COMPOSITIONAL FEATURES OF VISUAL ELEMENTS IN THE DESIGN OF MUSEUM APPLICATION INTERFACES IN CHINA

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Abstract. **Purpose.** *The aim of the study is to identify the compositional features of the visual organisation of museum application interface elements in China. The identification of their aesthetic characteristics will provide a theoretical basis for future interface optimization.*

Methodology. *This study employs systematic analysis, artistic analysis, and compositional analysis to conduct a multidimensional analysis of interface design. Systematic analysis focuses on the structural and functional relationships between various visual elements; artistic analysis explores the role of images, fonts, and colours in visual expression; and compositional analysis focuses on the impact of layout, visual hierarchy, and dynamic effects on user perception and interface experience.*

Results. *This study systematically analyses the visual elements and compositional characteristics of the interface design of museum applications in China. The study finds that most interface designs integrate aesthetics, functionality, emotionality, and traditional Chinese cultural connotations into a compositional paradigm that conveys cultural arts and national aesthetics to users. This study focuses on four core visual elements: layout (emphasizes clear information hierarchy and spatial order); font design (highlights traditional art and readability); colour coordination (reflects traditional colours and modern vitality; icon design (prioritizes functional orientation and cultural symbol expression). Additionally, the integration of visual elements with animation effects enhances the interface's interactivity and engagement, creating a dynamic visual experience that combines visual appeal with cultural immersion. The overall design embodies modularity, adaptability, and immersion, establishing a path for the deep integration of traditional cultural aesthetics with contemporary design expression.*

Scientific novelty. *This study is the first to adopt a compositional analysis perspective, systematically integrating visual elements and aesthetic characteristics in interface design to explore their role in enhancing visual communication and cultural expression. Practice has proven that visual elements not only convey national culture and regional characteristics but also serve as important vehicles for cultural narrative and emotional resonance. Creating interface designs that combine cultural significance, aesthetic appeal, and interactivity can optimize user experience, enhance the overall brand image of museums, strengthen users' cultural identity and national pride, and drive the future development of museum interface designs.*

Practical relevance. *This study provides innovative ideas for optimizing the visual aesthetics of interface design. Designers and scholars can utilize the results of this research to develop more reasonable design strategies to adapt to changing user needs and technological developments, and to enhance the user experience and cultural communication effects of museum applications.*

<u>*Keywords:*</u> *interface design, visual communication design, museum application, compositional features, typography, colour, icon design, aesthetic features, user experience, interactive elements, China.*

INTRODUCTION

With the development of digital technology, museum applications have become an important platform for cultural dissemination, educational promotion and user interaction. Museum applications not only provide the public with the opportunity to access digital resources anytime and anywhere, but also utilize social media to meet the needs and satisfaction of different users, and build an all-around visiting experience [3], which promotes the wide dissemination of culture and public participation.

Currently, there are fewer studies on visual design for museum applications in China, especially in optimizing user experience, enhancing visual effect and cultural expression through visual elements. Many museum applications have problems such as confusing visual hierarchies, uncoordinated colour coordination, and low cultural recognition, which leads to difficulties in accessing core information when browsing, and the interface lacks cultural recognition and attractiveness, affecting user experience.

In recent years, the introduction of interface aesthetics design, reasonable layout and sequencing, effectively reduce the cognitive load generated by visual perception, cleverly designed, simple and easy-to-understand interface can effectively reduce the cognitive cost of the subject's visual perception to obtain information [19]. Therefore, the interface design of museum applications needs to find a balance between information communication and aesthetic expression, reflecting cultural attributes while meeting modern aesthetic and interaction needs. In-depth research into the compositional characteristics of interface design provides necessary guidance for improving interface aesthetics and user experience.

ANALYSIS OF RECENT RESEARCH

In recent years, with the development of cultural digitization and human-computer interaction technology, the interface design of museum applications has gradually become an important direction in the cross research of humanities and technology. Especially in the context of the continuous penetration of mobile Internet and augmented reality technology, interface visual design not only assumes the function of information communication, but also gradually becomes a key factor affecting the user's participation and interactive experience. Studies around the world have begun to focus on how to enhance the attractiveness and educational effect of museum digital platforms through visual language.

In international research, scholars have focused on visual design in human-computer interfaces, exploring the classification principles of visual information, the principles of visual communication, and methods of interface visual design. Some studies have proposed that interface design is a key component of human-computer interaction, logical operations, and interface aesthetics [13; 4]. The aesthetic perception of an interface includes its visual appeal, the harmonious use of the interface by users, the close correspondence between design and aesthetic needs, and good cognitive and emotional care [5]. Specifically, an aesthetically pleasing interface can provide users with an intuitive visual experience through the visual design of elements such as graphics, text, and colour [5], and the visual design of icons can offer users the best experience [7]. This further demonstrates that visual design enhances the usability and efficiency of interface applications. Ruf A. et al.'s research validated that the deep perceptual processes triggered by the interface's emotional and cognitive stimuli further influence interest and learning through the discovery of aesthetic experiences [10]. Meanwhile, eye-tracking experiments play a crucial role in research, as they identify the characteristics of application interface perception. Montasemi et al.'s analysis of various information influence methods demonstrated that novice users tend to prefer simple graphical interfaces [6].

In relevant studies in China, scholars have conducted multi-dimensional explorations into the impact of visual elements on user experience. The research primarily focuses on two core issues. First, how graphic language enhances the visual appeal of interfaces and

improves information transmission efficiency. Studies indicate that interface design should emphasize the metaphorical and recognizable nature of graphic language, establishing clear visual hierarchies and spatial order to enhance users' understanding of information and the usability of applications. Additionally, design must align with users' aesthetic preferences, aesthetic preferences, and aesthetic tastes to enhance the overall perceptual experience [17]. Second, how does visual aesthetics influence users' first impressions and brand recognition. In practical use, well-designed interfaces can quickly capture users' attention, and comfortable and aesthetically pleasing visual effects can enhance the overall evaluation of a museum's brand image. Whether it be the shape and style of icons, or the plugins and layout of the interface, these elements all influence users' visual perceptions [20].

In summary, in recent years, the global research on the visual design of museum application interface focuses on visual cognition, colour layout, graphic language, user experience, aesthetic perception and information conveyance, etc. How to systematically integrate these studies and harmonise the main elements in practice remains to be a further breakthrough.

PURPOSE

The aim of the study is to analyse the compositional features of visual elements in the design of museum app interfaces in China, which will improve the user experience and enhance cultural communication.

In order to achieve the set goals, the following tasks were formulated: 1) identify the basic visual elements in interface design; 2) analyse their aesthetic characteristics; 3) summarize methods for integrating visual elements and aesthetic characteristics into interface design.

RESULTS AND DISCUSSION

Museum application is to build a new carrier for the museum collection information, but also as a human-computer interaction contact point, can create a good user experience platform. Designers provide easy-to-read and easy-to-use interfaces to make the user experience convenient, attract more users to pay attention to the museum culture, and make the users resonate with the museum culture emotionally during the experience, which fully embodies the value concept of people-oriented interface design [11].

Interface design is ultimately used to convey and display information. Designers use visual elements such as layout, font design,

colour matching, and icon design to form a set of interface design logic that is suitable for museum applications in China. At the same time, animation effects are used to give visual elements a sense of dynamism, interactivity, and immersion, enabling interface design to create a brand-new visual image that meets users' aesthetic needs and cultural experiences, thereby enhancing the corresponding brand value and improving user satisfaction and ease of operation [18].

After systematically collecting and analysing samples of application interfaces for museums in China, we used compositional analysis to summarize and categorize the visual elements in the interfaces. Compositional analysis is a research method that focuses on the spatial distribution, aesthetic characteristics, and narrative logic of visual elements in interfaces. Its core lies in revealing the spatial distribution patterns, aesthetic mechanisms, and design strategies of visual elements. The study found that the main categories of visual elements are as follows: information layout, font design, colour matching, and icon design.

Information layout. In interface design, information layout is the key to improving the efficiency of information communication and user aesthetic experience. Due to the large amount of information carried by the museum application, the visual hierarchy is reasonably planned in the limited interface, for example, the position, proportion and alignment of the elements, to enhance the organization and readability of the content [9]. Designers often use various layout methods to meet users' aesthetic needs, so that users can focus on the task itself and reduce their cognitive load [14; 16].

Among the many applications of interface design in museums, carousel layout, list layout, and card layout are three common and effective types of layouts. They each have their own characteristics in terms of information display, guiding browsing paths, and enhancing user experience.

Carousel Layout is a horizontal sliding content display method that combines pictures and titles to present key information. It supports autoplay and manual sliding, and efficiently displays multiple groups of content in a limited space. The Forbidden City Museum application displays multiple groups of cultural relics in the interface through horizontal rotation, and combines the white space layout to enhance the user's desire to explore and sense of cultural participation (Fig. 1.1).

List layout has a clear structure and logic, and is often used in exhibition catalogues and

other information-intensive pages. It arranges similar contents vertically according to the hierarchy, which is convenient for users to browse quickly and find information accurately, and emphasizes functionality and readability. The National Museum of China application uses this layout to display exhibition information, which is clear and concise, shortening the user's browsing time and improving ease of use (Fig. 1.2).

Card layout is to present each piece of information in the form of an independent "card", making the content more visually hierarchical and independent. The Henan Museum application uses a combination of text and images in its exhibition hall reservation activity. Each card is arranged in equal proportions, enhancing the intuitiveness and harmony of the interface (Fig. 1.3).
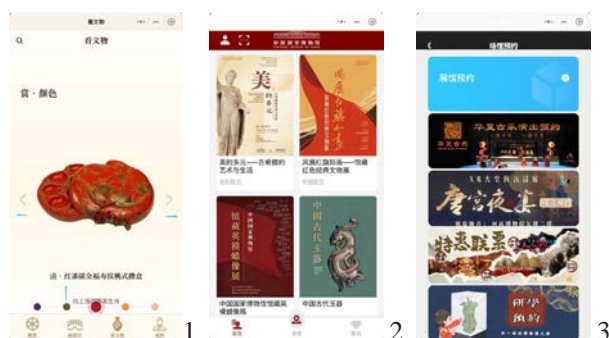

Fig. 1. Information layout analysis: 1 – Carousel layout, The Palace Museum; 2 – List layout, National Museum of China; 3 – Card layout, Henan Museum

Therefore, different types of layout designs produce distinct visual effects and information guidance formats. Carousel layouts can highlight key content, but information presented in a sliding format is easily overlooked. List layouts are clear and easy to read, but their visual appeal is relatively monotonous. Card-based layouts combine text and images for convenient interaction, but when information is dense, the interface appears cluttered. Designers tailor their approaches to different types of museums and user needs, employing modular hierarchical structures and white space layouts to strike a balance between aesthetic appeal and information capacity, thereby enhancing users' cultural awareness and understanding of the information presented.

Font Design. Fonts in interface design typically exhibit dual characteristics of functionality and artistry. From a functional perspective, the glyphs, font sizes, and typographic structures of fonts directly impact the readability and legibility of information [8], guiding users' reading behaviours and adapting to typographic designs across different devices. On an artistic

level, many museums use traditional Chinese fonts, customized fonts, or dynamic font effects, relying on digital technology to give font design a multi-sensory interactive experience, expanding the temporal and spatial dimensions of font design [2]. Font design has become not only an important visual element of cultural identity, but also a medium connecting users and interface narratives.

First of all, the core of font design lies in ensuring the accurate transmission of information. In actual design, easily recognizable fonts should be prioritized. Based on the hierarchical structure of the content and the spatial layout of the interface, the font size, weight, and line spacing should be reasonably adjusted to achieve a clear presentation of information hierarchy and orderly guidance of the reading process. The Nanjing Museum application enhances text hierarchy by optimizing font size, character spacing, and line spacing, thereby improving the clarity of information structure and visual comfort of the interface (Fig. 2.1).

Secondly, font design plays a crucial role in meeting users' cultural needs and reinforcing the cultural narrative of the interface. Through an analysis of multiple museum applications, it was found that designers typically use calligraphy or seal script-style fonts with cultural connotations in the title area to create a visually immersive atmosphere with a sense of historical depth, thereby reinforcing the museum's cultural heritage and narrative context. In contrast, the main text sections tend to use modern sans-serif fonts to ensure a good reading experience across various digital devices. The five characters "Shanghai Museum" in the Shanghai Museum application use a calligraphic font, showcasing the museum's innovative expression of ethnic characteristics and identity, and providing a representative practical model for cultural narrative and visual protection of local culture in museum apps (Fig. 2.2).

Finally, a simple and unified font layout is a key factor in improving user efficiency and interface aesthetics. Analysis of multiple museum apps reveals that clear and intuitive font arrangements help optimize visual pathways, guiding users to quickly identify key content and core functions within the interface. By controlling font types, avoiding the use of low-recognition traditional Chinese characters, adjusting the compositional relationship between fonts and other visual elements, and reasonably utilizing white space layout and a unified font style, the overall readability and browsing smoothness of the interface are effectively enhanced. The orderly font layout in the Hunan

Provincial Museum application makes the interface simple and clear, with core information prominently displayed (Fig. 2.3).
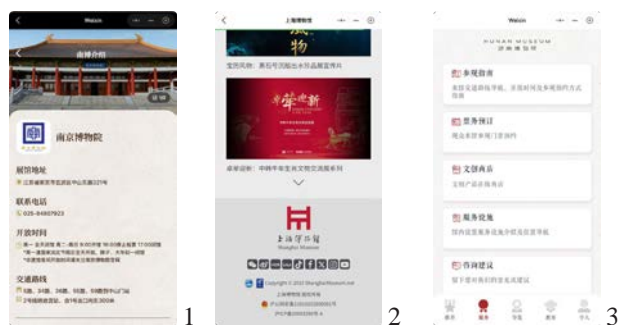

Fig. 2. Font design analysis: 1 – Easy Identification, Nanjing Museum; 2 – Cultural Characteristics, Shanghai Museum; 3 – Clear and Concise, Hunan Museum

Therefore, the aesthetic characteristics of fonts are reflected in the harmonious unity of cultural identity, functionality, and visual presentation. Designers create interface visuals that are simple, clear, and rich in cultural narrative. At the same time, they ensure that fonts have good adaptability in multi-terminal environments, taking into account layout flexibility, adaptive scaling, and multilingual support, thereby achieving efficient information transmission and consistent visual experience, making fonts the key link between content, culture, and user experience.

Colour collocation. Colour in interface design is the user's first impression of the application, and colour directly affects the user's emotion and perception, especially the background colour affects the user's visual experience and search performance [15]. Reasonable colour matching can improve users' understanding and experience of the interface. First, it is consistent with the style of the main content. Colour in the interface design not only beautifies the vision, but also carries the emotion and culture, and the choice of colour is closely integrated with the theme of the museum and the historical background. Gansu Museum application the choice of loess, russet and dark green to create a quiet and heavy visual atmosphere, echoing the Silk Road culture and the natural landscape of the Northwest, arousing the user's respect for history and empathy, and enhancing the sense of cultural immersion (Fig. 3.1).

Secondly, it is compatible with the connotation of the museum. Colour carries rich cultural connotations, and each colour is endowed with unique symbolism in different cultural contexts. Designers skilfully use these connotations in the interface to evoke the user's intuitive perception of culture and resonance. The Hubei Museum application adopts the red colour from the Chu culture lacquerware as the background colour, showing the regional cultural flavour and historical depth, creating a unique cultural atmosphere (Fig. 3.2).

Finally, it is compatible with the modernized personality tone. Incorporating modern visual colours into the design not only caters to the trend of the times, but also meets the needs of users. The Suzhou Museum application uses orange as the background colour, and the vibrant colour quickly attracts attention, stimulates the desire to explore, enhances interactivity and participation, and creates a functional and modern interface (Fig. 3.3).

Therefore, ccolour coordination in interface design exhibits characteristics that blend the continuity of traditional artistic colours, the communication of emotional expression, and modern vitality. By analysing the themes, regional cultural characteristics, and contemporary aesthetic trends of different museums, we can delve deeply into the cultural connotations and contemporary spirit of colours to shape a unique brand cultural identity for museums, enhance the visual appeal and personalized display of interfaces, and deepen users' cultural memories and emotional resonance.
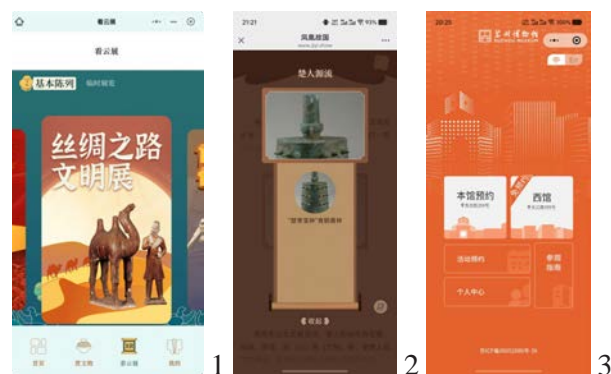

Fig. 3. Colour collocation analysis: 1 – Natural Colours, Gansu Provincial Museum; 2 – Cultural Atmosphere, Hubei Provincial Museum; 3 – Modern Vitality, Suzhou Museum

Icon Design. In the interface, icons serve as highly recognizable visual symbols that convey information quickly, helping users better understand application functions and serve as the cornerstone for completing operational workflows, thereby providing users with the most direct visual experience [12]. Additionally, many museum-related applications integrate icon design with animation. When users click or swipe, the icons display subtle animation effects such as scaling, rotating, or bouncing, enhancing

their guidance and interactivity and improving the user experience.

The symbolization and abstraction of icon design are its core characteristics. Symbolization represents functions through simple and intuitive graphics, while abstraction simplifies complex content into lines or graphics, positively impacting the interface's comprehensibility, readability, and universality [1]. The icon design applied by the Sanxingdui Museum application draws inspiration from elements of bronze masks, using modern visual techniques to distil the characteristics of the artifacts and simplify details, thereby showcasing the unique artistic style of Sanxingdui culture. Additionally, the icons incorporate micro-interactive animations such as click-to-zoom and colour highlighting, enhancing user feedback and engagement, and endowing cultural symbols with vibrant expressiveness (Fig. 4.1).

Icon design often combines historical heritage, traditional art styles or local characteristics with icon forms to enhance visual aesthetics and help users better perceive the cultural atmosphere of the museum. The icon design of Dunhuang Museum application combines Dunhuang mural art and Buddhist culture, drawing on the patterns, architecture and Buddha's hand elements in Mogao Cave murals. Through simplification and graphical processing, it shows the unique charm of Dunhuang art (Fig. 4.2).

Finally, the icons are made delicate and interesting through modern design language, and simplified geometric shapes and lines are used to enhance the sense of fashion and vitality. For example, the icon applied by China Silk Museum application combines the simple transformation of iconic elements with a simple and generous style, which attracts young groups and has cultural depth, making the icon more refined and easily recognizable (Fig. 4.3).

Therefore, the aesthetic characteristics of icon design combine symbolism and abstraction, blending culture and art, and employing modern design language. By refining and translating cultural symbols, the interface is imbued with distinct ethnic characteristics and artistic beauty. Meanwhile, animation effects have increasingly become an integral part of icon design, enhancing the dynamic expression and operational feedback of icons. The combination of static and dynamic icon design enhances the visual guidance and interactivity of the interface, making it more engaging and immersive.

CONCLUSIONS

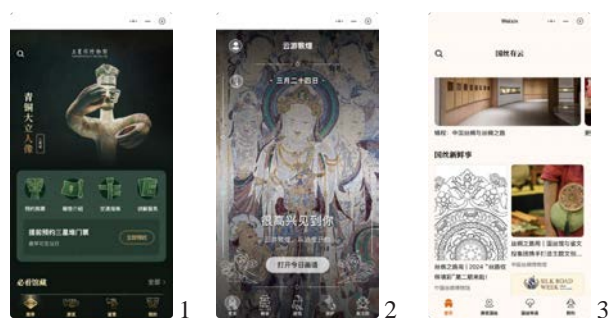This study identifies four fundamental visual elements within the interface: information

Fig. 4. Icon design analysis: 1 – Symbolization and Abstraction, Sanxingdui Museum; 2 – Culture and Arts, Dunhuang Museum; 3 – Simple and Modern, China Silk Museum

layout, font design, colour collocation, and icon design. Information layout establishes the structure and visual hierarchy of content. Font design emphasizes innovation in traditional fonts and readability of information. Colour combinations draw inspiration from traditional colour palettes, regional cultures, and contemporary aesthetics to create a cultural atmosphere with emotional warmth. Icon design employs symbolic and abstract design language, combined with animation effects, to achieve an immersive interactive experience. The study found that these visual elements constitute a interface design that combines functionality and aesthetics, giving museum applications emotional warmth and cultural depth, and shaping a digital interactive space rich in cultural narrative, thereby effectively enhancing users' cultural identity and national sentiment.

Overall, the interface of the museum application finds a balance between information communication and aesthetic expression, and strives to create a user experience that is easy to read, easy to use, and easy to perceive.

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АНОТАЦІЯ

Юань Боя, Скляренко Н. В. Композиційні особливості візуальних елементів у дизайні інтерфейсів музейних додатків у Китаї.

Мета. *Метою дослідження є виявлення композиційних особливостей візуальної організації елементів інтерфейсу музейних додатків у Китаї. Визначення їх естетичних характеристик забезпечить теоретичне підґрунтя для майбутньої оптимізації інтерфейсу.*

Методологія. *У дослідженні використовуються методи системного аналізу, художнього аналізу та аналізу композиції для багатовимірного аналізу дизайну інтерфейсу. Метод системного аналізу зосереджується на структурі та функціональних взаємозв'язках між окремими візуальними елементами. За допомогою методу художнього аналізу досліджується роль зображень, шрифтів та кольорів для візуалізації інформації. Метод аналізу композиції використовується для аналізу впливу верстки, візуальної структури та динамічних ефектів на сприйняття користувачами та досвід роботи з інтерфейсом.*

Результати. *У дослідженні проведено системний аналіз візуальних елементів та композиційних особливостей дизайну інтерфейсу китайських музеїв. Дослідження показало, що більшість дизайнів інтерфейсу поєднують в собі естетичність, функціональність, емоційність та композиційні парадигми традиційної китайської культури, демонструючи користувачам мистецтво та національну естетику. Дослідження зосереджується на чотирьох основних візуальних елементах: верстка (підкреслює чітку ієрархію інформації та просторовий порядок); дизайн шрифтів (підкреслює традиційне мистецтво та читабельність); поєднання кольорів (відображає традиційні кольори та сучасну енергію); дизайн іконок (акцентує увагу на функціональності та вираженні культурних символів). Водночас поєднання візуальних елементів та анімаційних ефектів підвищує цікавість та інтерактивність інтерфейсу, створюючи динамічний візуальний стиль, що приваблює зорово та забезпечує культурний досвід. Загальний дизайн демонструє модульність, адаптивність та ефект занурення, створюючи шлях глибокого поєднання традиційної культурної естетики та сучасного дизайну.*

Наукова новизна. *Це дослідження вперше з точки зору аналізу композиції систематично об'єднує візуальні елементи та естетичні особливості дизайну інтерфейсу, досліджуючи їх роль у посиленні візуальної комунікації та культурного самовираження. Практика доводить, що візуальні елементи не тільки передають національну культуру та регіональні особливості, але й є важливим носієм культурного наративу та емоційного резонансу. Створення інтерфейсу, що поєднує в собі культурну спрямованість, естетичність та інтерактивність, сприяє оптимізації користувацького досвіду, покращенню загального іміджу музею, посиленню культурної ідентичності та національної гордості користувачів, а також сприяє розвитку дизайну інтерфейсів музеїв у майбутньому.*

Практична значущість. *Це дослідження пропонує інноваційні ідеї для оптимізації візуальної естетики дизайну інтерфейсу. Дизайнери та науковці можуть використовувати результати цього дослідження для розробки більш раціональних стратегій дизайну, щоб адаптуватися до мінливих потреб користувачів та технологічних розробок, а також для покращення користувацького досвіду та ефектів культурної комунікації музейних додатків.*

<u>*Ключові слова:*</u> *дизайн інтерфейсу, дизайн візуальних комунікацій, музейний додаток, композиційні особливості, типографіка, колір, дизайн іконок, естетичні особливості, користувацький досвід, інтерактивні елементи, Китай.*

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