**PROCEEDINGS ARTICLE**

# The Mapping and Conversion Relationship of the Elements in the "Product-Technology-Art" System

Jun Yan[1,*]

[1] *Birmingham Institute of Fashion & Creative Art, Wuhan Textile University, Wuhan, China*

## ABSTRACT

Through the analysis of various types of products, this article decomposes product functions, process technology and aesthetic factors, and explores the mutual mapping and conversion relationship among product, technology and art. The following conclusions are drawn: the progress of technology enriches the expression of art; art promotes the creative thinking of technology; products provide development space for technology and art; art and technology make products more complete from the perspective of aesthetics and applicability.

## 1. INTRODUCTION

Technology and art have been closely linked and interacting with each other since they were born and exist in the product. In order to harmonize and unify the three elements of product, art and technology in product design, and achieve perfect functions, mature technology, product modeling and other artistic factors that conform to public aesthetics, it's needed to analyze and study the mapping and conversion relationship of the elements among the three systems of product, technology and art.

## 2. OVERVIEW

At the beginning of creation, in order to survive and capture prey, ancestors made tools for different purposes according to their needs, and the original tools only had the function of use. At this time, it was the initial stage of the survival of mankind, human activities didn't clearly distinguish whether they were material or spiritual, and people collectively referred to activities that included skills, thinking, or making utensils as "skills" or "arts" [1]. Later, with people's pursuit of quality of life and the enrichment of the spiritual world, tools are no longer limited to use and decorative details are added to make the product ornamental. Technological changes have brought about the upgrading of products and the products of an era can reflect the technological progress and artistic aesthetics of this era. Taking time as the axis, the first industrial revolution was the demarcation point between manual work in small units and production by large machines. Before the industrial revolution was the era of handicrafts, and products and utensils could only be made by hand. Cloth was hand-woven, porcelain was printed by hand, iron was made by manpower, and every product was different and couldn't be exactly the same. After the first industrial revolution, the development of technology made machines the main driving force of industrial production, and the aesthetics of the two periods were very different. Britain could be taken as an example. Its early stage was the era of manual work, during which the aesthetics were complex and gorgeous, and the prominent styles included Baroque and Rococo. In the later stage, because the technology was still at an immature stage, the style tended to be geometric with simple lines and distinct color blocks. It can be seen that technology and art are inseparable.

*Corresponding author. Email: yanjun@wtu.edu.cn

# 3. INFLUENCE OF TECHNICAL ELEMENTS ON PRODUCT DESIGN

Technology (□□) is a method and method principle for solving problems, referring to the method by which people use existing things to form new things or change the functions and performance of existing things. "□" refers to skills and "□" refers to methods. Different skills and different methods create technologies for making tools for various purposes. The technical design of the product is the most important element technology to realize the product functionality and manufacturing feasibility [2]. Technology originated in the primitive society of living in caves and hunting. At that time, in order to capture prey, people sharpened stones and tied them to long sticks to make guns to carry out hunting activities in sequence; they also polished bones, left small holes and threaded as bone needles, and sewed clothing to cover body (Fig. 1). In the Paleolithic Age, there were already designs for stone tool making, but at this time, people's understanding of beauty had not yet formed, and stone tools were simple and rough in shape. While in the Neolithic Age, primitive people's understanding of modeling technology and modeling styles gradually developed and progressed, and from the moment the ancient ancestors sprouted their aesthetic consciousness, they already knew how to decorate themselves with jewelry [3]. With the development of civilization and the diversification of people's needs, the ancients used their wisdom to invent and create utensils that conformed to the technical characteristics of the time. Since then, people's concepts have gradually improved, utensils can meet people's needs and the supply market appears, providing after-sales service, and the concept of product begins to form. When a user chooses a product, the product function is the key factor to guide the user to purchase. Therefore, the product contains technology which is an important factor to meet users' material functional needs.

The Wassily chair, the world's first steel tube chair, can serve as an example (Fig. 2). The Wassily chair was designed in 1925 by the design master Marcel Lajos Breuer in memory of his teacher Wassily Kandinsky. Originally, the strap of the Wassily chair was made of high-quality horsehair material, which was later replaced by a firm twill fabric used by the military for waistbands for mass production [4].

From the point of view of ergonomics, it is found that the Wassily chair is designed more suitable for the human body and users are more comfortable when using it, all of which is brought about by the change and development of technology. The Wassily chair changes the material and form of traditional chairs. Gone are the days of using mortise and tenon joints and reinforcing with wooden pegs to make chairs. The Wassily chair appeared in the 1920s, a period just after the first industrial revolution. The first industrial revolution led to changes in the model of production: from manual work to large-scale machine and mass production, the high-efficiency production method then made the cost of the product lower, the price of the product also decreased accordingly, and the novel product form promoted the development of sales and outputs. Domino-style industry development caused by technological change is also driving changes in other industries, such as the history of automobiles.



**Figure 1.** Primitive society utility tools: bone tools, stone tools, ceramic tools. Source: Baidu Baike.



**Figure 2.** The Wassily chair. Source: Baidu Baike.

323

*Athena Transactions in Social Sciences and Humanities, Volume 1*
*Proceedings of the 8th International Conference on Arts, Design and Contemporary Education (ICADCE 2022)*

In modern times, an automobile is an essential means of transport. Before the advent of the automobile, people travelled long distances on wooden carts powered by horses, cattle and other livestock, and the slow movement of such vehicles often took months to reach their destination. An automobile is a self-propelled vehicle with simple power, the machine replaces animal power and the speed is greatly improved. The development history of automobiles has a process from part to system. In 1712, the British created a self-propelled steam engine that didn't require human and animal power, which made the machine run by itself through the operation of machinery. The advent of the steam engine brought the machine industry to a new peak and laid the foundation for the invention of the steam turbine and internal combustion engine needed to manufacture automobiles. In 1769, the world's first steam-driven tricycle came out, which was the predecessor of the automobile. Then the appearance of the internal combustion engine brought the internal combustion engine automobile. Compared with the steam-driven automobile, the internal combustion engine automobile was faster with more power (Fig. 3). Afterwards, the advent of the gasoline internal combustion engine made automobiles truly popular among the masses. Every improvement in technology makes the function of the product better meet the needs of users and the advancement of automobile technology brings more convenience to people's transportation. After more than 100 years of continuous improvement and innovation, automobiles have condensed the wisdom and ingenuity of human beings and have become today's transportation vehicles with various types and specifications, being widely used in various fields of social and economic life [5].

The development of technology has gone through six periods: the Stone Age, the Bronze Age, the Iron Age, the Steam Engine Age, the Electricity Age, and the Information Age. An age has the iconic materials of the period. The advent of new materials marks the advancement of technology during this period. The development of technology makes the old materials refined and processed into new materials, and the materials are transformed into products by technology, so the products also have the characteristics of this period. The three industrial revolutions have brought earth-shaking changes to people's lives. Daily necessities, construction methods, travelling and transportation are very different from before. There also have been three major changes in technology: from 14,000 years ago to the 18th century, human beings changed from nomadic life to settled life; from the 18th century to the middle of the 19th century, the emergence of steam engines brought about the industrial revolution; from the end of the 20th century to the present, computers and high-speed communication networks develop. These three changes have brought new technologies and products have also become more intelligent and user-friendly. Technology is also the support of product functions.

## 4. INFLUENCE OF ARTISTIC AESTHETICS ON PRODUCT DESIGN

Art is a kind of culture that reflects reality and places emotions through a carrier, shaping images and creating atmosphere; art is also a social ideology that uses images to reflect reality but is more typical than reality. With the help of the product as a carrier, art is integrated into the symbol form and color form of the product and the emotional value brought by it enriches the connotation of the product. With the innovative development and advancement of science and technology, China's economic development level is also improving, its comprehensive national strength is also gradually increasing, and people's material living standards are also improved. In this process, it has led to new changes in consumers' aesthetic needs and aesthetic standards for products. The aftertaste of the first industrial revolution changed people's perception of aesthetics and the aesthetic style was no longer complicated and gorgeous (Fig. 4). The modernist design style is thusly inspired, the basic principles of which can be summed up in 3 famous sayings in the history of design: "Less is more", "Decoration is sin", and "Form follows function".



**Figure 3.** Steam engine, steam-driven automobile and internal combustion engine automobile. Source: Baidu Baike.

**Figure 4.** Comparison of product styles before and after the industrial revolution. Source: Baidu Baike.

The famous design master Sottsass once said: "Design is the design of lifestyle. Product design is not only the artistic design of objects, but also the formal design of beauty" [6]. The Bauhaus school was established in the 1920s. In design theory, Bauhaus put forward three basic viewpoints: the new unity of art and technology; the purpose of design is people rather than products; design must follow natural and objective laws [7]. These viewpoints have played a positive role in the development of industrial design. Because the machine can't replace hands to decorate the product, the simple and elegant appearance is sought after by people, which makes people turn their attention from the decoration of the product to the function of the product. Art brings added value to the product in addition to the use efficiency, such as the product's modeling form, material, color, etc. Product form is divided into three categories: functional form, symbolic form and color form. Among them, firstly, the functional form is the material structure of the product, which is generated by a certain function. The structure of the product determines the modeling form of the product, and its functional form is subject to the structural form, such as ceramic products. Secondly, the symbolic form of the product refers to the external appearance such as the product's modeling structure, and only through its external form can it function for the applicable object of the product. Thirdly, the color form refers to the color appearance of a product, which is the expression of hue and chromaticity. The color form is not only aesthetic and decorative, but also symbolic and iconic. These forms follow the aesthetic rules, so that the artistic expression of the product is balanced and unified with the overall product, giving users a comfortable experience of using the product.

## 5. UNITY OF TECHNOLOGY AND ART IN PRODUCTS

Product design is a comprehensive discipline that spans the two major disciplines of art and technology. In fact, a complete product is a comprehensive expression of factors such as internal organization, external form, and the relationship between product, user and environment. Product development in the enterprise is no longer just a simple creative activity, but requires people to look from a higher-end, broader, and more commercial perspective [8].

Product design is a discipline combining art and technology. If there is only art but no technology in product design, then the product can only be called an artwork; if there is only technology but no art, then the product can only be called a tool. A good product is the result of the joint action of technology and art. In product design, technology and art are closely related, and if the two cannot work together, then the product cannot meet the functional and psychological needs of users at the same time. The purpose of product design is to provide people with products that meet all their needs. Only when technology and art balance each other and endow the product with technical form and artistic expression, can it be regarded as a product that meets the needs of users. For example, due to the rapid development of technologies such as computer technology and the Internet, people can transmit information, socialize, and know about the outside world through computers. For different user groups, computers are divided into desktop computers, notebook computers and handheld tablet computers. Desktop computers are suitable for people who use them in fixed places; notebook computers are suitable for people who need to work in a mobile office; handheld tablet computers are suitable for people who have no special needs and require simple office work. In these three types, products provide users with the same functional services. The features that distinguish a product from other types will bring unique user experience and emotional value to users (Fig. 5).
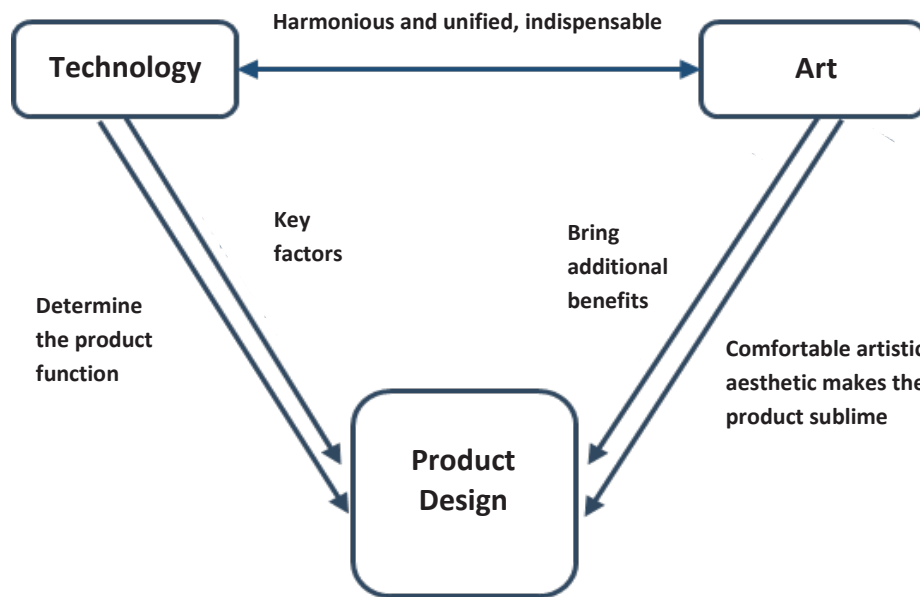
**Figure 5.** The influence of technology and art on product design. Source: drawn by the author.

Technology and art are essentially two different forms. Technology is the manifestation of the material and art is the reflection of the spirit. Just like the artworks created by artists, the expression of art needs the help of technology, but the artistic aesthetic value of the artwork itself is the spiritual level that the artist conveys to the outside world through technology. Each product has its own focus. Some products are to solve the material needs of users and some products are to provide users with emotional value, but most products are the combined effect of technology and art. The combination of technology and art enables products to provide both material and spiritual services. In order to achieve a harmonious and balanced state between the applicability and aesthetics of the product, it needs to be matched according to the focus of the product. With the different focus of products, the "proportion" of technology and art is also different. If there are many artistic components in a product, then the product needs to provide users with emotional value that exceeds the needs of material functions, such as cushions. During the production process of cushions, the designer will make various styles and images according to the theme, and most consumers will be guided to buy through the external image of the cushion. Only a small part of people will buy cushions based on the material and functional form of them. The psychological value created by such products is greater than the material value. If there are more technical components in a product, then the product needs to provide more material service than psychological value, such as hair dryers. Therefore, in product design, technology is the support, and art is the auxiliary technology to improve the formal beauty

of the product and enhance the added value of the product. The two are indispensable in the level of people's demand for products today [9]. The unified collaboration of technology and art in the product meets the functional and psychological needs of users and provides users with a good using experience.

## 6. CONCLUSION

From ancient times to the present, technology and art have been closely linked and developing together. The two interact and promote each other and the emergence of products brings new development space for them. Before the appearance of products, technology and art existed in two independent forms. Technology represented skills and the production of tools and utensils was inseparable from skills. Art was expressed as aesthetics, and people used different opinions on aesthetics to add decorations that conformed to their own aesthetics. At this point, a product has appeared, which is a product with a market that can be used to sell it. Products combine technology and art to bring "objects" into perfect condition. Products can reflect user needs and needs determine the technical form and artistic form of products. Technology and art are matched in all aspects and finally reach a harmonious and balanced level to meet users' functional and psychological needs of the product. From this, the following conclusions can be drawn: first, the product is the carrier to show the technical form and artistic form; second, technology and art interact and provide new ideas for the innovation of product function, modeling form, emotional expression, and symbolic decoration;

third, products contain technology and art, and the two interact, in which the progress of technology enriches the expression of art; fourth, art promotes the creative thinking of technology; fifth, products provide development space for technology and art; sixth, art and technology make the product more complete from the perspective of aesthetics and applicability, so that the product, technology and art are harmoniously unified and perfectly balanced.

## REFERENCES

[1] Le Ouyang, Lilan Peng. On the Relationship Between Science and Technology and Art Design in Product Design [J]. Art Science and Technology, 2019, 32(04): 181. (in Chinese)

[2] Jianzhong Yu. Product Design Methods of Integrated Art, Technology and Humanized Factors [J]. Packaging Engineering, 2016, 37(12): 188–191. (in Chinese)

[3] Xiaowen Liu. Research on the Design and Development Mode of Modern Jewelry [D]. Beijing: Beijing Institute of Fashion Technology, 2014: 51. (in Chinese)

[4] [UK] Bias, [France] Debon. Centennial Industrial Design Collection: Classical Innovative Design Works in the 20th Century, translated by Binghong Zhan et al. China Textile & Apparel Press, 1st Edition, 2001. (in Chinese)

[5] Automobile Encyclopedia Compilation Committee. Automobile Encyclopedia. Beijing: Encyclopedia of China Publishing House, 2010. (in Chinese)

[6] Yanzu Li. The Design Thought of "Zhou Li · Dong Guan · Kao Gong Ji" [J]. Aesthetics and Art Research, 2010(5): 78–81. (in Chinese)

[7] Xia Ye. Research on German Industrial Design in the 20th Century [D]. Wuhan University of Technology, 2006. (in Chinese)

[8] Yiwen Li. Product Development and Design [M]. Jiangsu Fine Arts Publishing House, 2006. (in Chinese)

[9] Fengguo Qi. Technical Aesthetics and Artistic Aesthetics in Product Design [J]. Beauty & Times (Part 1), 2012(01): 119–120. (in Chinese)