness, and ease of control. The elite changed from disliking machines to admiring machines, realizing the negative effects of the absence of design, and corrected their understanding of design and aesthetics. Design had become a conscious behavior, began to adapt to the development of technology gradually. People explored the design aesthetics that adapted to the current situation of scientific and technological development, and there had been a design style with distinctive features. At that time, designers were not ignorant of the machine, but their knowledge of technology was relatively simple. Although they studied the social mainstream of the visual language and expression techniques, they only aimed to cater for the form of technology sense. The standardization concept of mass production was introduced into the office from the factory and even seeped into home, which led to a design mind that the concept was greater than the actual effect.

The third scientific and technological revolution started the information age. In this period, the popularity of commercial design made the role of design be widely recognized, and the nature of design was concerned, which promoted the transformation of various fields of society and affected human life and the mode of thinking. Designers designed products directly, but they influenced people and society indirectly [1]. The influence of technology on design was generally recognized. Technology was not the restriction factor of design, but the driving force to realize design. Although designers still could not understand the full of technology, they had mastered the

general methods of technology. The function of design that showed the symbolization effect of technology had been recognized, and the sense of technology of design had become the effective sensory feeling and behavior experience to show the development of society. The negative impact of technology was gradually recognized, and the diversity of design value was widely recognized. Besides, the information of design achievements was more abundant.

III. THE DEVELOPMENT OF TECHNOLOGY AND THE CHANGE OF DESIGN TREND

Design involves the economy of country and the life of people, and it not only changes the material world but also change the spirit. The corresponding design trend forms in different periods. Design mind is the direct representation of designers and design theorists, affecting the trend of design practice, and reflects the mainstream consciousness of each era to a certain extent. The relevant elements of design will be the incentive to stimulate ideological change. As a result, the impact of technology on the design trend changes with the development of the times.

Technology brings about the qualitative change in the material foundation of design. New technologies and new products are involved in people's lives, changing their way of life, renewing people's space-time concepts, life, radius of activities, and interpersonal relationships. As a result, people's aesthetic concept has undergone an earthshaking change [9]. The progress of technology has produced aesthetic effect while producing practical function and the variety of aesthetic taste has formed various design styles with the aid of scientific and technological means [3]. So obviously, the influence of science and technology on the design trend cannot be avoided.

After the first scientific and technological revolution, the great power of technology was not correctly recognized, and the rough machine and its inferior products failed to inspire modern design. After the second scientific and technological revolution, the great social change made the design trend wander between classical experience and technical rationality. Machine, as the material carrier of technology, shows the ability of human beings to transform the world. And people's worship of machine power, speed and efficiency prevails, forming the design concept represented by machine aesthetics. Machine aesthetics, as an aesthetic tendency, is popular with various modern art and design schools before and after the first World War [10]. Machine aesthetics originated from futurism in Italy. Although the level of industrial and technological development in Italy was relatively backward in Europe at that time, new products such as airplanes and automobiles strongly inspired the passion of artists and painters for technological products. Futurism concerns neither the product itself nor technological sense, but speed and power. Purism, born in France, takes machine aesthetics as an important theme, focusing on machines, science and the passion to transform the world [10]. Aware of the industrialization is an inevitable trend, Deutscher Werkbund advocated standardized mass production, and Peter Burrows worked to create "product forms directly from machines" [11]. Various factions push the standardization of geometry to the extreme. The founder of machine aesthetics, Le Corbusier, put forward the aesthetic theory in the era of machine production,

and the so-called factory aesthetics also derived from the standardized workshop to the office and even the family. Since then, modernist design has continued the aesthetic characteristics of machine aesthetics to some extent, and it regards era as the background and regards the technological revolution as the supporting. Functionalism is regarded as the criterion. Function, structure and materials are important factors in design. Function, structure, material are important factors in design. New ideas, new technologies, new forms sweep across Europe, and the welfare of technology has a broad impact on the various areas of design.

The World War II brought disasters to the world, interrupted normal production and life, but objectively promoted the rapid development of technology. The economy in wartime reflects the will of the state and design is dispensable at that time. The civil use of technology after the war gives the society a powerful needle, forming a new peak of material culture, and the design trend associated with technology is surging. German Ulm School of Modeling built modern design on the technology and science, and vigorously promoted new rationalism, which has been affected so far. Northern Europe, the United States, Italy and other countries have evolved functionalism into organic functionalism, which reflects the trend of science and technology softening and regards people rather than things as the core of design. With the application of new materials and new technology in architecture and product design, high-tech style emerges as the times require, bringing the sense of technology to the extreme. Some buildings use new materials to highlight texture, use exaggeration to expose the structure, and highlight the beauty of precision. Some products use basic shape, and the color is neutral color of gray color. Besides, using metal, plastic and other materials symbolizes new technology, showing the appearance of high-tech characterization. High-tech style is technical style at first, emphasizing the characteristics of industrial technology, and followed by high-grade [12].

Through the specific design style and design trend, the sense of technology is gradually recognized. The sense of technology is the visual abstraction of technology, and its characteristics correspond to the keywords in the popular impression. The best way to enhance the technology is to transplant the sensory features that are real high-tech into other designs. Aesthetics and technology are different concepts. Technology is very beautiful in our mind, but we can't judge what it looks like. When the sense of technology became the byword of yearning for technology, the public began to feel the symbol experience of the sense of technology in design. Today, the combination of technology and design in daily life is seamless. Technology gives design more choices, and the creativity of design is deeply influenced by ideas and beliefs.

IV. THE SPECIFIC PRESENTATION OF TECHNOLOGY VALUE IN DESIGN

Design is the concentrated presentation of human's substantial power, which designs according to value orientation and ability level. The initial aim of design is at overcoming the limits of human, promoting the limits of human, satisfying spiritual needs. With the improvement of ability, it is for positive significance to human beings and society to expand design field. Design not only is the expression of individual creativity, but

also deeply influenced by society, economy, culture and technology. Therefore, the connotation of design value is extremely rich.

The value of the design is combined with virtual and reality, and the material carrier is the basis of all value realization. Technology aims to discover, explore and transform the world, and meet the material needs of human development. In particular, the scientific and technological revolution has strengthened the role of material factors in design and endowed design with specific value. Through the creation activities of design, people feel the form of good power and the rich content of reality brought by the development of science and technology [13].

A. *Design Relies on Technology to Expand Human Vision*

Design intensively displays the power of technology through human creation, and artificial environment. Design originated from the simulation of natural phenomena and the creation based on it, humanizing the visible material resources which were available. Originally, human beings relied on their senses and experience to recognize surrounding things, found suitable objects and turned them into artificial objects by experience. Without the guidance of systematic knowledge, they can only conduct trial and error constantly. Technology relied on its system of knowledge and skill, accelerated making artificial nature, expanded space for creation, and made human touch invisible material resources of nature which were new materials, new energy, new structure and new principle presented as material reality by design. The results of design and creation have developed from meeting the demands of explicit physical activities to meeting the demands of internal mental activities, and from isolated things to material systems.

Design demonstrates the power of technology in the nonphysical world through sensory experience. Design connects emerging technological advances with demands, transforming unperceived supernatural forces into sensory sensations. Sensory perception becomes a direct way to receive design achievements. Shape, color and quality are the most original effective information. The information of sensory perception is extremely rich. The power of technology can't be showed directly by simple features such as speed, temperature, weight, soft and hard. In addition, the mapping of sensory experience in the human brain also has the use value. Virtual reality arises at the right moment, and the combination of design and technology constructs things which are more real than the real. Abstract and profound technology is represented by virtual reality as distinct perception and experience to enhance the existence of technology.

B. *Design Changes Human Behavior through Technology*

Design expands human's behavior through technology, increasing human needs. Technology breaks the constraint of nature. Human's living space extends from the partial surface to the sea, air, underground and even space. The activity time changed from fragmented to continuous, and the influence of day and night and season weakened. The defects of human's body are made up by tools, speed, power and other functions beyond imagination. Human beings are gradually reconstructing space and expanding their capabilities. They get rid of the influence of nature and adapt to artificial nature, aiming at

omnipotence. Under the guidance of science, using technology to create the material world which meets the needs of substance, design provides the material basis suitable for human's function and mind. Technology inspires new demands, and design is constantly working toward the goal.

Design changes the way of life through regularity-oriented science and technology, and improves human life through behavior reconstruction. Design creates purpose-oriented material culture to coordinate the relationship between people, nature and society. In the pre-industrial era, design based on life experience to explore the improvement and innovation of things; In the industrial society, technology had replaced experience as a reliable basis for improving the material world. The development of technology has upended the world of human's experience. The laws that were once regarded as truth have been denied. The concepts of substance and time have been constantly revised. The interaction between people and things is changing people's behavior while improving the material world. Inevitably, technology influences behavior reconstruction and objectifies the standards for measuring behavior. Design materializes technology as perceivable, knowable and thinkable material entity to guide behavior in order to satisfy the demands of behavior experience and thus to realize the unity of regularity and purpose.

C. Design Influences Human Ideas through Technology

Technology changes the way of thinking, and design reflects scientific and technological consciousness. Design is no longer just a creation act combined skills with techniques, but with a richer connotation. For the modern mind, the method of design can only be understood and the possibility can only be clearly analyzed in the sense of science or engineers [14]. Technology provides the ideological basis, practical knowledge and implementation tools that complement designers' innovative behaviors and avoid the instability of processes and results. Through rigorous ways and methods, design reveals the rationality of technology, making technology become a reference system for interpreting corresponding phenomena and ideas. The rich knowledge system of technology enables the design to get rid of the restriction of experience and avoid the artificial limitation of innovation. The design needs advanced tools, and technology provides material basis and technical guarantee. Technology guides the new idea of creation, expanding design thought from people and things to things and things.

Technology enriches the aesthetic connotation and strengthens the characteristics of design beauty. Design is the creation act of human beings. Design beauty is different from natural beauty, but influenced by its material basis. Design beauty, belonging to social beauty, consists of technical beauty and artistic beauty. Artistic beauty reflects people's form of concept, and objectifies subjective feelings such as feeling, experience and thought. The technological beauty materializes the creation of human beings, and reflects the combination of law and purpose through objective material reality. Technical

beauty includes functional beauty and formal beauty. Functional beauty shows the unity of material beauty and goodness through use, which has a certain degree of purpose. Formal beauty is the material existence of sensitive intuition and the aesthetic value contained in the external expression mode. Technological beauty and functional beauty are both closely related to technology.

V. CONCLUSIONS

Design and technology are both hot issues at the moment, and they are closely related and complicated. The supreme purpose of design is to meet people's needs, and technology is to explore and transform the world. Technology and design interact in the long process of creation, and science and technology connect to design respectively at different times. Technology endows the effect of design with the technology value of design, highlighting the essential characteristic of design as material creation. The technological value of design constantly enriches its connotation along with the development of society.

ACKNOWLEDGMENTS

This research was financially supported by the Postgraduate Research & Practice Innovation Program of Jiangsu Province (KYZZ16_0072).

REFERENCES

- [1] Li Chaode, "Design Aesthetics," Anhui Fine Arts Publishing House. Hefei., pp. 15, 2009.
- [2] Adrian Forty, "Objects of Desire: Design and Society since 1750," Yilin Press. Nanjing, pp. 77, 2014.
- [3] Zhuge Kai, "Ten Lectures on Artistic Design," Shandong Fine Arts Publishing House. Jinan, pp. 56, 2009.
- [4] Li Ping, "From "Center" to "Middle": The Development of the Contemporary Designing Aestheticism," *Hundred Schools In Art*, vol. 4, pp. 135-138, August 2005.
- [5] Chu Xiaoqing, "Designing: Between Science and Humanity," *Hundred Schools In Art*, vol. 3, pp. 116-119, June 2004.
- [6] Hang Jian, "Design: the Basic Problem of Chinese Design," Chongqing University Press. Chongqing, pp. 177, 2009.
- [7] Herbert Marcuse, "One Dimensional Man," Shanghai Century Publishing Group. Shanghai, pp. 3, 2008.
- [8] Xu Hengchun, "Design Aesthetics," Tsinghua University Press. Beijing, pp.100, 2006.
- [9] Ouyang An, "Effect of Technological Factors on Design Taste," *Packaging Engineering*, vol. 25, pp. 131-132, March 2004.
- [10] Chen Anying, "Futurism and Purism: Origin of the European Machine Aesthetic," *Zhuangshi*, vol. 4, pp. 26-30, April 2010.
- [11] Xu hengchun, "The Aesthetic Vision of Modern Product Design: From the Aesthetics of Machine to the Aesthetics of Technology and Design," *Zhuangshi*, vol. 4, pp. 21-25, April 2010.
- [12] Wang Shouzhi, "World History of Modern Design," New Century Press. Shenzhen, pp. 316, 2001.
- [13] Li Chaode, "The Cultural Standpoint of Design: a Study of the Right of Discourse in Chinese Design," Jiangsu Art Publishing House. Nanjing, pp. 67, 2015.
- [14] Reyner Banham, "Theory and Design in the First Machine Age," Jiangsu Art Publishing House. Nanjing, pp. 51, 2009.