

## Article

# Research on Personalized Customized Design of Museum Cultural and Creative Products from the Perspective of Visual Communication Design

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**Abstract:** Amid the convergence of upgraded cultural consumption and digital technology, the museum cultural and creative industry is entering a pivotal phase of transformation, shifting from the production of homogeneous products toward the provision of personalized experiences. With the rapid advancement of artificial intelligence, the transition from traditional mass production to personalized customization has become an inevitable trend. This study emphasizes the central role and value of visual communication design in facilitating this transformation. It defines the conceptual framework of personalized customized design, explores its multifaceted significance for users, museums, and the design discipline, and systematically constructs an implementation approach grounded in visual communication design methodology. Finally, it envisions future development directions, aiming to offer both theoretical insights and practical paradigms to support the high-quality and sustainable development of museum cultural and creative products.

**Keywords:** visual communication design; museum cultural and creative products; personalized customization; user experience; cultural dissemination

## 1. Introduction

The integration of culture and technology is not only a key driver of high-quality economic development but also a strong foundation for building a culturally robust nation. As this integration deepens, the process of cultural digitalization continues to accelerate, serving as a catalyst for stimulating new consumption vitality and driving emerging development momentum. Meanwhile, the rapid advancement of artificial intelligence is reshaping social production and consumption patterns, moving them toward greater personalization and intelligence [1].

Against this backdrop, the museum cultural and creative industry is at a critical juncture, transitioning from traditional standardized production to personalized customization that addresses users' deeper experiential needs [2]. The concept of "New Museology," which emphasizes audience-centered practices, is gaining traction and aligns closely with the trend of personalized and emotionally driven consumption [3,4].

However, current research and practice predominantly focus on technical implementation and business models, leaving a gap in systematic studies on how visual communication design can empower cultural and creative customization and transform user experiences [5]. In practice, the mainstream model for museum cultural and creative products remains "batch replication with single-symbol attachment," which simply extracts surface symbols from cultural relics and applies them to standardized mass-produced products without a comprehensive visual system strategy [6]. This approach exposes three major shortcomings at the level of visual communication: it diminishes the effective transmis-

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sion of cultural information, weakens user experience, and reduces emotional identification. Collectively, these issues reveal deep-seated deficiencies in cultural and creative design regarding systematic planning, synergy, and user-centered orientation [7-9].

## **2. Concept Definition: The Integration of Visual Communication and Personalized Customization**

In the context of museum cultural and creative products, the deep integration of visual communication design and personalized customization has created a new paradigm of cultural innovation. Understanding this paradigm requires clarifying the essence of both concepts and their interaction mechanisms.

### *2.1. Redefining Museum Cultural and Creative Products: From Material Objects to Experiential Media*

Traditionally, museum cultural and creative products have been understood as replicas or souvenirs, whose primary value lies in reproducing and symbolically representing the form of cultural relics. Their main function is to satisfy audiences' desire for proof of visitation or collection [10]. While such products can facilitate cultural dissemination, they remain essentially static objects with limited emotional connection and shallow cultural narrative.

In the era of the experience economy and artificial intelligence, the role of these products is shifting from static objects to dynamic carriers of cultural experience and emotional connection [11]. The ultimate value of cultural and creative products now lies not merely in their physical form but in the cultural experiences, emotional resonance, and meaning they can generate [12].

The new generation of cultural and creative products transcends superficial imitation, delving into the historical context, artistic concepts, and spiritual essence of cultural relics. Products become interactive, explorable, and participatory interfaces—for example, AR interactive cards based on ancient paintings or design tools that allow users to combine historical patterns to create unique designs [13]. Through engagement, users can interpret the knowledge, skills, and philosophies embedded in cultural symbols.

Focusing design on transforming cultural understanding and social perceptions into tangible products allows museums to bridge history with the present and connect with users' personal emotions [14-17]. A product that generates a star map based on a user's birthdate or a seal combining a surname with ancient printing techniques transforms broad historical culture into personalized narratives and emotional attachments. Its value lies in the unique significance and memory it evokes, establishing a deep and lasting connection with users [18].

Thus, contemporary museum cultural and creative products transform academic resources and cultural symbols into perceptible, interactive, and meaningful experiences. Evaluation criteria have shifted from superficial appearance or aesthetics to whether a product can effectively tell a story, evoke resonance, and create meaning, ultimately fulfilling the mission of cultural dissemination [19].

### *2.2. Multi-level Interpretation of Personalized Cultural and Creative Products*

Personalized customization refers to providing users with products that reflect their unique preferences or needs, either by understanding user demands or by allowing direct participation in the design and production process [20]. It not only expresses users' aesthetic tastes and life values but also enables them to enjoy exclusive services and personalized experiences. In the context of museum cultural and creative products, personalized customization is not a singular concept but a spectrum, progressing from simple symbol replacement to deep collaborative creation [21]. Each level involves different technical implementations, degrees of user engagement, and values in visual communication design.

A refined understanding of this spectrum is essential for constructing an effective design strategy.

Many users seek to express their individuality through customized products, which serve as extensions of their personality and garner recognition from others. This process provides a sense of achievement and encourages users to convey emotional needs and personal charm through design [22].

#### Selective Customization of personalized cultural and creative products

Selective customization is the primary form of personalized customization, based on a "modular selection" approach. Designers create a database of separable visual elements, such as patterns, colors, text, and materials [23]. Within this framework, users assemble these modules to create the final product—for example, selecting pattern positions on a canvas bag, engraving names on stationery, or combining calligraphy fonts and poetry content for custom copybooks. At this level, visual communication design ensures the aesthetic quality, cultural accuracy, and composability of each module. Users act mainly as selectors rather than creators, and their personalized experience derives from the freedom to choose and the uniqueness of the final product, while the originality and dominance of design remain with the designer [24].

#### 2.2.1. Generative Customization of Personalized Cultural and Creative Products

Generative customization represents a major advancement, shifting from "selection" to "generation," driven by data and algorithms. Systems dynamically produce unique visual designs based on user data—such as preferences, browsing history, or real-time inputs—creating outputs that extend beyond preset modules. For example, a personalized star map can integrate historical astronomical charts with modern aesthetics, or a unique pattern can be synthesized using user-preferred colors and cultural motifs [25].

At this stage, the designer's role transforms from content creator to "definer of design rules" and "trainer of algorithmic systems." Designers deconstruct cultural symbols, encode their composition rules into algorithmic logic, and establish boundaries to ensure aesthetic quality and cultural consistency [26]. Compared with selective customization, generative customization allows more complex and flexible visual presentations. By leveraging digital media, algorithms, interactivity, and artificial intelligence, designers create dynamic, experiential, and dialogic brand identities. The focus shifts from creating a static logo to delivering integrated visual and interactive experiences that enhance user engagement and cultural resonance [27].

#### 2.2.2. Participatory Customization of Personalized Cultural and Creative Products

In personalized customization, it is first important to determine whether users have a clear understanding of their needs. Often, users only have a general idea of the product they want and lack clarity on more detailed requirements. In such cases, designers must interpret and explore the deeper needs and motivations of users.

Participatory customization, as an advanced form of personalized cultural and creative design, emphasizes the creative process itself rather than solely focusing on the final product. The system provides users with a creative "tool" or "framework" offering sufficient freedom. Within this framework, users can actively explore, experiment, and become co-creators of the design. Examples include AR applications that allow users to assemble and recolor virtual fragments of cultural relics to create their own digital restoration plans, or touch-based interactive interfaces where users control brushstroke force and rhythm to simulate the painting process of ancient artisans, producing dynamic videos and static patterns [28].

At this level, the core challenge of visual communication design is to create an intuitive, engaging, and educational interactive system. Designers must carefully balance users' creative freedom with cultural accuracy, guiding creation without compromising the

cultural essence. Through thoughtful interaction design, the customization process becomes a meaningful journey of cultural cognition and experiential learning.

The personalized customization of museum cultural and creative products progresses from "result-oriented customization" to "process-oriented customization," and from "user selection" to "user generation." It is fundamentally a process in which visual communication design, via intelligent systems, transforms cultural symbols into dynamic visual languages that users can engage with, ultimately producing personalized and meaningful material carriers.

### 3. Design Studies Empowerment from a Multi-dimensional Perspective

In the era of artificial intelligence, design studies provide multi-dimensional empowerment for the personalized customization of museum cultural and creative products. From the user's perspective, design transforms consumers from passive viewers into active co-creators by building participatory creative experiences [29]. This not only enhances the emotional and experiential value of products but also strengthens users' connection with culture. For museums, design drives the cultural communication paradigm from one-way output to two-way dialogue, enabling precise and diverse cultural dissemination. User data further informs operational decisions, supporting the transformation of museum brands toward younger, more intelligent identities. For the design discipline, this practice expands research boundaries from static visual representation to dynamic system design and encourages reflection on issues such as algorithmic aesthetics and cultural ethics, reinforcing designers' core competitiveness and highlighting the integrated value of design in cultural inheritance and technological innovation [30].

#### 3.1. Upgrade the User's Experience from "Audience" to "Co-Creator"

The core value of personalized customization lies in the profound emotional engagement it creates [31]. When users become active co-creators rather than passive viewers, their relationship with cultural relics changes qualitatively. By participating in design decisions, users imbue products with personal memories, emotions, and aesthetics, resulting in exclusive items that carry unique narratives and personal imprints. These products transcend industrial replicas to become emotional carriers, strengthening the psychological connection between users and cultural heritage and transforming the experience from mere "viewing" to "owning" and ultimately "belonging" [31].

The customization process itself offers high experiential value. Designed as an engaging and exploratory cultural context, it allows users to learn through creation and perceive through interaction. Product design emphasizes aesthetic expression, integrating visual, auditory, and interactive elements to provide pleasure and enjoyment. The role of co-creator enhances both inspiration and educational value while supporting entertainment and relaxation, enabling users to enjoy the process and relieve stress. Through interactive digital platforms, users can further express emotions, share experiences, and engage socially, deepening emotional resonance and establishing lasting connections.

For example, as users combine patterns or generate designs, they naturally learn about the composition rules of cultural relics, the historical significance of colors, and the styles of calligraphy [32]. This hands-on, participatory experience is far more meaningful and memorable than passive knowledge acquisition. It satisfies users' higher-level needs for cultural engagement and self-actualization, transforming simple consumption into a rich cultural experience and cognitive journey [33].

#### 3.2. The Paradigm Shift from "Communication" to "Dialogue" in Museums

For museums, personalized customization is profoundly transforming the paradigm of cultural dissemination, driving a shift from one-way, authoritative communication to two-way, interactive dialogue [34]. This transformation enhances the effectiveness of cul-

tural communication. Traditional museum products often follow a "one-size-fits-all" production model, whereas personalized customization incorporates users into the creative process, making each product a unique carrier of personal emotions and cultural identity. Products that embody users' creativity and emotional investment are not only more valued and appreciated but also encourage social sharing, creating a new communication chain of "museum - user - social network" and enabling precise and viral dissemination of cultural content [35].

Personalized customization also supports the rejuvenation of museum brands. By providing innovative interactive creation experiences, museums attract audiences who seek self-expression and participation, projecting an image of innovation, openness, and inclusivity. This brand renewal extends beyond individual products, reshaping public perception of museums from traditional repositories of cultural relics into platforms for cultural innovation, participation, and creation, thereby enhancing their social influence and contemporary relevance [36].

Beyond branding, personalized customization generates a continuous stream of valuable user data. Every action-pattern selection, color matching, or content customization provides insights into users' aesthetic preferences, cultural interests, and cognitive patterns. These insights inform exhibition planning, highlight themes that engage audiences, guide research on cultural relics, and identify connections between heritage and contemporary life. They also support educational content development, the creation of market-oriented cultural product series, and the establishment of a sustainable cycle of "user feedback - data analysis - content optimization." This approach transforms museum operations toward a data-driven, user-centered model, enhancing operational efficiency while maintaining cultural authority [37]. Ultimately, it enables museums to respond flexibly to social needs while balancing cultural preservation with innovative development.

### *3.3. Boundary Expansion and Value Reshaping of the Discipline of Visual Communication Design*

The trend of personalized customization in museum cultural and creative products is driving a fundamental evolution in the research paradigm of visual communication design. This transformation can be understood across three main dimensions.

#### *3.3.1. Structural Transformation of Research Paradigms*

The focus of research is shifting from static and deterministic visual representations to the design of rules and mechanisms for dynamic and generative visual systems. Designers must not only master traditional aesthetic principles and modeling skills but also possess systematic thinking and computational design capabilities [38]. Cultural elements are deconstructed into composable visual meta-languages, with algorithm-recognizable semantic associations and combination rules established to construct a design system capable of generating infinite visual possibilities. Such systems encompass not only databases of visual elements but also usage norms for cultural symbols, logical frameworks for aesthetic judgment, and interactive processes for user experience.

#### *3.3.2. Deepening and Expansion of Ethical Speculation*

This paradigm shift brings profound ethical considerations. Key issues include defining and assessing the aesthetic value of algorithmically generated designs, redistributing design sovereignty among designers, users, and AI, and clarifying responsibilities for creative ownership and decision-making. Designers must also ensure the accurate and respectful use of cultural symbols, preventing distortions that may result from algorithmic deconstruction and recombination [39].

### 3.3.3. Reconstruction and Upgrading of Core Competitiveness

The core competencies of designers are fundamentally reconstructed under this new paradigm. Their value extends beyond traditional graphic skills to encompass cultural understanding, aesthetic judgment, systems thinking, and emotional empathy. Designers assume three primary roles: translating cultural rules into machine-readable logic, building generative systems that balance cultural accuracy with creative flexibility, and calibrating generated outputs to ensure aesthetic quality and cultural fidelity.

### 3.3.4. Redefinition of Disciplinary Boundaries and Social Roles

These transformations redefine the boundaries and social roles of visual communication design. The discipline increasingly intersects with computer science, data analysis, and human-computer interaction, forming a more open and diverse knowledge system [40]. Designers' social roles evolve from service providers to mediators and facilitators, bridging people and technology, culture and consumption. They are tasked not only with creating beauty but also with building systems that can generate beauty and transforming culture into interactive, generative digital experiences. This elevation enhances the social influence and academic depth of the discipline, positioning visual communication design as a vital link between traditional culture, contemporary life, human creativity, and artificial intelligence [41].

## 4. The Construction of a Practical Approach Driven by Visual Communication Design

In the implementation of personalized customization for museum cultural and creative products, visual communication design plays a central role. This chapter systematically constructs a three-stage practical approach led by visual communication design, covering the entire process from the digital preprocessing of cultural resources to the output and quality control of the final product.

### 4.1. Digital Deconstruction of Cultural Symbols and Database Construction

The personalized customization system begins with the systematic digital deconstruction of the cultural IP of museum collections. Designers meticulously analyze the visual elements of cultural relics, breaking them down into fundamental pattern units, color systems, material features, shaping rules, and underlying storylines to form a structured "cultural gene pool." This process is not merely a material collection but an interdisciplinary study combining design and cultural scholarship, aiming to extract core elements that balance historical authenticity with modern design vitality.

Following deconstruction, each visual element is digitally coded with comprehensive metadata, including cultural significance, historical period, category, applicable contexts, and combinatory rules [42]. This process transforms perceptual and experiential cultural knowledge into structured data that algorithms can interpret, providing essential semantic support for deep learning and intelligent generation, thereby enabling high-quality personalized customization.

### 4.2. Generation Logic and Interaction Design of Personalized Design System

At the mid-stage, the focus is on generating logical design rules for algorithmic execution. Designers translate cultural knowledge into machine-recognizable rules, establishing visual combination guidelines that ensure cultural accuracy and aesthetic integrity. These rules govern pattern compatibility, color matching, and spatial composition, granting algorithms creative flexibility while preventing misuse of cultural symbols or aesthetic confusion. This layer embodies the designer's cultural insight and determines the depth and quality of the generated outputs.

At the interactive level, user interface design bridges the gap between user cognition and the complexity of the underlying algorithms. The goal is to create an intuitive interface that aligns with human-computer interaction principles while reflecting cultural

characteristics. Strategies include gamified preference selection, progressive question-and-answer processes based on cultural narratives, and direct visual control of cultural elements. Such design translates users' aesthetic preferences into system-recognizable parameters, reducing cognitive load and transforming knowledge-intensive cultural customization into an enjoyable, immersive experience. This approach enhances system usability and reshapes the interactive relationship between users and cultural content, upgrading the experience from instrumental engagement to cultural participation and emotional resonance, while promoting the integration of museum education and public cultural understanding.

#### *4.3. Output of Design Results and Aesthetic Calibration*

At the back-end, the system achieves flexible multi-modal output. Leveraging the cultural gene pool and algorithmically generated visual solutions, final outputs can be applied to diverse carriers, including physical products, digital media, and immersive experiences such as AR try-ons or interactive on-site installations. This ensures that users' personalized cultural consumption needs are met across multiple scenarios.

To maintain cultural authority and aesthetic quality, a manual calibration mechanism is established. Designers act as "ultimate gatekeepers," conducting aesthetic review and cultural accuracy checks on AI-generated outputs, correcting deviations or misuses of cultural symbols. This ensures that every output meets museum standards, preserves cultural integrity, and maintains high design quality.

### **5. Conclusion**

Through systematic theoretical construction and practical exploration, this research establishes the central role of visual communication design in the personalized customization of museum cultural and creative products. In the era of artificial intelligence, visual communication design has evolved from a traditional focus on static visual presentation to becoming the core driver of the entire customized system. By constructing an intelligent design framework of "cultural deconstruction - system generation - multi-dimensional output," designers transform cultural resources into interactive, generative, and dynamic design languages.

This innovative model advances cultural dissemination from a "broad casting" approach to precise, targeted engagement, enabling users to shift from passive recipients to active co-creators. It facilitates deep cultural experiences and emotional resonance while redefining the role and value of designers—from visual creators to cultural translators, system architects, and ethical stewards. This approach maximizes the potential of design within the cultural innovation landscape.

Looking forward, technological integration with VR/AR, 3D printing, and AIGC will expand personalized customization beyond flat visual media into three-dimensional physical products, virtual wearables, and even metaverse digital collectibles, achieving fully immersive, multi-dimensional experiences. Ethically, the establishment of industry standards and guidelines is essential to define algorithmic boundaries, ensure accurate and respectful cultural interpretation, and prevent misuse or trivialization of cultural symbols.

From an evaluative perspective, a comprehensive system integrating quantitative and qualitative metrics should be developed to measure customization effectiveness across dimensions such as user satisfaction, cultural communication efficiency, commercial conversion, and social impact. Such a system will create a sustainable, optimized closed-loop framework, providing both scientific guidance and practical reference for the healthy development of museum cultural and creative products.

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