CULTURAL SYMBIOSIS AND REGENERATION OF SHANGHAI CABLE FACTORY INDUSTRIAL HERITAGE

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ABSTRACT
In the context of urban renewal and industrial restructuring, the conservation of Shanghai's industrial heritage has shifted from the preservation of individual buildings to the coordination of historical memory, spatial structure, public life, and urban cultural identity. From the perspective of cultural symbiosis, this article takes the former Shanghai Cable Factory as the main case and examines its cultural value, conservation status, and regeneration challenges. The study combines literature review, archival research, field investigation, and questionnaire surveys involving 15 experts and 385 members of the public. The AHP results show that cultural value received the highest criterion weight (0.3517), followed by socio-economic function (0.2828), spatial design characteristics (0.1855), and ecological environment (0.1801). The overall mean of the public questionnaire was 3.6295 on a five-point scale. By combining expert weights with public improvement gaps, the study identifies authenticity preservation, safety and accessibility, historical interpretation, cultural display and education, and industrial spatial character as the main regeneration priorities. The results show that the key problem is not a lack of heritage resources, but the limited transformation of industrial remains into accessible and understandable public experiences. The regeneration of the Shanghai Cable Factory should therefore be understood as a cultural-symbiosis-oriented process that reconnects industrial heritage value, public urban functions, local memory, and spatial renewal. This article provides a theoretical and empirical basis for conservation-oriented regeneration research on Shanghai's industrial heritage.
Keywords: Industrial Heritage, Conservation Status, Cultural Symbiosis, Urban Renewal

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INTRODUCTION

Shanghai is one of the most representative cities in China's modern industrialization. Since its opening as a treaty port in the mid-nineteenth century, the city gradually developed a modern industrial system shaped by Western technology, capital input, and local industrial growth. Industries such as textiles, shipbuilding, machinery, electricity, and cable manufacturing played an important role in the formation of Shanghai's urban industrial structure. Among them, the industrial areas along both banks of the Huangpu River, especially the Yangshupu waterfront industrial belt, became important spatial carriers of Shanghai's industrial civilization.

From the perspective of industrial heritage conservation, these sites should not be understood simply as abandoned factories or obsolete production spaces. They are material witnesses of urban industrial transformation and cultural resources that record technological progress, labor memory, social organization, and urban spatial evolution. In the context of urban renewal, the conservation of industrial heritage therefore needs to move beyond single-building preservation and functional replacement, and instead consider the relationship among historical memory, spatial structure, public life, and contemporary urban identity.

This article takes the former Shanghai Cable Factory as the main case and examines its cultural value and regeneration challenges from the perspective of cultural symbiosis. The study focuses on how industrial heritage value can be identified, how industrial memory can be connected with public life, and how the current conservation status and spatial problems of the Shanghai Cable Factory can be understood as key issues for subsequent regeneration research.

Research Objectives

This research aims to systematically study the cultural value and cultural symbiosis mechanism of Shanghai's industrial heritage, and to analyze the current conservation status, spatial problems and regeneration challenges of the former Shanghai Cable Factory and related industrial heritage in Shanghai.

LITERATURE REVIEWS

The cultural value and cultural symbiosis mechanism of Shanghai's industrial heritage

Historical and Regional Characteristics of Shanghai Industrial Heritage

Shanghai's industrial heritage is closely related to China's modern industrialization and the evolution of urban space. Since the mid-nineteenth century, Shanghai gradually developed a modern industrial system shaped by Western technology, capital input, and local industrial growth. Industries such as textiles, shipbuilding, machinery, electricity, and cable manufacturing formed an important foundation of the city's industrial structure. The Yangshupu waterfront industrial belt, as one of the earliest and most concentrated industrial areas in Shanghai, witnessed the formation of modern industry and became an important spatial carrier of the city's industrial civilization (Zhang, 2022).

From the perspective of industrial heritage conservation, the value of these sites lies not only in individual buildings or factory remains, but also in the broader relationship among industrial production, social life, urban space, and cultural memory. The Nizhny Tagil Charter defines

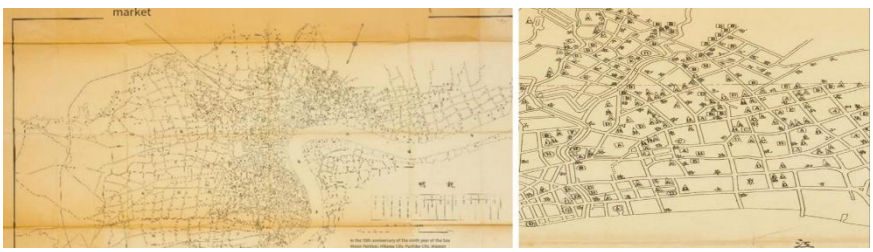


Figure 1 map showing the distribution of factories in Shanghai in 1928

industrial heritage as the remains of industrial culture with historical, technological, social, architectural, or scientific value (TICCIH, 2003), while the Dublin Principles further emphasize the relationship among industrial sites, structures, landscapes, machinery, documents, and their cultural and natural settings (ICOMOS & TICCIH, 2011). Within this context, the former Shanghai Cable Factory can be understood as an important case for examining Shanghai's electric power industry, cable manufacturing, and the transformation of waterfront industrial space. (Figure 1)

Multiple Cultural Values of Shanghai Industrial Heritage

The value of Shanghai's industrial heritage is not limited to architectural remains, but is formed through the interaction of history, technology, society, space, and cultural memory. According to international industrial heritage theory, industrial heritage includes not only factories, workshops, machinery, warehouses, energy facilities, and transportation infrastructure, but also the social spaces and cultural relationships associated with industrial production (TICCIH, 2003; ICOMOS & TICCIH, 2011). Therefore, the value identification of Shanghai's industrial heritage should move beyond the visual preservation of old buildings and examine how industrial production, technological development, labor organization, urban space, and collective memory are connected.

In Shanghai, this composite value is especially evident in the Huangpu River industrial belt and the Yangpu waterfront. These areas witnessed the formation of modern industry and preserve important evidence of the city's industrial modernization. The Shanghai Cable Factory further illustrates this value structure. Its large-span workshops, red-brick façades, reinforced concrete structures, steel truss roofs, storage spaces, transportation corridors, and production traces reflect the logic of industrial production while also providing a basis for public-space transformation, cultural display, and landscape regeneration. In this sense, Shanghai's industrial heritage should be understood not as obsolete industrial land, but as a cultural resource that can continue to be interpreted and transformed in contemporary urban life.

Cultural Symbiosis Mechanism and the Reinterpretation of Industrial Heritage

The concept of symbiosis originally comes from biology and has gradually been extended to sociology, urban studies, and design research to explain interaction, interdependence, and co-evolution among different systems (Chen, 2021). In the context of urban renewal and landscape design, cultural symbiosis does not refer to the simple coexistence of different cultural elements. Rather, it emphasizes the construction of mutually supportive relationships among historical culture, spatial function, ecological environment, social participation, and contemporary public life.

For industrial heritage regeneration, cultural symbiosis provides a relational way of thinking.



Figure 2 Current status of the site

Symbiotic design emphasizes connection, coordination, continuity, moderate intervention, and local expression (Guo, 2021). It also stresses that different cultural and spatial elements should not be mechanically superimposed, but should form organic collaboration and adaptive transformation (Li, 2019). This perspective is especially relevant to industrial heritage, because old factories should not be treated merely as obsolete buildings or redevelopment land, but as cultural fields where industrial memory, production technology, spatial structure, and public life continue to interact.

In the case of the Shanghai Cable Factory, cultural symbiosis means that red-brick façades, workshop structures, production traces, material textures, and waterfront spaces should not be preserved as static objects. Instead, these heritage elements should be reconnected with public activities, spatial experience, and urban cultural narratives. In this sense, the regeneration of industrial heritage moves beyond "old building conservation" and turns toward the coordinated transformation of historical value, contemporary function, social participation, and local identity. (Figure2)

Conservation Status, Spatial Problems and Regeneration Challenges of the Shanghai Cable Factory

The Shanghai Cable Factory is an important case within the Yangpu waterfront industrial heritage system. Founded in 1931 and formerly known as "China Wire and Cable Factory," it preserves old workshops, office buildings, storage areas, and other industrial building types. Some existing buildings retain functionalist industrial architectural features such as reinforced concrete structures and steel truss roofs. These remains are not only physical resources for reuse, but also carriers of the historical memory of Shanghai's electric power industry, cable manufacturing, and urban industrial development.

The key issue in its conservation is not simply the preservation of building façades, but the identification and interpretation of industrial heritage value. Workshop structures, red-brick façades, production traces, material textures, and industrial components together form the memory system of the site. If conservation remains at the level of architectural repair without interpreting production processes, technological history, and labor memory, industrial heritage may be reduced to a visual symbol rather than becoming a meaningful cultural resource.

The spatial problems of the Shanghai Cable Factory are mainly related to the mismatch between its former production-oriented organization and contemporary public use. The original spatial structure served production efficiency, storage, transportation, and internal management, resulting in a relatively enclosed and functionally singular site. With the withdrawal of production functions, the site needs to be reorganized as an open, continuous, and accessible public cultural space. Therefore, pedestrian circulation, public corridors, activity nodes, waterfront connections, and cultural display spaces become key issues in its regeneration.

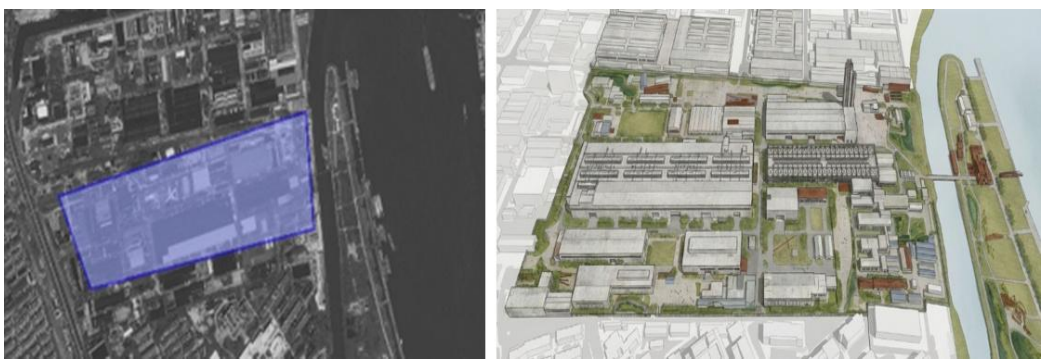


Figure 3 Floor plan

From the perspective of cultural symbiosis, the regeneration challenge of the Shanghai Cable Factory lies in coordinating conservation, public use, and cultural interpretation. Its renewal should avoid both shell-like preservation and excessive commercialization. Instead, it should transform industrial memory into spatial experience, connect former production spaces with public life, and allow the site to become an urban cultural place that can be used, understood, and recognized. (Figure3)

RESEARCH METHODOLOGY

Data Collection

This study adopts literature review, archival data collection, field investigation, and case analysis to examine the conservation status of the Shanghai Cable Factory within the broader context of Shanghai industrial heritage. The literature review establishes the historical and theoretical foundation of the study. Since the mid-nineteenth century, Shanghai has developed a modern industrial system supported by industries such as textiles, shipbuilding, machinery, and electric power. The Huangpu River waterfront, especially Yangshupu, was one of the earliest and most concentrated industrial zones in modern Shanghai, and played an important role in the city's industrial development (Zhang, 2022). Therefore, the Shanghai Cable Factory should be understood in relation to Shanghai's industrialization, Yangpu Riverside renewal, and the continuation of urban industrial memory.

Data collection focuses on industrial heritage conservation, urban renewal, cultural symbiosis, Yangpu Riverside industrial development, and the historical evolution of the Shanghai Cable Factory. Literature and archival materials are used to clarify the concept, value composition, historical background, and renewal issues of industrial heritage. Site-related materials help analyze the spatial pattern, existing conditions, and conservation problems of the Shanghai Cable Factory.

Field investigation was conducted at the former Shanghai Cable Factory and its surrounding area. The investigation focused on building preservation, remaining industrial components, spatial structure, road organization, waterfront relationship, public openness, and current use. It helped identify problems such as weakened historical information, fragmented spatial organization, insufficient cultural expression, and weak community connection.

Expert and Public Questionnaire Survey

This study adopts expert and public questionnaire surveys to support the identification of cultural value and the analysis of regeneration challenges. The questionnaire design was developed on the basis of literature review, field investigation, and semi-structured interviews, so that the selected indicators could reflect both professional concerns and actual site problems.

The expert questionnaire was conducted with 15 professionals from the fields of industrial heritage conservation, environmental design, architectural design, landscape planning, and urban renewal. The expert group included professors, associate professors, senior engineers, and architectural engineers. Their responses were mainly used to judge the relative importance of factors related to heritage protection, spatial quality, operational use, and cultural narrative expression.

The public questionnaire collected 385 valid responses from local residents, visitors, and potential users around the Shanghai Cable Factory and the Yangpu waterfront area. The questionnaire focused on users' perceptions of heritage recognition, environmental quality, spatial accessibility, public use, safety, cultural identification, and overall experience. Compared with the expert questionnaire, the public questionnaire emphasized everyday spatial perception and user needs.

Questionnaire Data Processing and Analysis

The questionnaire data were analyzed by comparing expert judgment with public perception. Expert responses were processed through AHP pairwise comparisons to generate indicator

weights and determine the professional priorities for conservation and regeneration. At the criterion level, cultural value received the highest weight (0.3517), followed by socio-economic function (0.2828), spatial design characteristics (0.1855), and ecological environment (0.1801). All judgment matrices passed the consistency test.

The 385 public responses were analyzed using mean scores on a five-point Likert scale. The overall mean was 3.6295, while the indicator means ranged from 3.4000 to 3.8857. Safety and accessibility received the highest public score (3.8857), followed by the retention of industrial spatial character (3.7870) and pollution reduction and environmental remediation (3.7532). The public scores were then converted into improvement gaps and combined with the expert global weights.

The integrated results identified the preservation of original structural details and authenticity (0.1146), safety and accessibility (0.0932), historical-function interpretation and narrative expression (0.0778), cultural display and educational facilities (0.0679), and industrial spatial character (0.0660) as the five highest priorities. The results also revealed a difference between public needs and professional judgment. Operational vitality had the largest public improvement gap but ranked only eighteenth after the expert weight was considered. This comparison enabled the study to distinguish between problems perceived by users and issues requiring professional priority in subsequent regeneration.

RESEARCH RESULTS

Identification of Cultural Value and Cultural Symbiosis Mechanism

The results show that the cultural value of Shanghai's industrial heritage is not limited to the preservation of architectural remains. Rather, it is a composite value system formed by historical memory, technological development, social life, spatial structure, and local identity. In the case of the Shanghai Cable Factory, workshop structures, red-brick façades, industrial components, material textures, and production-related remains serve as important carriers of industrial memory and reflect the development of Shanghai's cable manufacturing and urban industrial system.

The expert questionnaire further shows that industrial heritage value should be understood beyond building appearance. At the criterion level, cultural value received the highest AHP weight of 0.3517, followed by socio-economic function at 0.2828, spatial design characteristics at 0.1855, and ecological environment at 0.1801. All four judgment matrices passed the consistency test, indicating that the expert evaluations were sufficiently consistent.

The 385 public questionnaires produced an overall mean of 3.6295 on a five-point scale, with indicator means ranging from 3.4000 to 3.8857. Safety and accessibility received the highest public mean of 3.8857, followed by the retention of industrial spatial character at 3.7870 and pollution reduction and environmental remediation at 3.7532. These results indicate that the public recognized the site's basic spatial and industrial characteristics, while operational vitality, ecological construction, public activities, and cultural interpretation still required further improvement.

When expert weights and public improvement gaps were considered together, the preservation of original structural details and authenticity ranked first, with a comprehensive priority weight of 0.1146. Safety and accessibility ranked second at 0.0932, followed by historical-function interpretation and narrative expression at 0.0778, cultural display and educational facilities at 0.0679, and the retention of industrial spatial character at 0.0660. (Table 1).

Table 1 AHP Criterion Weights and Public Evaluation Results

Evaluation dimension	Expert AHP weight	Public evaluation function	Main interpretation
Cultural value	0.3517	Measures recognition of authenticity, historical narratives, industrial characteristics, and cultural facilities	Highest professional priority
Ecological environment	0.1801	Measures pollution control, ecological quality, materials, and environmental experience	Requires long-term ecological improvement
Socio-economic function	0.2828	Measures public activities, community participation, operational vitality, safety, and accessibility	Important for public use and continued operation
Spatial design characteristics	0.1855	Measures spatial organization, functionality, industrial character, and overall experience	Supports spatial reconnection and adaptive use
Overall public evaluation	—	Mean = 3.6295; indicator range = 3.4000 – 3.8857	Public evaluation was generally moderate to positive

The 385 public questionnaires produced an overall mean of 3.6295. At the dimensional level, cultural value received a mean of 3.6665, socio-economic function 3.6545, spatial design characteristics 3.6239, and ecological environment 3.5730. The indicator means ranged from 3.4000 to 3.8857, indicating a generally moderate-to-positive evaluation but clear differences among individual issues. (Table 2).

Table 2 Integrated Expert–Public Priority Results

Rank	Indicator	Public mean	Gap	AHP global weight	Comprehensive weight
1	P1 Preservation of original structural details and authenticity	3.7455	0.3136	0.1199	0.1146
2	P15 Safety and accessibility	3.8857	0.2786	0.1097	0.0932
3	P3 Historical-function interpretation and narrative expression	3.6545	0.3364	0.0758	0.0777
4	P4 Cultural display and educational facilities	3.639	0.3403	0.0655	0.0679
5	P19 Retention of industrial spatial character	3.787	0.3032	0.0714	0.066
6	P10 Pollution reduction and environmental remediation	3.7532	0.3117	0.0652	0.0618
7	P11 Improvement of public activity spaces	3.5195	0.3701	0.0502	0.0565
8	P12 Community participation and interaction	3.7403	0.3149	0.0576	0.0554

9	P5 Expression of industrial-era characteristics	3.6935	0.3266	0.0543	0.0541
10	P16 Rational spatial layout and multifunctional use	3.639	0.3403	0.0454	0.0471

Spatial Integration and Design

Building upon preliminary quantitative assessments and spatial diagnostics, this study translates the identified priority issues into specific strategies for circulation organization, public spaces, cultural displays, and ecological restoration. The design focuses on reconnecting the relatively fragmented spatial structure of the former Shanghai Cable Factory site while preserving its original industrial scale, structural rhythm, material characteristics, and traces of production. (Figure4)



Figure 5 Original site



Figure 4 Renovation design effect

The site employs a tiered transportation system comprised of a main pedestrian loop, secondary connecting lines, and internal routes within building clusters, linking main entrances, existing factory buildings, and public spaces. Cultural nodes, community service spaces, ecological

restoration areas, and public activity facilities are strategically placed along the main pathways. The following design drawings illustrate how the preliminary diagnostic findings are translated into spatial interventions, demonstrating the concrete connections between cultural symbiosis, heritage preservation, and contemporary public use. (Figure5)

DISCUSSION AND CONCLUSION

This paper takes the Shanghai Cable Factory as an example to discuss the cultural value of Shanghai's industrial heritage and its continuation in contemporary urban life from the perspective of cultural symbiosis. The research shows that the Shanghai Cable Factory cannot be viewed merely as a group of old factory buildings, nor simply as undeveloped industrial land. The site's value is closely related to its cable production history, workers' experiences, original building materials, production and transportation systems, and the relationship between the factory area and the surrounding city. The role of the cultural symbiosis perspective is to focus on how these historical elements can continue to be identified after site renewal, while simultaneously providing conditions for new public uses.

The questionnaire results provide a more concrete basis for judging the priorities of regeneration. Combining expert weighting with improvement gaps in public evaluations, the preservation of original structural details and authenticity, safety and accessibility, historical function display and narrative expression, cultural display and educational facilities, and the continuation of the industrial space's texture become the main priorities.

Based on these results, more specific recommendations can be made for the subsequent renewal of the Shanghai Cable Factory. Before renewal, an investigation and classification of the existing factory buildings, structural components, material textures, historical markers, and production traces should be conducted. Areas with higher historical value should be primarily preserved and restored, while spaces with lower sensitivity can be adaptively utilized according to actual needs. The existing fragmented circulation within the site can be improved through continuous pedestrian loops, connecting lines between building clusters, accessible routes, and waterfront connections. Existing production and transportation routes can be transformed into culturally interpretive routes, with historical texts, preserved equipment, ground signage, educational spaces, and digital guides placed at key locations to allow the public to learn about the site's industrial history while using it. These suggestions, derived from expert evaluations, 385 public questionnaires, site surveys, and publicly available factory history and site information, represent more than just the designer's personal experience; they have accumulated valuable experience for future design practices.

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Data Availability Statement: The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Conflicts of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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