

The Application of Multimedia Human-Computer Interaction Technology in Art Design and Psychology

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Abstract: - This article aims to explore the deep integration and innovative application of multimedia human-computer interaction technology in the fields of art design and psychology. Currently, with the development of technology and the diversification of user needs, how to design products or services that can trigger specific emotional reactions, meet personalized needs, and enhance user experience has become an important research question. This study aims to fill this research gap by constructing a multimedia human-computer interaction application platform to effectively integrate art design and psychology. The multimedia human-computer interaction application platform constructed in this article aims to promote the deep integration and innovation of art design and psychology through the following aspects. Design products or services that can trigger specific emotional responses from users using the theory of emotional cognition in psychology and multimedia interaction technology. With the help of big data analysis and artificial intelligence technology, the platform can collect and analyze users' psychological characteristics such as preferences and behavior patterns, and achieve personalized design and customization of products. This precise design based on user psychology can not only enhance user satisfaction but also promote the market competitiveness of the product, by continuously optimizing the human-computer interaction interface and process, reducing the cognitive burden on users and improving operational convenience. At the same time, using principles such as attention management and memory patterns in psychology, design reasonable interactive elements and information architecture to enable users to enjoy both aesthetic design and efficient, enjoyable operational experience.

Key-Words: - Multimedia, Human-computer interaction, Art design, Psychology, Application, Attention Management, Emotional Cognition.

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1 Introduction

Art and design, as the crystallization of creativity and aesthetics, have the core value of conveying specific concepts and emotions through various sensory experiences such as visual and tactile senses. Psychology, on the other hand, is a science that studies human psychological phenomena and their influencing factors, revealing the psychological mechanisms behind how people perceive, think, feel, and behave. Integrating psychology into art and design means that designers not only need to consider the unity of formal beauty and functionality in the creative process, but also need to deeply understand the psychological needs, aesthetic preferences, and emotional experiences of target users, in order to create works that not only meet practical needs but also touch people's hearts and resonate with them, [1].

As we all know, in art design, if you want to design works that conform to the laws of artistic beauty and trigger users' sensory pleasure and psychological satisfaction, you need to understand the common laws and special complex of human universal psychology, to properly integrate it with the practice of specific art design, and apply it to the designed works, [2]. Moreover, the current research and development of psychology has become more and more mature, which provides the conditions for our art design.

In general, we will feel everything outside with our subjective psychology, and at the same time, we will consciously combine with the unique aesthetic feelings of individuals, [3]. In vision, hearing, smell, touch, and taste, the proportion of visual information far exceeds that of other senses, accounting for more than 80% of the overall sensory

information, such as the size, distance, color, dynamic and static state, environmental background, [4]. Therefore, from the perspective of psychology, we can study the different feelings that the color, shape, environmental atmosphere, volume, etc. of design products will have on people. Design involves a wide range of, such as advertising psychology, indoor and outdoor design psychology, architecture, and garden psychology, human perception is the most important part of design psychology research and also the basis of research, [5].

A new product is closely related to art design and consumer psychology from development to development and marketing. In the market, new products should be displayed to consumers with their own external form artistry and internal structure performance, so as to attract consumers' attention and interest with their unique appearance artistry and use value, stimulate consumers' emotional love and purchase motivation, meet some psychological needs of consumers, and lead to the realization of consumption activities, [6]. The product withstands the test of consumer psychology and realizes consumer behavior, which directly affects product development and design, production decision-making, market sales, economic profits, and the completion of enterprise goals. Therefore, art design and consumer psychology have become issues of great concern to business operators and industrial designers.

The artistic design of new products has individuality and commonness, and so do products. In addition to considering the common requirements of product functions and structures, the design of new products should also be endowed with unique artistic individuality, [7]. Products lack artistic individuality, so it is difficult to distinguish them from similar products to show their own excellence and originality, [8]. The artistic individuality of products is generated by psychological functions such as association and imagination through the symbolic effect of products, such as the symbolic effect of products on status, prestige, youth, efficiency, and modern consciousness. The following points can be considered when designing new products with artistic personality and symbolism, [9]:

(1) With rapid physical development and significant improvement in cognitive abilities, adolescents begin to pursue independence, identification, and a sense of belonging. They are curious about new things and face the exploration and challenges of self-awareness. Product design should focus on the personalized needs of teenagers,

provide diverse choices, and incorporate positive values guidance to help them establish a healthy self-identity. At this stage, individuals gradually enter society and take on more responsibilities and roles. They pursue career success, harmonious interpersonal relationships, and the realization of personal value. Product design should reflect professionalism, fashion sense, and practicality while incorporating emotional design elements to meet the diverse needs of young people in work, life, and social aspects.

(2) In the design, it is very necessary to investigate various relevant relationships such as individual and group, family and society, different education levels, ethnic groups, regions, China and foreign countries, cold and temperature in multiple directions, so as to adapt the product to a wide range of levels, [10].

3) Multi-functional design aims to achieve multiple uses or functions through a single product, thereby improving the efficiency and convenience of product use. This design approach requires designers to have a deep understanding of users' actual usage scenarios and potential needs in the early stages of product development, cleverly integrating multiple independent functions into one, saving space and reducing costs. For example, smart home devices such as smart speakers not only have basic music playback functions but also integrate various auxiliary functions such as voice assistants, smart home control centers, alarm reminders, etc., greatly enhancing the user experience. Therefore, we must pay great attention to the era of products, the quality and low price of products, and the upgrading of products.

In general, good work needs to be consistent with the needs of customers. Designers should first discover the needs of customers, and all information comes from customers. So many customers need different forms, but the ultimate goal is the same. Therefore, on the basis of people's need for psychological design, simple modeling can highlight the characteristics of the works. The more concise the works look, the simpler they will be, and they will last forever. An excellent work not only needs good appearance design but also contains morals. Because no design style can permanently occupy the high ground of fashion, all these will gradually fade away from the bustling coat in the tide of history, and functional design is throughout the development of graphic design, [11]. Integrate the functions, realize the integration of the functions of the works, simplify the complexity, reduce the operation steps, and make the works easier to use.

Multimedia technology, as the core driving force of this transformation, essentially involves the comprehensive processing and management of text, images, photos, audio, video, and even more complex multimedia data through highly integrated computer systems, in order to achieve efficient transmission and visual display of information. Its core advantage lies in the ability to transform originally nonintuitive and scattered multi-source data information into intuitive and infectious forms through innovative encoding, decoding, and presentation technologies, directly reaching the user's sensory world, [12]. This transformation not only greatly enriches the levels and dimensions of information expression, but also significantly improves the efficiency and depth of information transmission. Human-computer interaction technology is a bridge connecting humans and the computer world. It makes computers no longer just cold data processing machines, but intelligent partners who can understand human intentions and respond to human needs, [13]. Through constantly evolving input and output devices such as touch screens, virtual reality devices, voice assistants, etc., human-computer interaction technology has achieved a natural multimodal interaction mode from simple keyboard typing and mouse clicking to complex gesture recognition, eye tracking, voice interaction, and more. This transformation not only lowers the threshold for technology usage but also greatly enhances users' immersion and satisfaction during the usage process, [14].

With the application and popularization of computer technology, the products on the market are becoming more and more intelligent and complex, and the functions are continuously accumulated and integrated. Therefore, consumers have made many unnecessary cognitive mistakes, [15]. When people feel that simple interfaces cannot meet their consumption needs, multimedia human-computer interaction technology appears as an independent design stage. In the early stage, multimedia human-computer interface mainly expanded the communication bandwidth from computer to the user through rich information expression, [16]. Gesture input technology further enriches the ways of human-computer interaction, enabling users to communicate intuitively and quickly with computers through gesture actions. This technology is not only applicable to touchscreen devices, but also gradually expanding to broader fields such as virtual reality and augmented reality. Through gesture input, users can express their intentions more freely and achieve more complex operational tasks. In the field of product design, the application

of gesture input technology makes product interfaces more concise and intuitive, while also providing users with more diverse interactive experiences, [17].

In order to achieve this goal, human-computer interaction technology has undergone profound changes in input and output forms, from simple to complex, and from single to diverse, [18]. Early interactive devices such as panel switches, display lights, and perforated paper bags, although limited in functionality, laid the foundation for later technological developments, [19]. With the advancement of technology, we have witnessed a leap in the development of interaction methods, from the intuitiveness of manual operations, to the precision of command language, and to the intuitiveness and ease of use of graphical user interfaces, [20]. Each transformation has greatly enriched the dimensions and depth of human-computer interaction. It is worth mentioning that multimedia human-computer interaction technology has developed into five main interaction modes today. They are: manual operation mode, command language mode, graphical user interface mode, network virtual human-computer interaction mode, and multimedia (multi-channel) intelligent human-computer interaction mode, [21]. These patterns not only represent different stages of the development of human-computer interaction technology but also reflect the profound impact of technological progress on user experience, [22].

Corresponding to the computer recording technology in Bopomofo input method, multimedia human-computer interaction technology also plays an important role in the fields of art design and psychology. In art and design, multimedia human-computer interaction technology enables designers to use virtual reality, augmented reality and other technological means to create more vivid and intuitive design works. These technologies not only enrich the forms of design expression, but also improve design efficiency and quality, [23]. Computer multimedia technology can visually display key information such as the overall structure, movement route, and timing of tactical coordination, helping students better understand and master tactical knowledge. Through animation simulations and video demonstrations, students can clearly observe the details and key points of tactical execution, thereby improving their understanding and application of tactics. In psychological research, multimedia technology can simulate various experimental scenarios, collect and analyze behavioral data and reaction time of subjects, and provide strong support for the in-depth study of

psychological phenomena, [24]. However, Xu's research mainly focuses on the specific application effects and potential value of MMI technology. This study not only provides more scientific and humane guiding principles for product design but also offers a new perspective for understanding the complex relationship between user psychology and product design. On the basis of inheriting and developing previous research, this study further explores the potential application of MMI technology in product art design. We not only focus on how MMI technology can enhance the market appeal and brand awareness of products but also deeply analyze how it shapes consumers' emotional experiences and explore more innovative design strategies and methods.

Compared with traditional teaching methods, the use of dynamic visualization technology in basketball tactical action teaching has significant advantages. It can not only enhance learners' interest and participation in learning, but also significantly shorten the time for tactical action acquisition, improve learners' tactical understanding and practical application abilities. Meanwhile, dynamic visualization technology can also provide teachers with richer teaching resources and tools, helping them better design and implement teaching plans, and improve teaching quality and efficiency. In addition, the application of multimedia human-computer interaction technology in art design and psychology also provides us with useful insights. In art and design, this technology can create virtual environments, provide immersive design experiences, and help designers better capture and express their creativity, [25]. The application of multimedia human-computer interaction technology in art design and psychology also provides useful insights for the design of 3D learning spaces. In art and design, this technology can create immersive virtual environments that help designers better capture and express their creativity. In psychological research, multimedia technology can simulate various experimental scenarios and gain a deeper understanding of human learning, acceptance, and creation processes. These applications not only demonstrate the broad application prospects of multimedia human-computer interaction technology, but also provide scientific basis and theoretical guidance for the design of 3D learning spaces, [26].

2 Analysis of Multimedia Human-Computer Interaction Technology

2.1 Function Principle of Multimedia Human-Computer Interaction Technology

The three-dimensional data model is constructed by multimedia technology to realize multimedia human-computer interaction. The subjective decision information is taken as important evidence in the process of building the three-dimensional data model. This article constructs a three-dimensional data model using multimedia technology and extracts subjective decision information from different sources using Dempster combination rules to improve information quality and decision-making efficiency. The Dempster combination rule quantifies the reliability of different information sources using confidence level $m(A)$ and calculates the comprehensive decision result, thereby improving information quality and decision-making efficiency. The Dempster combination rule is used to extract subjective decision information from different sources to improve the quality of information extraction.

Suppose that all possible answers to a decision problem Q are mutually exclusive and exhaustible propositions $\theta_l (l=1,2,\dots,L)$, but there is only one proposition θ^* is the correct solution of the decision problem Q , and is called the sample space composed of all propositions $\Theta=\{\theta_l \mid l=1,2,\dots,L\}$ is the recognition frame of Q .

Setting 2^Θ indicates the gather by Θ , $m(A)$ represents the confidence of any nonempty subset A in the set, then the mapping function $m: 2^\Theta \rightarrow [0,1]$ satisfies, as shown in Equation (1):

$$\begin{cases} m(\varphi) = 0 \\ \sum_{A \in \Theta} m(A) = 1 \end{cases} \quad (1)$$

Set the decision expert E_n to identify the frame of Q for the decision problem Θ , which can be inferred that the decision function m_n, A_n^* represents the focal element corresponding to E_n , then the Dempster combination rule integrating $m_1, m_2, \dots, m_n$ can be expressed as Equation (2):

$$\begin{cases} m(\varphi) = 0 \\ m(A) = \frac{1}{1-K} \end{cases} \quad (2)$$

Wherein the Equation (3) of K is as follows:

$$K = \sum_{A_n^* = \varphi} [\prod_{n=1}^N m_n(A_n^*)] \quad (3)$$

$m(A)$ reflects the joint support of $m_1, m_2, \dots, m_n$ for proposition A , and sets the conflict factor as K ,

which describes the degree of conflict between evidences. $1/(1-K)$ represents the normalization factor.

In the process of using threshold to describe the evidence conflict, because the threshold is a dynamic parameter variable, it can better describe the conflict degree between the decision-making subject and the decision-making result, thus realizing the description of the relationship between the decision-making cost and the decision-making result.

For identification framework $\Theta=\{A_1, A_2, A_3\}$, the corresponding decision function of the decision experts E_1 and E_2 can be expressed as Equation (4):

$$\begin{cases} m_1(A_1) = x, m_1(A_2) = 1 - x, m_1(A_3) = 0 \\ m_2(A_1) = 0, m_2(A_2) = 1 - y, m_2(A_3) = y \end{cases} \quad (4)$$

The extraction process of virtual multimedia subjective decision information based on the multi gravity center knowledge network can be divided into four steps: asking questions, proposing schemes, evaluating schemes and selecting schemes. It is assumed that the decision-making expert E_n is from the recognition framework for the decision-making scheme Q , and Θ is inferred that the set of possible propositions is A_n^* ($u_n=1, 2, \dots, U_n$). The estimated value of possible occurrence of A_n^* reference and identification framework is v_n^* , then the knowledge matrix constructed by decision expert E_n for decision scheme Q can be expressed as Equation (5):

$$V_n = \begin{bmatrix} 1 & 0 & \dots & 0 & v_1^* \\ 0 & 1 & \dots & 0 & v_2^* \\ \dots & \dots & \dots & \dots & \dots \\ 0 & 0 & \dots & 1 & v_n^* \\ \frac{1}{v_1^*} & \frac{1}{v_2^*} & \dots & \frac{1}{v_n^*} & 1 \end{bmatrix} \quad (5)$$

In the process of information inference, the decision-making expert makes a comparison between the arbitrary inference information A_r^* and Θ , while the relationship between the inference information A_r^* and A_r^{**} can be described as Equation (6):

$$\begin{cases} \frac{m_n A_r^*}{m_n(\Theta)} = \prod_r v_r^* \\ \frac{m_n A_r^*}{m_n(A_r^{**})} = \prod_r v_r^* / \prod_r v_r^{**} \end{cases} \quad (6)$$

2.2 Human-computer Interaction based on Multimedia Technology

Under the multimedia platform, the information can be forwarded through the sharing and copying functions of the network, and so on, so as to realize information interaction and improve the utilization

efficiency of multimedia information. Set the proportion of information shared by the i -th media $\sigma_i x_i / N_i$, $\sigma_i > 0$ represents the coefficient of the i -th media sharing, and x_i represents the information amount of the i -th media, so as to obtain the proportion of the information amount shared by the n -th media. When n -th media are obtained to realize information sharing, the amount of information in the multimedia is as shown in Equation (7):

$$\frac{dx}{dt} = rx \left(1 - \frac{x}{N}\right) + \sum_{i=1}^n \sigma_i \frac{x_i}{N_i} \quad (7)$$

In Equation (7), x and N represent the total information amount and the upper limit of network information, respectively. Due to the acceleration of information transmission speed, the upper limit of virtual multimedia information amount is increased, so the i -th media information amount upper limit N_i is increased to go $k_i N_i$. Where k represents the promotion coefficient, so as to obtain that after n interactions of multimedia information, the information amount of n network media satisfies is as shown in Equation (8):

$$\frac{dx_i}{dt} = rx_i \left(1 - \frac{x_i}{k_i N_i}\right) \quad (8)$$

The defined bidirectional interaction coefficient can be expressed as Equation (9):

$$F_i = \sigma_i k_i \quad (9)$$

In the above equation, the interaction coefficient describes the interaction degree of multimedia and network media. The greater the value is, the higher the interaction degree is.

Through the above discussion, the data model of multimedia human-computer interaction can be expressed as Equation (10):

$$\begin{cases} \frac{dx_i}{dt} = rx_i \left(1 - \frac{x_i}{k_i N_i}\right) \\ \frac{dx}{dt} = rx \left(1 - \frac{x}{N} + \sum_{i=1}^n \sigma_i \frac{x_i}{N_i}\right) \end{cases} \quad (10)$$

Where the initial value of $x(t)$ is $x(0)$, so it can be concluded that when $t \rightarrow +\infty$, the model has a limit state, so Equation (11) is as follow:

$$\begin{cases} x_i(t) = k_i N_i \\ x(t) \rightarrow N_{max} = (1 + \sum_{i=1}^n \sigma_i k_i) N \end{cases} \quad (11)$$

Through the above discussion, the functional principle and data model of multimedia human-computer interaction are established.

2.3 Application Platform based on Multimedia Human-Computer Interaction Technology in Art Design and Psychology

In the application of multimedia human-computer interaction technology, it is necessary to initialize the multimedia human-computer interaction system, and then obtain data and voice information. Secondly, the operator's actions are continuously tracked in the spatial position, and the content of the human-computer interaction technology is judged according to the data generated. In the application of multimedia human-computer interaction technology, it is necessary to first initialize the multimedia human-computer interaction system, and then obtain data and voice information. Next, the system will continuously track the operator's actions in spatial location and determine the content of human-machine interaction based on the generated data. In order to better understand this process, we provide a specific framework diagram of multimedia human-computer interaction technology, as shown in Figure 1.

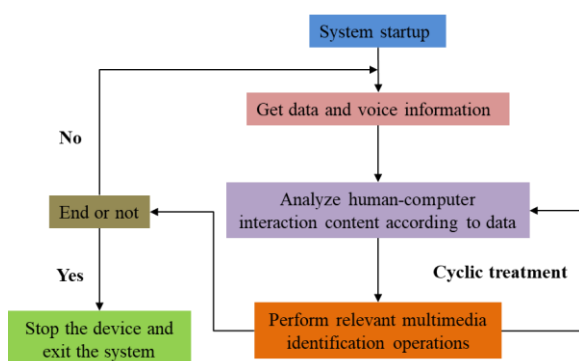


Fig. 1: Framework of multimedia human-computer interaction technology

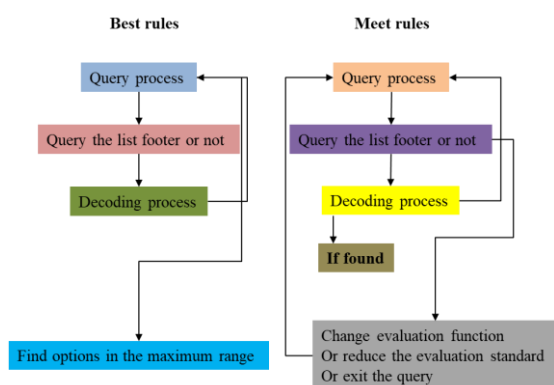


Fig. 2: Schematic diagram of application platform of multimedia human-computer interaction technology in art design and psychology

When using the application platform of art design and psychology based on multimedia human-computer interaction technology, the way users browse the menu to obtain information depends on the user's purpose and its own knowledge accumulation. Users have clear goals for product art

design. The search process using the platform is a typical two-part selection structure. In the search menu provided by us, there are only two cases of matching or mismatching in each layer. If an error occurs or the target cannot be found in the list, an error message will be returned. When using art design and psychology application platforms based on multimedia human-computer interaction technology, the way users browse menus to obtain information is deeply influenced by their purpose and their own knowledge accumulation. For users with clear goals for product art design, the search process using this platform presents a typical two-part selection structure. To visually demonstrate this structure, we have designed the search menu diagram in Figure 2.

3 Application Analysis of Multimedia Human-Computer Interaction Technology in Art Design and Psychology

3.1 Application Rate of Multimedia Human-Computer Interaction Technology in Different Product Art Design and Psychology

After many changes in style and historical precipitation, product design has realized a series of changes from germination to development and maturity. From the initial decoration style, almost all of which are pattern decoration, to the later style of the classical art review, and then to modernism and postmodernism, artists have only worked hard on the form of design, as well as on the raw materials, price, production technology, and production capacity of commodities. As well as the final profit, they think hard to achieve the maximum effect. They often do not pay attention to the use object of the product, and do not pay attention to the in-depth study of the consumption object ontology. It is difficult for the product design to advance qualitatively or even leap forward. The excellent cases of product design are in northern Europe, which has always insisted on humanized design. As long as the basic use functions are not affected, the products of northern Europe will try their best to meet people's psychological needs, pay attention to ergonomics, and consider people's living habits and national customs. Therefore, many products of northern Europe are recognized, loved and respected by people.

Figure 3 shows the application rate of multimedia human-computer interaction technology in different product art designs and psychology. It can be seen that clothing design, housing design, interior design, and curriculum design, which are closely related to people's lives, have different laws of change with time. Among them, with the increase of time, the application rate of multimedia human-computer interaction technology in clothing design remains almost unchanged, while the application rate of housing design, interior design, and curriculum design fluctuates greatly and shows a downward trend. It is worth noting that the application rate of curriculum design is the lowest, and it shows a decline first and then a stable change. The main reason may be that it is closely related to people's psychological needs. Clothing is necessary for people, so people's psychological needs for it are always present, so its application rate is relatively stable. House design and interior design are also people's just needs, but there are periodic changes. People will have different needs only when they buy houses or carry out house decoration. The curriculum design is about the children's psychological needs for learning. After the curriculum design is determined, the later needs will change little, so its application rate will be stable in the later stage. In short, in order to improve the characteristics of each art design, it is necessary to combine art with people's psychological needs, so as to improve the application rate of multimedia human-computer interaction technology and promote its development and progress.

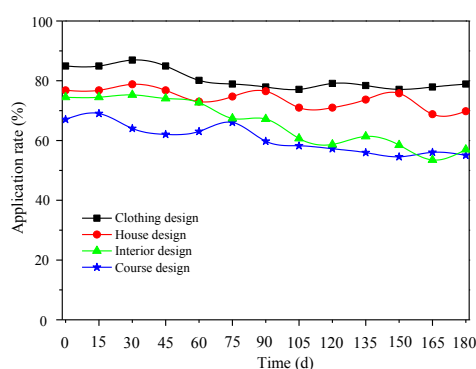


Fig. 3: Application rate of multimedia human-computer interaction technology in different product art design and psychology

3.2 Psychological Investigation of Multimedia Human-Computer Interaction Technology in Different Product Art Design

If you want to know the real needs of customers, you should really investigate the products that

people really want in their hearts. The content of the survey includes the customer's gender, age, education, social experience, work nature and interests. Because age, cultural level, social life experience, etc. will affect a person's preference for goods, and their aesthetic concepts are also different. For example, young people, prefer new technologies and products, and they often become advocates and followers of new trends. The signs in public places are basically in the form of a combination of graphics and text. This design makes it easy for customers to read and understand. In addition, in the process of investigation, some people may have irregular and uncertain ideas, so the results of the investigation are also uncertain. This requires the designer to investigate the results that the customer really wants as much as possible, and at the same time, it needs to strengthen the designer's own analysis ability.

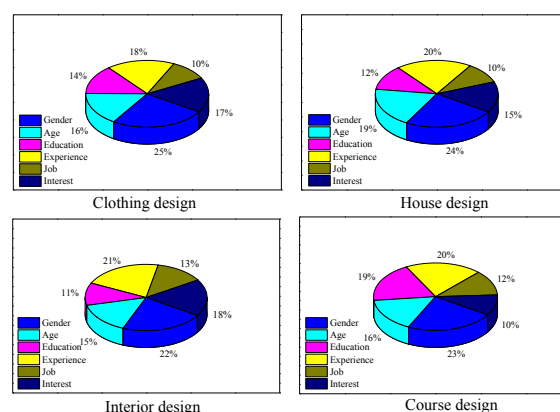


Fig. 4: The proportion of psychological investigation of multimedia human-computer interaction technology in the art design of different products

Figure 4 shows the proportion of psychological investigation of multimedia human-computer interaction technology in the art design of different products. It can be seen that the proportion of art design of different products in psychology is different. Although there are differences, in clothing design, housing design, interior design, and curriculum design, the proportion of gender and social experience is the largest. The main reason may be that the difference in psychology between men and women will affect their judgment on product design, while social experience is based on the psychological needs formed by everyone's life in society, and they have their own unique experience thinking on product design. Therefore, if the proportion of factors in all aspects of product design is not different, it is necessary to comprehensively consider people's own experiences, preferences, and

gender, and at the same time, strengthen the analysis of personal psychological needs, and strive to promote people to have the same proportion of factors in different art designs, so as to promote the common development of art design and psychology.

3.3 Designer Creativity of Multimedia Human-Computer Interaction Technology in Different Product Art Design and Psychology

Creativity is the motive force of designers, but creativity is not imagined out of thin air. It requires certain scientific theories. Designs without scientific theories are all Utopian designs and can not promote the development of design. Creativity is the core of the designer's ability. Improve the designer's ability to judge the level of psychological needs of customers and enhance the designer's creative thinking, requires the designer to have a considerable artistic perception ability and image thinking ability, and also have his own independent thinking ability to scatter around the design goal. To design products that can be effectively applied to people's lives, no matter in psychological or spiritual aspects. We should establish a scientific user model based on real and effective research content. First, the designer should really and effectively investigate people's needs before designing the product, investigate the situation of different people in the initial stage, and then establish the initial model. Secondly, in the process of establishing the user model, the results are different due to different personnel. At this time, designers need to have a clear understanding and judgment, which can improve their own analysis ability to ensure the authenticity and reliability of the information obtained from customers, so as to reduce the occurrence of errors.

Figure 5 is a classification of designer creativity in different product art designs and psychology by media human-computer interaction technology. It can be seen that the proportion of judgment ability, art perception ability, image thinking ability, and independent thinking ability in different product art designs is different, and the proportion of judgment ability in the four art designs is the highest. The main reason for this phenomenon is that different product art designs have different psychological considerations. For clothing design and housing design, judgment and artistic perception are very important, while for interior design and curriculum design, judgment and image thinking are very important. Therefore, in order to improve the creativity in the process of artistic design of

different products, we should comprehensively consider the needs of artistic design of various products, start from the actual needs of people's psychology, realistically carry out artistic design, give full play to the creativity of designers, and achieve the progressiveness of artistic design.

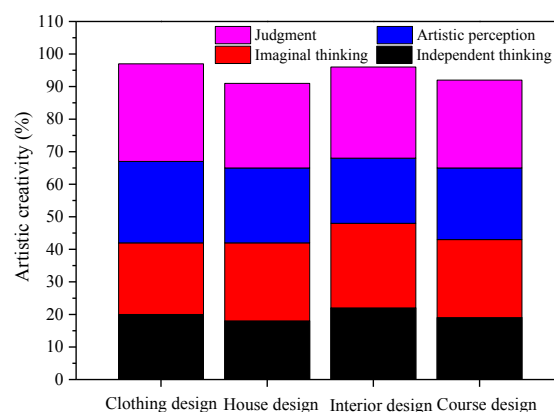


Fig. 5: Classification of designer creativity in different product art design and psychology by media human-computer interaction technology

3.4 Product Packaging and Decoration of Multimedia Human-Computer Interaction Technology in Different Product Art Design and Psychology

As far as art design is concerned, product packaging design itself is an important part of it, and this part has a close relationship with the Chinese people. This naturally makes psychology better reflected in the art design of product packaging design. Packaging is the technology and method to maintain product value and keep products in good condition. Decoration is the means of beautifying packaging. Packaging and decoration not only have the functions of storing, storing and displaying products, but also have the functions of displaying products and attracting consumers. Packaging and decoration reflect the continuation and final process of product production, which also requires designers to devote their efforts. The packaging structure design should adapt to the consumers' desire for low cost, save materials to reduce costs, facilitate sales display and identification, suit the consumers' desire for convenience, and facilitate people's use. The excellent design of packaging must highlight the product image, be full of modern characteristics, have artistic charm, be convenient and safe, and strive to increase consumers' good interest and interest in the product so that consumers can feel genuine, reliable, and impressive. Only in this way can consumers be motivated to purchase.

Figure 6 shows the realization rate of multimedia human-computer interaction technology in product packaging and decoration in different product art designs and psychology. From this, we can see that the realization rate of packaging and decoration of different product art designs is different. Among them, the packaging realization rate of clothing design is the highest, while the decoration realization rate of interior design is the highest. There is no certain law to follow for the packaging and decoration of the same product art design. However, the realization rate of packaging and decoration of different product art designs is higher than 80%. The main reason for the above phenomenon may be that different products have different packaging and decoration. For the clothing design of art, packaging is the most important, while for interior design, decoration accounts for a larger proportion. Therefore, in order to distinguish the packaging and decoration of different product art designs, we should fully understand the performance and characteristics of the products, and achieve the reasonable application of packaging and decoration. This will not waste resources, but also make the products beautiful and meet the psychological needs of consumers, thus promoting the development and progress of art design to a certain extent.

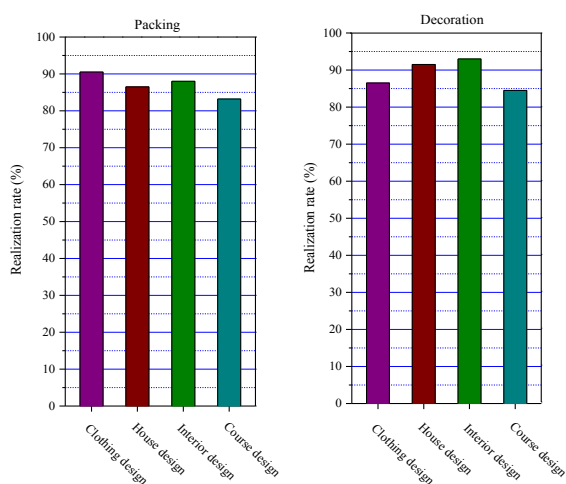


Fig. 6: The realization rate of multimedia human-computer interaction technology in product packaging and decoration in different product art design and psychology

In terms of packaging structure design, designers should fully consider consumers' demand for low cost. For example, a well-known snack brand has optimized its packaging design by using recyclable materials and reducing unnecessary packaging layers, which not only reduces production costs but also wins the favor of

environmentally friendly consumers. According to the data released by the brand, this change has reduced its packaging costs by about 20%, while sales have increased by nearly 15%. This successful case fully demonstrates that packaging structure design that meets the low-cost needs of consumers not only helps to save resources and reduce costs but also enhances the market competitiveness of products. In order to distinguish the packaging and decoration of different product art designs, designers should fully understand the performance and characteristics of the products, combine them with the psychological needs of consumers, and achieve the reasonable application of packaging and decoration. This will not waste resources but also make the product more beautiful and practical, meet the diverse needs of consumers, and promote the development and progress of art and design to a certain extent.

3.5 Satisfaction Analysis of Multimedia Human-Computer Interaction Technology in Different Product Art Design and Psychology Systems

The design of a new product needs the artistic design of appearance modeling. At the same time, it needs to understand consumer psychology and behavior, so as to observe and analyze the needs of consumers and develop and design new products according to the needs of consumers at different levels. The development of new products is of great significance to the country, enterprises, and people's lives. Some major new product developments will even affect the whole world. Therefore, it is of special significance for enterprises to develop new products. Entrepreneurs are also increasingly aware that new product development and design should be taken as the fundamental way for enterprises to survive, develop, and create the best economic benefits. In order to effectively apply the designed products to people's lives, whether it is psychological or spiritual, we must establish a scientific user system based on real and effective research content. First of all, designers should really and effectively investigate people's needs before designing products, investigate the situation of different people in the initial stage, and then establish the initial system model. Secondly, in the process of establishing the user system, the results are different due to different personnel. At this time, designers need to have a clear understanding and judgment. Improve their own analysis ability to ensure the authenticity and reliability of the

information obtained from customers, so as to reduce the occurrence of errors.

Figure 7 shows the satisfaction of multimedia human-computer interaction technology in different product art design and psychology systems. It can be seen from the above that the satisfaction in the art design of different products is different, and the fluctuation range and change trend are different. The satisfaction of clothing design is the highest, followed by course design, and the satisfaction of housing design is the lowest. For clothing design, the satisfaction of different people is almost the same, with the smallest fluctuation, followed by curriculum design, while the satisfaction of housing design fluctuates greatly, and the difference between the maximum and minimum satisfaction is large. The main reason may be that the styles of artistic design of different products are different according to people's psychological needs. For different people, this will also lead to differences in satisfaction to a certain extent. Therefore, in order to improve the satisfaction of the artistic design of different products, we should fully investigate and understand people's psychological needs, carry out product artistic design according to their needs, optimize the design process, and serve the people in all directions. Only in this way can we improve the satisfaction of product artistic design and promote the development and progress of artistic design.

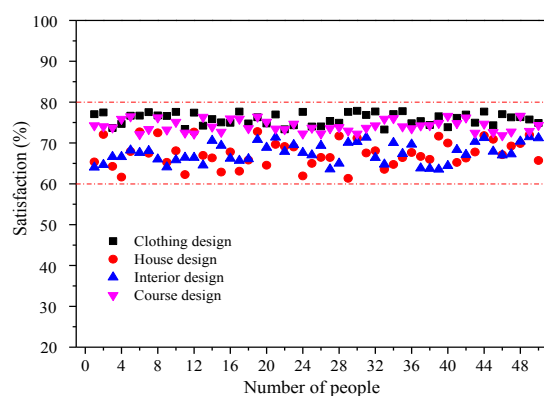


Fig. 7: Satisfaction of multimedia human-computer interaction technology in different product art design and psychology systems

Clothing design case: A specific clothing design project can be introduced, which utilizes multimedia human-computer interaction technology to collect consumers' preferences for clothing styles, colors, materials, and other aspects. Through comparative analysis, it was found that a certain design element (such as specific color combinations) can significantly improve consumer satisfaction. At the same time, it can demonstrate the application effect

of this design element in actual products, as well as consumer feedback on it. In the field of education, multimedia human-computer interaction technology is also widely used in curriculum design. The author can describe an example of a course design that presents course content through multimedia means and dynamically adjusts based on students' learning progress and feedback. By collecting satisfaction survey data from students, it was found that this interactive course design can significantly improve students' interest and participation in learning. In addition to the satisfaction trend shown in Figure 7, the author can further provide specific satisfaction survey data. For example, statistical indicators such as satisfaction scores and standard deviations of different product art designs in different populations can be listed. These data can more intuitively demonstrate the differences in satisfaction between different product art designs, as well as the relationship between these differences and people's psychological needs.

4 Conclusion

At the application level, we are committed to widely deploying the constructed platform in the art and design of various products, covering but not limited to multiple fields such as home goods, fashion clothing, electronic products, etc. By delving into the subtle connection between product art design and customer psychology, we reveal how design elements can evoke specific emotional resonance, thereby shaping consumer purchasing preferences and brand loyalty. In this process, we not only focused on the visual beauty of design, but also gained a deeper understanding of the cultural significance, social dynamics, and individual psychological differences behind design that affect its acceptance. Based on the above in-depth research, we propose a series of strategic measures aimed at promoting sustained progress and development in the field of art and design. First and foremost, we advocate for the implementation of a user-centered approach in design practice, emphasizing the need for designers to deeply understand the psychological traits and behavioral habits of the target user group to ensure that design works can accurately meet user needs. Secondly, we encourage cross-disciplinary cooperation, especially by strengthening exchanges and integration with disciplines such as psychology, sociology, anthropology, etc., and exploring new paths for design innovation through interdisciplinary collaboration. In addition, we actively embrace advanced technologies such as big data and artificial

intelligence, using these tools to track and analyze customer feedback in real-time, in order to flexibly adjust design strategies and respond to market dynamics in a timely manner.

This study also has certain limitations. Firstly, although we analyzed the art and design of multiple product categories, we did not cover all possible fields, so the universality of the research results needs further verification. Secondly, although we emphasized the cultural and social factors behind the design, we did not delve into how these factors evolve over time and geography, which may have a significant impact on the long-term effects of design. In future research, we propose to further expand the scope of the study to cover more product categories and regional cultures, in order to verify the universality and applicability of the results of this study. Secondly, it is possible to conduct in-depth research on how design elements evolve over time and geography, as well as the impact of this evolution on consumer psychology and behavior.

Declaration of Generative AI and AI-assisted Technologies in the Writing Process

The authors wrote, reviewed and edited the content as needed and they have not utilised artificial intelligence (AI) tools. The authors take full responsibility for the content of the publication.

References:

- [1] Zhu Y, Research on the Application of Multimedia Technology in French Listening Teaching, *Journal of Physics Conference Series*, Vol.1915, No.4, 2021, pp. 042004. doi: 10.1088/1742-6596/1915/4/042004.
- [2] Kang X, & Nagasawa S Y. Integrating kansei engineering and interactive genetic algorithm in jiangxi red cultural and creative product design. *Journal of Intelligent & Fuzzy Systems*, 2023, 44(1), 647-660. doi: 10.3233/JIFS-221737.
- [3] Coppola F, Faggioni L, Gabelloni M, De Vietro F, Mendola V, Cattabriga A, & Golfieri R. Human, All Too Human? An All-Around Appraisal of the "Artificial Intelligence Revolution" in Medical Imaging, *Frontiers in psychology*, Vol.12, No.1, 2021, pp. 710982. doi: 10.3389/fpsyg.2021.710982.
- [4] Ignatov I, Vanlyan K, Electromagnetic Conception of Color Vision in Additive Mixing of Colors, *Application in the Photography, Art and Psychology. Journal of Medicine, Physiology and Biophysics*, Vol.64, No.1, 2020, pp. 9-15. doi: 10.7176/JMPB/64-02.
- [5] Cheng S, Application of aesthetic psychology in the colour matching of art design, *Revista argentina de clínica psicológica*, Vol.29, No.1, 2020, pp. 622-627. doi: 10.24205/03276716.2020.287.
- [6] Cebal L M, Sanabria Z J, Ramirez M M A, & Kaminsky C I. One hundred years of neurosciences in the arts and humanities, a bibliometric review. *Philosophy, Ethics, and Humanities in Medicine*, 2023, 18(1), 17. doi: 10.1186/s13010-023-00147-3.
- [7] Ewoldsen, Honoring the scholarship, mentorship, and legacy of a Media Psychology founder, *Media Psychology*, Vol.24, No.1, 2021, pp. 6-9. doi: 10.1080/15213269.2020.1866614.
- [8] Liao S H, Widowati R, & Lee C Y. (2024). Data mining analytics investigation on TikTok users' behaviors: social media app development. *Library Hi Tech*, 42(4), 2024, 1116. doi: 1131.10.1108/LHT-08-2022-0368.
- [9] Si Y. Biotechnological Advancements in Textile Art: Applying Biological Forms and Structures to Commercial Dyeing and Weaving Processes. *Journal of Commercial Biotechnology*, 2024, 29(6), 174-182. doi: 10.5912/jcb1985.
- [10] Li J, The Application of Curve Algorithm and Computer Aided Design in Garment Design, *Lecture Notes on Data Engineering and Communications Technologies*, Vol.103, No.1, 2022, pp. 565-570. doi: 10.1007/978-981-16-7469-3_62.
- [11] Chen J, Qian Y, Research on the Application of Computer Multimedia Technology in English Education and Teaching, *Journal of Physics: Conference Series*, Vol.1915, No.3, 2021, pp. 032018 (5pp). doi: 10.1088/1742-6596/1915/3/032018.
- [12] Kaimal G, Arslanbek A, Indigenous and Traditional Visual Artistic Practices: Implications for Art Therapy Clinical Practice and Research, *Frontiers in Psychology*, Vol.11, No.1, 2020, pp. 1320. doi: 10.3389/fpsyg.2020.01320.
- [13] Uusiautti S, Hyvrinen S, Defining the new concept of sustainable success – A state-of-the-art analysis on the phenomenon, *New Ideas in Psychology*, Vol.60, No.5, 2021, pp. 100819. doi: 10.1016/j.newideapsych.2020.100819.

- [14] Leikin R, Sriraman B, Empirical research on creativity in mathematics (education): from the wastelands of psychology to the current state of the art, *ZDM*, Vol.54, No.1, 2022, pp. 1-17. doi: 10.1007/s11858-022-01340-y.
- [15] Schoch K, Ostermann T, Ottersberg, Giving the Art Greater weight in Art Psychology: RizbA, a Questionnaire for Formal Picture Analysis. Creativity, *Theories – Research - Applications*, Vol.7, No.2, 2020, pp. 373-410. doi: 10.2478/cetra-2020-0019.
- [16] Fan X, Research on the Application of Computer Ergonomics in Industrial Product Design, *Journal of Physics Conference Series*, Vol.1915, No.3, 2021, pp. 032044. doi: 10.1088/1742-6596/1915/3/032044.
- [17] Deng J, Chen X, Research on Artificial Intelligence Interaction in Computer-Aided Arts and Crafts, *Mobile Information Systems*, Vol.2021, No.1, 2021, pp. 1-14. doi: 10.1155/2021/5519257.
- [18] Hou S, Research on the Application of Data Mining Technology in the Analysis of College Students' Sports Psychology, *Hindawi Limited*, Vol.2021, No.1, pp. 1-7. doi: 10.1088/1742-6596/1578/1/012087.
- [19] Zhou X X, Research on the Application of Computer Audio Technology in Piano Education, *Journal of Physics: Conference Series*, Vol.1915, No.3, 2021, pp. 032074 (6pp). doi: 10.1088/1742-6596/1915/3/032074.
- [20] Zhou Z, Research on the Application of Computer Technology in Art Education, *Journal of Physics Conference Series*, Vol.1915, No.3, 2021, pp. 032037. doi: 10.1109/CTMCD53128.2021.00009.
- [21] Wang Z, Chen M, Lyu J, Chen S, & Chen Y. Research on Human-Computer Interaction Design of Office Chair Based on QFD Method, *IOP Conference Series: Materials Science and, Engineering*, Vol.740, No.1, 2020, pp. 012180 (7pp). doi: 10.1088/1757-899X/740/1/012180.
- [22] Mao W, Zhang B, Research on the Application of Visual Sensing Technology in Art Education, *Hindawi Limited*, Vol.2021, No.1, 2021, pp. 1-10. doi: 10.1155/2021/2406351.
- [23] Xu L, Research on the Application of Computer Recording Technology in Modern Chinese Bopomofo, *Journal of Physics: Conference Series*, Vol.1578, No.1, 2020, pp. 012087 (5pp). doi: 10.1088/1742-6596/1578/1/012087.
- [24] Yu, L., Li, D., Chen, D., & Li, W. Application and Research of Basketball Tactics Teaching Assisted by Computer Multimedia Technology, *Advances in Intelligent Systems and Computing*, Vol.1117, No.1, 2020, pp. 821-828. doi: 10.1007/978-981-15-2568-1_112.
- [25] Rekik, G., Khacharem, A., Belkhir, Y., Bali, N., & Jarraya, M. The instructional benefits of dynamic visualizations in the acquisition of basketball tactical actions, *Journal of Computer Assisted Learning*, Vol.35, No.1, 2019, pp. 74-81. doi: 10.1111/jcal.12312.
- [26] Shin D, Park S, 3D learning spaces and activities fostering users' learning, acceptance, and creativity, *Journal of Computing in Higher Education*, Vol.31, No.1, 2019, pp. 210-228. doi: 10.1007/s12528-019-09205-2.

Contribution of Individual Authors to the Creation of a Scientific Article (Ghostwriting Policy)

- Bin Xu: As the main person in charge and first author of this article, BIN XU was responsible for the overall planning of the research, the construction of the theoretical framework, and the proposal of integration strategies for multimedia human-computer interaction technology in art design and psychology. He delved into the principles of emotional cognition theory, attention management, and memory patterns in psychology, and combined them with multimedia interaction technology, providing a solid theoretical foundation for the innovation of this article. In addition, Bin Xu also participated in the proposal of design ideas and the formulation of preliminary implementation plans for multimedia human-computer interaction application platforms.
- Xiaorong Huang: As a co-author of this article, is mainly responsible for the application of big data analysis and artificial intelligence technology in platform design in the research. She utilized her professional knowledge to design data collection and analysis methods based on psychological characteristics such as user preferences and behavior patterns, providing technical support for personalized product design and customization.

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Conflict of Interest

The authors have no conflicts of interest to declare.

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