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AHP-Based Cultural Imagery Value Construction and Design Translation Strategy for the Changzhou Section of the Grand Canal

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ABSTRACT
To explore the revitalization methods and innovative value expression of Ten Scenic Views of the Grand Canal in Changzhou through a cultural imagery perspective, thereby enhancing the appeal and visibility of this cultural tourism route. A three-dimensional spectrum diagram of form-content-function was constructed based on cultural imagery theory. The Analytic Hierarchy Process was employed to quantitatively evaluate factor weights, determine priority design factors, and propose subsequent design translation strategies. The integration of cultural imagery theory and the AHP hierarchical analysis method yields a design strategy that combines Chinese sensibility with scientific rigor. This study's framework precisely identifies the most valuable cultural imagery representations along the Ten Scenic Views of the Grand Canal route in Changzhou, efficiently achieving key factor extraction and scientific evaluation. It offers methodological references for value reconstruction and dynamic inheritance in the cultural belt development of cities along the Grand Canal.

Keywords: *Changzhou section of the Grand Canal, Cultural imagery, Cultural value construction, Design transformation research, AHP.*

1. INTRODUCTION

Against the backdrop of the national strategy to advance the Grand Canal Cultural Belt, the living transmission and innovative transformation of cultural heritage have become vital engines for regional cultural-tourism integration [1]. By the end of 2021, ten products from the Changzhou section of the Grand Canal were selected among Jiangsu's 100 iconic canal cultural-tourism sites, forming a linear cultural corridor spanning ancient and modern times [2]. Through multiple in-depth field investigations and benchmarking against cities like Suzhou that excel in canal symbol output, three major challenges in the cultural value transformation of Changzhou's Ten Scenic Views were identified: First, fragmented cultural symbols. Regional cultural resources lack a systematic narrative and quantitative user demand data to inform design prioritization decisions. Second, insufficient resource conversion efficiency. The integration of culture and tourism remains superficial, failing to align with locally focused problem-solving approaches, resulting in the indiscriminate application of homogenized innovation methods. Third, experience formats are overly uniform. Designers predominantly rely on subjective experience to translate symbolic imagery, insufficiently exploring regional cultural uniqueness and lagging in its application, thus struggling to meet diverse market demands.

To address these issues, this study deconstructs cultural imagery and Ten Scenic Views of the Grand Canal along the Changzhou section from multiple dimensions. By applying the Analytic Hierarchy Process to identify high-perceptibility design elements, it provides quantitative foundations for subsequent design strategies. This approach aims to transcend the limitations of traditional qualitative research, establishing measurable pathways for cultural value transformation and innovation. and design

transformation. This approach aims to propel the transformation of the Changzhou section from heritage preservation to value regeneration, offering methodological insights for the development of the Grand Canal Cultural Belt [3].

2. DECONSTRUCTING THE CULTURAL IMAGERY SPECTRUM OF THE CHANGZHOU SECTION OF THE GRAND CANAL

2.1 Classification and Application Pathways of Cultural Imagery in Canal Heritage Revitalization

The image is a core category in traditional Chinese aesthetics, whose philosophical essence lies in the meaning construction achieved through the fusion of subject and object [4]. An image, therefore, is an objective phenomenon selected and systematically organized within subjective consciousness. Gu proposed the tripartite theory of artistic conception, whose research on imagery, artistic conception, and archetype transcended traditional literary theory systems [5]. This classical category has been extended and transformed in contemporary cultural studies. For instance, Fu and Li proposed the concept of super-image, viewing national symbols like the Grand Canal as civilizational community images bearing a tripartite structure of cultural identity, heritage carrier, and public space [6]. This aligns with the underlying logic of this study.

Based on this theoretical framework, this paper defines cultural imagery as: the collective mental schema of the Chinese nation, within specific historical contexts, toward the symbolic meanings, emotional memories, and value identifications embodied by iconic material or immaterial cultural carriers. Its contemporary value lies in achieving meaning construction—transitioning from material perception to spiritual identification—through operational narrative paradigms.

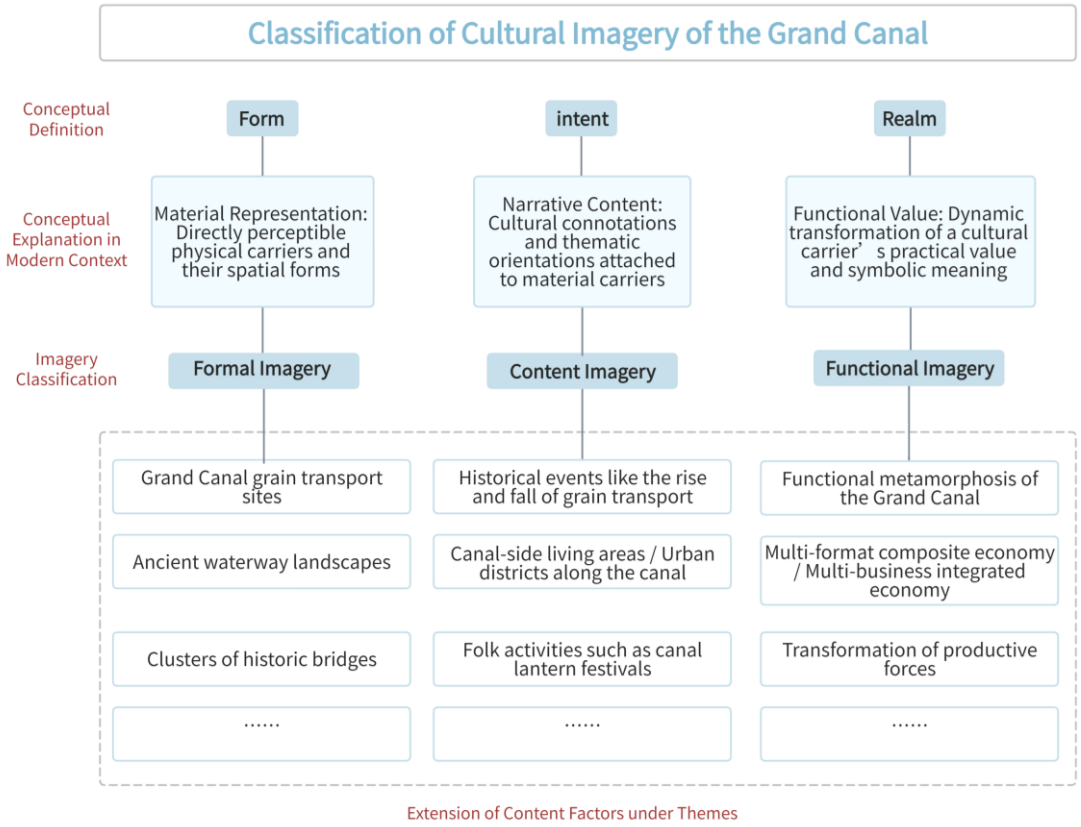

Figure 1 Classification framework for cultural imagery of the Grand Canal.

The traditional framework of image-meaning-realm can be derived into the reality-oriented triad of material representation-narrative content-functional value, comprising three relatively independent yet organically unified core levels. For instance, the Great Canal's functional

metamorphosis from an ancient grain transport route to a modern cultural heritage site. In contemporary cultural-tourism integration, this further evolves into cultural capital for constructing regional identity. It preserves the continuity of historical genes while endowing the site with a new era context and productive capacity, constituting functional imagery [7]. Based on these principles, this paper establishes a classification framework for the cultural imagery of the Grand Canal, as illustrated in “Figure 1”.

2.2 Three Dimensions of Cultural Imagery Extraction for the Changzhou Section of the Grand Canal

2.2.1 Formal Imagery—Visualization of Physical Carriers

The Spring and Autumn Yancheng Ruins embody the pre-Qin city defense system through their three cities and three rivers moat layout and the layered textures of rammed-earth walls [9]. Tianning Temple's ancient architecture, featuring double-eaved hip-and-gable roofs and Tang-Song pavilion-style design, along with its world's tallest Buddhist pagoda, embodies the solemnity of Ming-Qing religious architecture [10]; Industrial relics at Canal No. 5 and Changzhou Economic Development Zone's Red Industrial Tourism Route preserve the physical remnants of early industrial landmarks, forming visual imprints of modern industrial civilization [11]. These are summarized as three core historical site imagery factors: Ancient City Ruins, Buddhist Zen Architecture and Industrial Landmarks.

Qingguo Lane preserves over 80 buildings from the Ming and Qing dynasties through the Republican era. Its Jiangnan residential style—characterized by green bricks, small tiles, and horse-head walls—combines with the granite streets and river wharves of Ancient Canal South Street to form a city-river interdependence urban district [12]. This is summarized as two lifestyle imagery factors: Jiangnan Residential Architecture and Urban District Space.

Hongmei Park creates a classic composition of tower reflections on the canal through its visual axis linking the Half-Mountain Pavilion, Wenbi Tower, and Tianning Pagoda. The waterfront space along the canal in Anji Village, featuring intangible cultural heritage lotus lantern displays, exemplifies the transformation of a traditional village into an ecological leisure demonstration zone that perfectly utilizes its original waterfront ecology [13]. This can be summarized as two natural landscape imagery factors: natural texture and traditional ecology.

Based on the Ten Scenic Views of the Changzhou section of the canal, tangible formal imagery is categorized into three types: historical site characteristics, living scene spaces, and natural landscape textures.

2.2.2 Content Imagery—Intangible Cultural Narratives

The Spring and Autumn Yancheng Ruins connect historical events like Ji Zha's enfeoffment and the Wu-Yue rivalry, serving as a visual stage for civilizational evolution. Literary allusions like Dongpo Mooring at the Yizhou Pavilion shaped the cultural image of a thousand-year-old place of learning, unmatched in the southeast, becoming a core anchor for regional cultural identity. These are summarized as two historical event image factors: Waterfront Memories and Humanistic History Tales.

Qingguo Lane's intangible cultural heritage revitalization project integrates Changzhou comb-making techniques and random-stitch embroidery workshops into historic buildings, creating a living heritage transmission space where intangible heritage meets alleyways. At Anji Village along the Grand Canal, traditional customs like the grain transport boat ritual and canal lantern festival are revived. Combined with boatmen's chant performances, these recreate scenes of everyday life during the ancient grain transport era, transforming folk traditions into participatory aesthetic experiences for the public. The "Biji Lane-Piling Station" section of Ancient Canal South Street revives historical imagination of the canal transport hub by reconstructing the Qianlong Emperor's Southern Inspection Tour. These initiatives crystallize two core folk tradition elements: Jiangnan Intangible Heritage and Remnants of Canal Transport.

The Three Heroes Memorial Museum uses red letters and revolutionary relics as core media to embody the historical depth of the canal's revolutionary heritage. Tianning Temple, as the foremost Buddhist monastery in the southeast, forms a Zen landmark with its imperial plaque "Dragon City Buddhist Teaching" and thirteen-tiered pagoda, where incense and the canal

intertwine to create Changzhou's unique Buddhist cultural landscape. These are summarized as two major symbolic factors: the Red Genealogy and the Zen Melodies and Buddhist Chanting.

Thus, defining content imagery involves excavating the cultural significance embedded within physical spaces. The core lies in activating the complete narrative of historical memory, promoting the revitalization of traditional folk customs, and enhancing spiritual symbolic recognition.

2.2.3 Functional Imagery—Mechanisms for Cultural Value Continuity

Anji Village achieves functional synergy between rural revitalization and cultural heritage through its "Canal Village" homestay cluster and intangible cultural heritage craft workshops. Hongmei Park and Tianning Temple jointly developed the Zen Night Tour project, using light and shadow technology to reconstruct the poetic imagery of tower shadows and temple bells. These two scenarios, driving the transformation of cultural resources into experiential economy, respectively correspond to the two functional aesthetic factors of the canal—rural residence experience and water-based Zen—demonstrating the iteration and integration of functional pursuits in urban spaces.

The Sanbao Street Freight Terminal Ruins were renovated into waterfront promenades and markets, elevating the site from a canal transport hub to a shared urban space. Changzhou Economic Development Zone's Red Industrial Tourism Route integrates industrial heritage, embedding the self-reliance spirit of the Third Front Construction into a modern industrial innovation education base. These linear developments elevate industrial symbols into emblems of urban striving [14], respectively embodying the contemporary canal city spirit factors of mass innovation and sharing and innovative endeavor.

The Canal No. 5 Creative District transforms a textile factory into clusters of art galleries and design studios, converting industrial buildings from production spaces into carriers of industrial cultural creativity. Qingguo Lane's culture + commerce model turns the historic district into a new cultural consumption landmark. These can be summarized as the two innovative factors of the canal experience: cultural tourism spaces and canal cultural creativity.

Thus, the core of confirming functional imagery lies in the dynamic transformation and continuation of the Grand Canal's value. Through spatial functional iteration and symbolic meaning regeneration, it connects the traditional imagery along the Grand Canal with the modern context [15].

3. EVALUATION OF CULTURAL IMAGERY AND FACTOR SELECTION FOR THE CHANGZHOU SECTION OF THE GRAND CANAL

3.1 Evaluation of Cultural Imagery for the Changzhou Section of the Grand Canal

3.1.1 Construction of the Cultural Image Evaluation Model

The Analytic Hierarchy Process is a multi-criteria decision analysis method. The operational steps involve: 1) Decomposing complex problems into ordered components to form a three-tier logical tree structure comprising the objective layer, criterion layer, and indicator layer; 2) Comparing factors within each layer using a 1–9 scale to determine relative importance and calculate factor weights, thereby constructing a judgment matrix; 3) Performing consistency tests after calculating single-layer weights to ensure logical coherence. The final integrated decision synthesizes the combined weights of the indicator layer on the objective layer through hierarchical total ranking, achieving a transformation from qualitative judgment to quantitative analysis . The fundamental steps for constructing the cultural image evaluation model for the Changzhou section of the Grand Canal include:

First, it is to establish a hierarchical structure by coding to form a framework. This study divides the problem into three levels: the overall objective layer A centered on Cultural Image Value Assessment of the 'Ten Scenic Views of the Grand Canal in Changzhou Section; criterion layer B based on three dimensions of cultural image extraction; and evaluation indicator layer C focused on transforming abstract elements from the ten cultural tourism products of the Changzhou section into quantifiable, perceptible image factors. Subsequently, based on the cultural imagery spectrum diagram of the Changzhou section of the

Grand Canal, the two tiers beyond the aforementioned objectives are further subdivided. Tier B (Criteria) comprises Form Imagery B1, Content Imagery B2, and Functional Imagery B3; Tier C (Evaluation Indicators) includes the extracted Historical Site Characteristics C1, Living Scenario Spaces C2, Natural Landscape Textures C3, Historical Memory Events C4, Living Folk Traditions C5, Spiritual Symbolic Identity C6, Canal Functional Aesthetics C7, Canal Urban Spirit C8, and Innovative Cultural Tourism Experience C9. This establishes a culturally symbolic evaluation model with distinct layers and comprehensive dimensions, where factors are independent yet interconnected, as illustrated in "Figure 2".

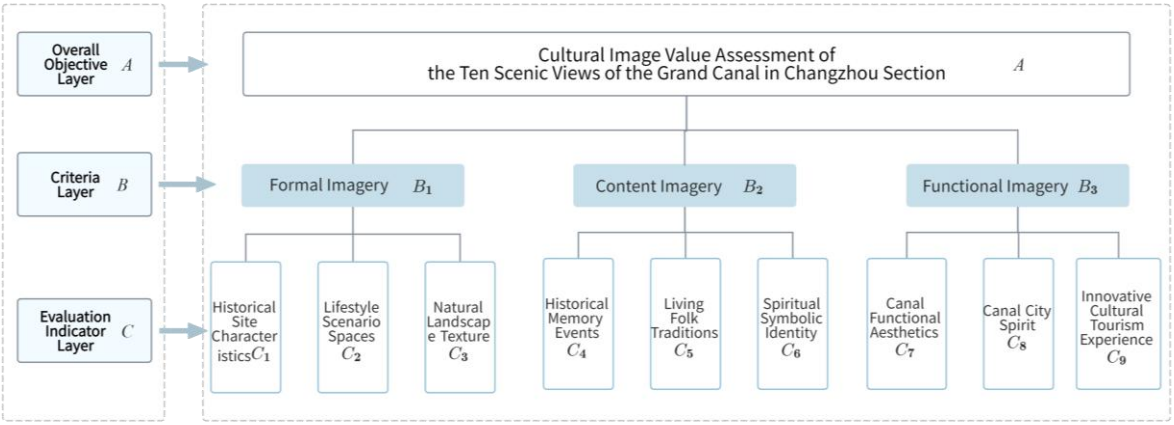

Figure 2 Cultural image evaluation model for the Changzhou section of the Grand Canal.

3.1.2 Assessment of Cultural Image Factor Importance

Following the construction of the cultural image evaluation model for the Changzhou section of the Grand Canal, the Analytic Hierarchy Process was employed to assess the importance of cultural image factors. Fifteen cross-disciplinary participants were selected: 2 scholars specializing in Grand Canal culture, 5 Changzhou tourists, 3 Changzhou cultural tourism practitioners, 3 graduate students in visual communication, and 2 visual communication faculty members. These participants anonymously scored and compared the importance of factors at both the criterion and indicator levels. Through multiple rounds of consultation and feedback, the consistency of expert opinions and the objectivity of factor importance judgments were ensured, leading to the construction of a judgment matrix. First, the importance of factors was assessed using a 9-point scale ("Table 1") to create a questionnaire survey.

Table 1. The fundamental scale of 1-9 (AHP)

Judgment Scale	Definition	Detailed Meaning
1	Equally important	Two factors are considered to have equal importance when compared.
3	Slightly More Important	When comparing two factors, one is slightly more important than the other.
5	Significantly more important	When comparing two factors, one is significantly more important than the other.
7	Particularly important	When comparing two factors, one is more important than the other.
9	Extremely important	When comparing two factors, one is extremely more important than the other.
2, 4, 6, 8	Intermediate Value	Used for situations falling between the above judgments.

Second, it is to clearly define the formula for judging matrix elements. For example, in this study, there are 9 factors to be compared (comparison factors are denoted as i and j). The judgment matrix is recorded as A = (aij) 9× 9, where: aij represents the importance ratio of factor i relative to factor j; when i=j, aij =1, meaning the two factors are equally important. Based on this principle, the

author constructs the judgment matrix and weight table for each level according to the scoring results from the first step. When calculating weights, the author uses the square root method: taking the square root of the row product and then normalizing. (“Table 2”)

Table 2. Criteria layer (layer A) judgment matrix weights

A	B1	B2	B3	Weight W1
B1	1	1/3	1/4	0.1228
B2	3	1	1/2	0.3216
B3	4	2	1	0.5556

The image factors at different criterion levels belong to evaluation dimensions of varying hierarchies. Constructing a 9-order matrix directly would lead to cross-dimensional comparisons, thereby disrupting the hierarchical structure of AHP. Hierarchical construction for specific factors within criterion levels is standard AHP practice, resulting in three 3-order judgment matrices as shown in “Table 3” “Table 4” and “Table 5”.

Table 3. Judgment matrix (C1-C3) for the criteria layer (formal concept B1)

Form Imagery B1	C1(Historical Site Characteristics)	C2(Lifestyle Scenario Space)	C3 (Natural landscape texture)	Weight W2
C1	1	5	3	0.637
C2	1/5	1	1/2	0.0883
C3	1/3	2	1	0.2247

Table 4. Judgment matrix for the guideline layer (content image B2) (C4-C6)

Content Image B2	C4(Historical Memory Event)	C5(Living Folk Traditions)	C6(Spiritual Symbolic Identity)	Weight W2
C4	1	3	2	0.4714
C5	1/3	1	1/2	0.1423
C6	1/2	2	1	0.3863

Table 5. Judgment matrix for the normative layer (functional image B3) (C7-C9)

Functional Image B3	C7(Aesthetics of Canal Function)	C8(Canal City Spirit)	C9(Innovative Cultural Tourism Experience)	Weight W2
C7	1	6	4	0.6809
C8	1/6	1	1/3	0.0825
C9	1/4	3	1	0.2366

3.1.3 Hierarchical Overall Ranking and Consistency Test

After calculating the weights for each judgment matrix, the importance of each indicator has been preliminarily quantified within its respective criterion layer. However, weights within a single criterion layer only reflect local importance. To comprehensively determine the overall contribution of each cultural image factor to the screening objective, hierarchical total ranking is required. This process integrates criterion-level and indicator-level weights to calculate the comprehensive weight of each factor. To ensure the reliability of the overall ranking results, consistency tests for hierarchical total ranking are performed using Formulas 1 and 3. This involves calculating the maximum characteristic root λmax and the consistency ratio CR, then comparing them with the random consistency index RI to determine whether logical contradictions exist in the overall ranking.

$$\lambda_{max} = \sum_{i=1}^{n} \frac{(Aw)_i}{nw_i} \quad (1)$$

$$CI = \frac{\lambda_{max} - n}{n-1} \quad (2)$$

$$CR = \frac{CI}{RI} \quad (3)$$

Table 6. Overall ranking of comprehensive weights for factors at the indicator level (C)

Indicator Layer	Primary Weight W1	Indicator Layer	Secondary Weight W2	Comprehensive Weight	Ranking
B1	0.1228	C1 (Historical Site Characteristics)	0.637	0.0783	2
		C2(Lifestyle Scenario Space)	0.0883	0.0108	9
		C3(Natural Landscape Texture)	0.2247	0.0276	8
B2	0.3216	C4 (Historical Memory Event)	0.4714	0.1516	4
		C5 (Living Folk Traditions)	0.1423	0.0458	7
		C6(Spiritual Symbolic Identity)	0.3863	0.1242	5
B3	0.5556	C7 (Canal Functional Aesthetics)	0.6809	0.3783	1
		C8(Canal City Spirit)	0.0825	0.0459	6
		C9(Innovative Cultural Tourism Experience)	0.2366	0.1315	3

Based on the principle of hierarchical total ranking, after synthesizing the weights of the criterion layer with those of the corresponding indicator layer, the maximum eigenvalue λmax = 3.0612 of the comprehensive judgment matrix was calculated using formula 1. Further calculations based on formulas 2 and 3 yielded a consistency index CI = 0.0306. Referring to “Table 6”, when the matrix order n=9, the average random consistency index RI=1.45. The calculated random consistency ratio CR=0.0211<0.10 indicates that the hierarchical total ranking exhibits good logical consistency, yielding reliable and valid results. Consequently, the comprehensive weight total ranking results for each indicator layer C factor possess decision-making reference value. After verification, the CR values of the sub-judgment matrices under each criterion layer were 0.0097, 0.0052, and 0.0321, respectively, all significantly below the critical value of 0.10. This fully complies with the consistency test standards, ensuring the scientific and rational nature of the cultural image factor screening results.

3.2 Design Image Factor Screening

Based on the factor evaluation of the Grand Canal cultural imagery using the AHP hierarchical analysis method described above: Within criterion layer B, the functional imagery B3has a weight of 0.5556, which is greater than the content imagery B2 weight of 0.3216 and the formal imagery B 1 with a weight of 0.1228. This indicates that within the construction of the Grand Canal's cultural imagery, the functional imagery within the value transformation dimension holds a dominant position, serving as the core element influencing the shaping of cultural imagery. Content imagery follows in importance, reflecting the significance of cultural narratives in enriching the connotations of imagery. While form imagery has a relatively lower weight, it remains the material foundation of cultural imagery. At indicator layer C, the composite weights of each factor show distinct differences: the nine factors rank as follows: C7> C1> C9> C4> C6> C8> C 5> C3> C2. Canal functional aesthetics (C7) leads with a weight of 0.3783, followed by historical site characteristics (C1) and innovative cultural tourism experiences (C9).

All judgment matrices passed consistency tests with CR values below 0.1, indicating sound judgment logic and scientifically reliable weighting results. This conclusion guides the precise refinement and subsequent development of the Grand Canal's cultural imagery. Priority should be given to cultural excavation and cultural-tourism integration practices centered on high-weight factors such as canal functional aesthetics and historical site characteristics, thereby achieving efficient transformation and value enhancement of cultural imagery.

4. VALUE CONSTRUCTION OF CULTURAL IMAGERY FOR THE CHANGZHOU SECTION OF THE GRAND CANAL

The value of cultural imagery centers on two core principles: representational aesthetic anchoring and experiential functional transformation, aiming to map the cultural essence onto real-world value expression.

4.1 Aesthetic Representation Value and Narrative Logic of Cultural Imagery

The cultural image value of the Grand Canal's Changzhou section fundamentally represents an intertextual dialogue between Chinese aesthetics and regional culture. The generation of meaning relies not only on the refinement of static objects but also on the narrative of dynamic scenes, achieving a transformation from physical space to spiritual domain through the creation of a realm beyond the image. This representational value manifests as a triple symbolic system: from material objects triggering behavior, to the formation of regional spirit.

"An image is the fusion of subjective life sentiment and objective natural scenery." In its representational mechanism, cultural imagery achieves value construction through the dynamic interaction of these three symbolic systems: the material symbolic system forms the cognitive foundation, transformed into recognizable visual language through standardized extraction; the behavioral symbolic system carries collective memory, strengthening emotional connections through participatory interaction; the spiritual symbolic system crystallizes into the core identifier of regional cultural identity, fostering enduring emotional belonging.

At the narrative logic level, the Changzhou section of the Grand Canal reinforces value recognition through a dual-track narrative structure: top-down protective narratives ensure the accurate transmission of cultural genes, while bottom-up experiential narratives enhance dissemination efficacy by revitalizing folk memory. This interwoven temporal-spatial narrative network transforms cultural imagery from static preservation objects into living conduits carrying the city's spirit, achieving an organic connection between historical context and contemporary value.

4.2 Functional Transformation of Cultural Imagery in the Experience Economy Context

When cultural imagery enters the real-world domain, its aesthetic value realization requires functional translation. Within the experience economy context, the value realization of cultural imagery necessitates functional translation pathways. Based on AHP analysis results, functional imagery B3 holds the highest weight 0.5556, indicating that functional transformation is the core dimension in constructing cultural imagery value.

Functional transformation unleashes value through three primary mechanisms: - Spatial Reconstruction: Transforming historical relics into contemporary consumption scenarios, such as converting industrial sites into cultural and creative parks. - Industrial Integration: Extending value chains through culture+ models, like intangible cultural heritage + tourism or Zen-inspired + night economy composite formats. - Technological Empowerment: Expanding experiential dimensions via digital media, such as AR-reconstructed historical scenes or digital twin-based online experience platforms.

The transformation pathway builds a closed-loop system based on the user experience cycle: pre-visit digital guides establish cognitive expectations; multi-sensory interactions during visits deepen experiential impressions; and post-visit cultural-creative derivatives and community engagement extend the value chain. This closed loop fundamentally establishes a feedback mechanism that mutually reinforces cultural and economic value: aesthetic value provides content support for functional transformation, while functional transformation creates monetization channels for aesthetic value, forming a virtuous cycle of cultural preservation and industrial development.

5. DESIGN TRANSLATION STRATEGY FOR CULTURAL IMAGERY OF THE CHANGZHOU SECTION OF THE GRAND CANAL

Building upon value construction, design translation—as the critical implementation phase for cultural imagery—requires establishing a systematic, actionable strategy guided by high-weight factors identified through AHP evaluation.

In implementing translation strategies, the priority translation path for high-weight factors should be adopted first. According to AHP analysis results, historical site characteristics (C1) and innovative cultural tourism experiences (C9) occupy a core position in the cultural imagery system. Design translation should focus on extracting symbolic elements from typical spatial features, including the plan layout of canal wharves, structural characteristics of ancient bridges, and construction logic of sluice gates, to establish a systematic visual symbol system for the Ten Scenic Views of the Canal. This system must be standardized through modular design methods for consistent application across wayfinding systems, cultural products, and digital interfaces, ensuring unified and enduring regional cultural recognition. The process may integrate Changzhou's Dragon City cultural symbol to develop a regionally distinctive IP character system. For instance, the creation of the Little Dragon Girl IP character combines traditional dragon motifs with contemporary aesthetics.(“Figure 3”) Featuring a water-inspired blue palette and incorporating canal wave patterns, it both preserves local cultural memory and generates visually compelling symbols with modern communicative power, offering a concrete example of cultural imagery's modern translation.

Figure 3 "Little Dragon Girl" IP character design for the Changzhou section of the Grand Canal.

At the level of translational depth, a systematic conversion mechanism for three-dimensional imagery must be established. Translation at the formal level should center on constructing a design gene bank for the Changzhou Canal. Through typological methods, visual elements such as architectural components, color systems, and material textures should be systematically organized and digitally archived, providing scalable standardized components for design practice. Content-level translation focuses on constructing narrative structures. This involves reconstructing historical scenes through augmented reality, reenacting historical events via immersive theatrical experiences, and narrating cultural stories through audio guides—forming an interwoven temporal-spatial narrative network. Functional layer translation focuses on enhancing spatial efficacy. Through adaptive reuse strategies, industrial relics are transformed into innovation incubation spaces, and historic districts are revitalized into cultural consumption clusters, achieving a value transition from static preservation to dynamic revitalization of cultural imagery.

Technology integration and cross-sector collaboration form the implementation framework for translation strategies. It is necessary to establish a layered digital technology architecture: foundational databases, platform-level digital twins, and application-level VR/AR technologies form a comprehensive technical support system. At the collaborative level, foster multi-stakeholder innovation mechanisms through design thinking workshops to facilitate cross-disciplinary dialogue. Integrate professional resources via collaborative design platforms, and ensure regional adaptability of translation outcomes through community-participatory design, cultivating a virtuous ecosystem for cultural preservation and innovative development.

6. CONCLUSION

This study employs a quantitative methodology system — deconstruction–evaluation-transformation — constructed using the Analytic Hierarchy Process. It transforms the Grand Canal Cultural Belt from a traditional object into an operational system of meaning, overcoming the subjective limitations of conventional evaluation. This approach efficiently connects with users’ emotional needs and precisely identifies key design factors. The case study of IP character design for cultural translation mentioned herein preliminarily validates the methodology’s effectiveness, providing a scientific strategy for allocating design resources to revitalize the cultural heritage of the Changzhou section of the Grand Canal.

The research still holds room for optimization: while this paper employs AHP to screen representative factors within key routes, it cannot fully capture the distinctive character of the entire Changzhou Canal section. Additionally, it lacks a public participation mechanism for design implementation. Strengthening community-driven collaboration is needed to foster local identity and cultivate humanistic warmth. These directions will provide a continuous optimization pathway for interdisciplinary research aimed at enhancing the development of the Grand Canal Cultural Belt.

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