

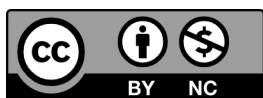
Research on Industrial Heritage Revitalization Strategies from the Perspective of Stock Renewal: A Case Study of Hanyang Iron Works

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Abstract: With the transformation of urban construction from incremental expansion to stock optimization, the revitalization of industrial heritage has gradually become a key research direction in the field of urban renewal, this study selects Hanyang Iron Works as a case to carry out in-depth discussions on the revitalization of industrial heritage from the perspective of stock renewal, and uses literature research method, field research method and case analysis method to systematically sort out the practical problems existing in the process of industrial heritage activation and utilization. In view of these problems, a series of targeted activation strategies is proposed, with the help of the questionnaire star platform to carry out data collection, to gain an in-depth understanding of the needs of young people for the activation and utilization of industrial heritage, and to apply the relevant research results to specific revitalization design practices. The “Static Protection” mode moves to the “Dynamic Regeneration” mode. This study provides new ideas and methods for the activation and utilization of industrial heritage, and can also enrich the cultural connotation of the city and promote the sustainable development of the city.

Keywords: Stock renewal; Revitalization of industrial heritage; Hanyang ironworks; Youth innovation and entrepreneurship; Modular space



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With the continuous advancement of new-type urbanization in China, urban construction has shifted from incremental expansion to stock optimization. The upgrading of urban industrial structure has led to the relocation of a large number of traditional industrial enterprises, resulting in some industrial land scattered in urban central areas. Due to the special historical background and value contribution, some of these industrial remains have a strong attribute of cultural heritage. Industrial heritage is a carrier and witness of urban history and development. It is also an “irreplaceable resource” of the city. The protection and utilization of industrial heritage are of great significance in historical, social, technological, economic and other aspects (Li Qiguo et al., 2022). Although such industrial remains contain profound cultural value, they also occupy valuable urban land resources. In the era of stock optimization with scarce urban construction land resources, the redevelopment of such industrial heritage with high cultural value is imminent. In addition, as a material carrier of industrial civilization, industrial heritage records the craftsmanship, management

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models and culture of specific historical periods. In the process of the change of heritage areas, regional identities, humanistic characteristics and social backgrounds have been formed, generating collective emotions and historical memories of citizens. In this context, the region has obtained contextual significance and become a specific place with urban spirit(Wang H et al., 2025). The Report to the 20th National Congress of the Communist Party of China also proposes to vigorously revitalize and utilize approved but unused land and idle land resources, continue to promote the development and utilization of inefficient urban land, and continuously increase the renovation efforts of old urban areas, old factories and old villages. The stock optimization of urban construction has put forward new requirements for the redevelopment of industrial heritage.

At present, both domestic and foreign studies show a common trend of moving beyond single static preservation to comprehensive dynamic activation, but there are differences in focus and paths. Domestic studies are closely combined with the local context of stock renewal. These studies have revealed the importance of contextual continuity, functional complexity and maximization of comprehensive benefits, providing a solid theoretical foundation for practice. In contrast, foreign studies pay more attention to cutting-edge and cross-border fields, with their perspectives focusing on precise protection and immersive experience driven by high technology, emotional connection and community participation oriented by people, as well as adaptive reuse and sustainable development models for the future.

However, there are still areas for further exploration in existing studies. Whether it is domestic discussions on renewal models or foreign attention to technological and social dimensions, most studies still regard the “youth group” as generalized users or community members, lacking systematic integration of them as core driving forces. This paper collects data and information through field survey method, literature research method, case study method and field investigation method, and attempts to construct a specific model of “historical value protection + diversified spatial functions + youth culture”. It aims to provide a valuable research case for how the theory of industrial heritage activation can more accurately respond to the needs of the new generation and stimulate sustainable endogenous vitality.

1 Current Situation of the Protection and Utilization of Hanyang Iron Works Industrial Heritage

1.1 Current Situation of the Protection of Hanyang Iron Works

Entering the 21st century, the protection work of Hanyang Iron Works has entered a new stage. The government has increased financial investment and policy support and launched large-scale renovation projects. Representative industrial buildings have been handled in accordance with the principle of “restoring old buildings to their original appearance”. In 2019, Sunac launched its renovation project, which, however, fell into an abandoned predicament and exposed many pain points. Due to financial difficulties, Sunac is temporarily unable to continue the construction, so many renovation plans can only remain on paper, and the completed parts have gradually deteriorated due to the lack of subsequent maintenance. The subsequent commercial operation is also a problem. At present, the market competition is fierce, and consumers have higher and higher requirements for commercial complexes (see Figure 1). Although Sunac·Wuhan 1890 focuses on the integration of industrial culture and commerce in its positioning, how to attract consumers’ continuous attention and consumption, and how to introduce high-quality merchants and ensure their long-term stable operation are all unsolved problems. In addition, it has not effectively attracted the youth group, nor has it

created spatial functions for innovation and entrepreneurship that meet the needs of young people. Furthermore, it has lost its population base and failed to form a good commercial ecology, leading to difficulties in sustainable development and ultimately abandonment. In summary, industrial heritage is different from general cultural relics and historic sites. The traditional “frozen” protection concept, such as the practice of “restoring old buildings to their original appearance”, is not completely applicable to the renovation of industrial heritage in urban central areas (Liu N et al., 2023).



Figure 1 The current situation of Hanyang iron works

(Image Source: Taken on location)

1.2 Protection Demands for Hanyang Iron Works Heritage

A total of 135 valid questionnaires were distributed and collected from the youth group in this survey, with an effective recovery rate of 100% (see Appendix). The respondents are mainly college students aged 19-25 (accounting for 80%) with a bachelor's degree (accounting for 77.04%), showing the characteristics of youthfulness, high cultural literacy and strong innovative vitality overall.

Demand analysis shows that young people have a strong demand for immersive and interactive cultural experiences. Over 60% prefer cultural and artistic activities (62.22%), while esports (54.07%) and reading/learning (50.37%) are also highly favored. In terms of information acquisition, 68.89% of young people rely on social media and short video platforms, and new media have become the core channel to reach young people. Regarding spatial functions, young people have prominent demands for creative exhibition areas (73.33%), leisure and social areas (67.41%), co-working spaces, etc. At the same time, they attach great importance to the preservation of industrial heritage architectural symbols (79.26%) and have high expectations for the application of digital technologies such as AR/VR (76.3%) and holographic projection.

For Hanyang Iron Works, young people have a basic understanding of its historical and cultural value, but most of the understanding remains superficial, with only 14.07% having an in-depth understanding. Currently, its renewal is faced with problems such as low public participation (59.26%), weak emotional resonance (57.78%), and lack of spatial interest (53.33%). Young people have a strong demand for art exhibitions, social spaces, industrial landscape greening, characteristic check-in areas, etc. They recognize the integration direction of digital technology with art and culture, and favor activity forms such as themed immersive exhibitions and art figure DIY.

The survey confirms that the activation of Hanyang Iron Works needs to balance the inheritance of historical culture and the needs of young people. Through the implantation of diverse functions, empowerment of digital technology and intervention of artistic elements, the alignment of historical value, use function and youth culture can be achieved, providing a key reference for the renewal of industrial heritage.

2 Methods and Strategies for Industrial Heritage Activation Under the Stock Background

2.1 Functional Implantation: Stimulating the Regenerative Vitality of Industrial Heritage

Industrial heritage emphasizes the integration of diversified functions, focusing on cutting-edge industries such as intelligent manufacturing and cultural technology to build functional spaces for innovation and entrepreneurship. Beijing 798 Art District (see Figure 2), relying on the original electronic industrial workshops, has introduced functional spaces such as artistic creation, exhibition, display, and cultural creativity. It has transformed industrial buildings into an innovative platform integrating multiple functions, including artistic creation, product display, and cultural experience, and constructed a dual-narrative functional space. It preserves industrial historical traces to create exhibition spaces, sets up display areas for old machinery and equipment to tell the history of industrial development, and at the same time builds a modern entrepreneurship hall and an innovation achievement display area to provide a platform for entrepreneurs to display and connect resources.



Figure 2 Comparison diagram of Beijing 798 art district before and after renovation

(Image Sources: visitbeijing.com.cn /www.zhihu.com)

2.2 Industrial Operation: Enhancing the Economic Value of Industrial Heritage

Industrial operation emphasizes taking innovative industrial clusters as the core, relying on the advantage of the close connection between the original factory buildings of industrial heritage, introducing industries such as digitalization and cultural technology, and forming an industrial ecology with closely connected various functions. Shenzhen Shekou Value Factory (see Figure 3) was originally the Guangdong Float Glass Factory. After renovation, industries such as design, film and television, and art have been introduced, and various design exhibitions, art activities

and film and television shootings have been held, forming a creative industrial cluster. It not only enhances the regional economic value, but also drives the development of supporting industries such as the surrounding commerce and catering. Through the coordinated development of industries, it promotes the cooperation of enterprises in the upper and lower reaches of the industrial chain, reduces the operating costs of enterprises, enhances industrial competitiveness, and realizes the sustainable operation of industrial heritage after activation.



figure 3 Comparison of Shenzhen Shekou value factory before and after renovation

(Image Source: www.sohu.com)

2.3 Spatial Renewal: Improving the Spatial Environment of Industrial Heritage

Under the stock background, the spatial renewal of industrial heritage needs to break the original closed space. Through the implantation of modular office units, the use of standardized partition walls and partition walls with fixed slide rails, combined with movable desks, chairs and prefabricated components, industrial workshops can be flexibly divided into multi-functional spaces. For example, Shanghai's "1933 Old Millfun" was originally the largest slaughterhouse in the Far East. During the renovation, its unique architectural structure was utilized, and a modular design was adopted to divide the space into creative studios, exhibition spaces and commercial areas to meet the needs of different tenants. At the same time, shared facilities are configured to reduce space waste by centrally setting up public areas such as lounges and pantries. High-frequency use facilities are placed at transportation hubs, and an intelligent management system is introduced to realize efficient resource allocation (see Figure 4).



Figure 4 Shanghai "1933 old millfun"

(Image Source: k.sina.com.cn)

2.4 Cultural Shaping: Building the Cultural Brand of Industrial Heritage

Cultural shaping is used to inherit the industrial historical context, while integrating modern innovative elements and youth cultural IP. By restoring and displaying historical traces of industrial buildings, such as architectural structures and production equipment, the cultural brand of industrial heritage is built. The core value of industrial heritage should be determined by culture, including material and intangible aspects, rather than attaching culture to the reconstruction of buildings or the renewal of urban land plots under a simple modern paradigm. For example, the Zollverein Coal Mine Industrial Complex in Germany's Ruhr region (see Figure 5) retains complete coal mining facilities and industrial buildings, and transforms these facilities and buildings into industrial museums, art centers, etc. It has become a World Cultural Heritage, enabling the display of industrial history and culture. Modern innovative activities are endowed with new cultural connotations for industrial heritage. Art exhibitions, creative markets, technology experience activities, etc., are held to attract young people to participate, promoting the integration of historical context and modern innovation, and enhancing the cultural appeal and social influence of industrial heritage. For young entrepreneurial groups, characteristic youth entrepreneurship spaces are created.



Figure 5 Zollverein coal mine industrial complex in the ruhr region, germany

(Image Source: cn.bing.com)

3 Activation Design Strategies for Hanyang Iron Works Under the Stock Background

3.1 In-depth Integration of Youth Innovation and Entrepreneurship Spaces with Industrial Spaces

Against the backdrop of the stock era, urban renewal has put forward higher requirements for the spatial transformation of industrial heritage. As the cradle of modern Chinese industry, the activation mode of Hanyang Iron Works needs to break through the traditional cultural and tourism development model, take the needs of youth innovation and entrepreneurship as the core driving force, and build a composite spatial system of historical culture + youth innovation.

The plan effectively leverages the advantages of the factory buildings of Hanyang Iron Works in terms of floor height and their spacious scale, uses detachable light steel structure partitions for functional zoning, and converts the original structure of industrial heritage into a spatial design language by retaining iconic elements such as exposed steel

frames, crane beams, and industrial pipelines (see Figure 6). This approach maintains the historical depth of all industrial buildings and, at the same time, creates a low-cost and highly flexible carrier for innovation and entrepreneurship activities. In the area of the original steelmaking workshop, independent office units and shared communication areas are divided by steel structure partitions. A single unit can accommodate a start-up team of 5 to 10 people, and the shared area is equipped with an intelligent conference system and leisure facilities to meet the needs of team collaboration and social interaction (see Figure 7). A movable and foldable furniture system is introduced, allowing entrepreneurs to quickly adjust the spatial layout according to the project cycle, realizing the functional transformation from a closed office to an open roadshow.



Figure 6 Hall entrance

(Image Source: Drawn by the project team members)



Figure 7 Independent office units and shared communication area

(Image Source: Drawn by the project team members)

3.2 Innovative Application of Movable, Modular, and Multi-Functional Design

Most renovations of traditional industrial heritage often face problems such as fixed and rigid spatial functions

and low usage efficiency. This project introduces the concept of movable modular design, takes the system as the starting point, and constructs a modular system through decomposition and combination based on product functions. It realizes dynamic recombination of space and integration of multiple functions by using standardized units combined with a track-bearing system. The modular units adopt steel structure frames of uniform specifications, with integrated infrastructure such as circuits, networks, and lighting inside, and reserved interfaces to support rapid equipment access (see Figure 8). The exterior of the units uses materials such as weathering steel plates and frosted glass, which can retain the industrial texture while meeting modern aesthetic needs. In the entrepreneurial office area, a single module can serve as an independent studio and can be expanded into an open office cluster through track splicing. In the exhibition area, display modules equipped with universal wheels can move freely along pre-embedded tracks, and the magnetic display board system can quickly complete the theme transformation from industrial history exhibitions to technological innovation exhibitions. Visitors can follow the movable display boards to understand the entire process of the ironworks from its construction to modern transformation.

This project designs a mobile theater module (see Figure 9). With an extendable roof, the module can add 20 square meters of open-air performance space when expanded, which can host immersive theater performances, open-air concerts and other activities. The integration of spatial transformation and plot not only reduces renovation costs, but also effectively responds to the challenge of changing functional needs of industrial heritage through the “diversified functions” of the space.



Figure 8 Open office cluster

(Image Source: Drawn by the project team members)



Figure 9 Movable theater

(Image Source: Drawn by the author)

3.3 New-type Operation Integrating Traditional Industry with Emerging Technology

To address the issues of insufficient interactivity in industrial heritage exhibitions and weak appeal to young groups, the activation design of Hanyang Iron Works takes digital technology as the core and constructs a new operational system of immersive experience exhibitions. The museum model is adopted to exhibit the development history of industrial civilization and important handicrafts through museums and exhibition halls, which plays a role in promoting industrial culture and inheriting industrial craftsmanship. In the industrial technology exhibition hall, the project uses digital technology to create 1:1 high-precision 3D models of the ironworks' core equipment, combined with AR glasses to enhance the visiting experience (see Figure 10). After wearing AR devices, visitors can synchronously watch virtual animations of equipment operation beside physical cultural relics to understand their smelting principles and historical backgrounds. An interactive historical exhibition hall is set up to restore the production scenes of the ironworks in the 1890s using VR and somatosensory interactive devices. Visitors can experience processes such as ore handling and blast furnace ignition through hands-on operations. Holographic projection is used to restore graphic materials, old photos, etc., from specific years, realizing in-depth interaction with history.

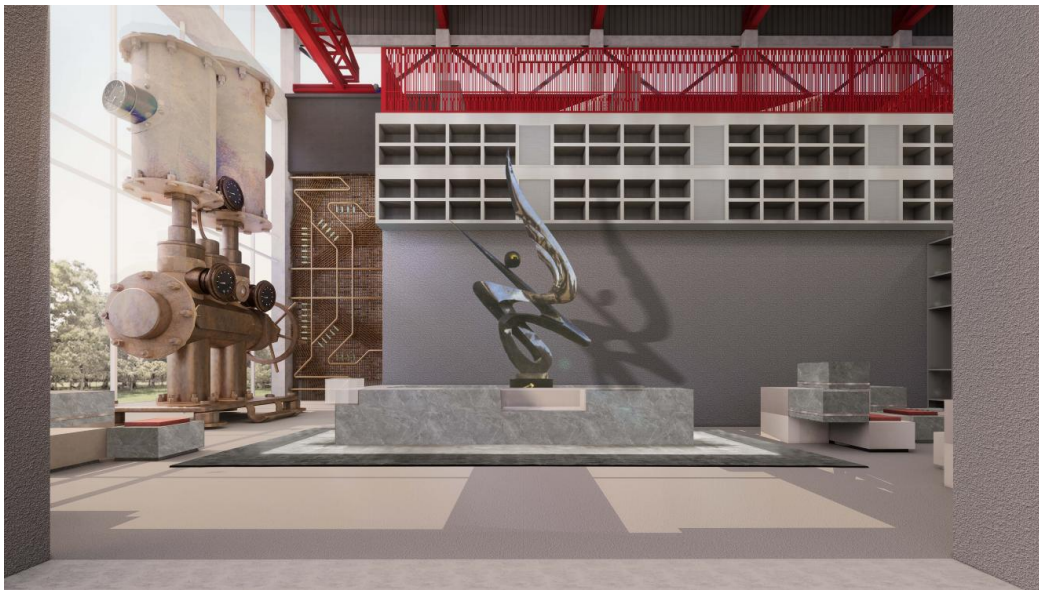


Figure 10 Industrial exhibition hall

(Image Source: Drawn by the project team members)

The innovation exhibition hall has introduced an AI intelligent system and a big data analysis platform to provide personalized explanation services (see Figure 11). For student groups, the explanation will focus on historical knowledge. For entrepreneurs, some innovative cases will be recommended. The big data platform will analyze data such as visitors' movement routes and stay durations to optimize exhibition layout and activity planning. Such in-depth integration of technology and culture enhances the exhibition effect of industrial heritage, and through the innovative operation model, Hanyang Iron Works has become a new benchmark for industrial culture communication in the digital age.



Figure 11 Innovation exhibition hall

(Image Source: Drawn by the project team members)

3.4 Building a Youth Cultural IP

American anthropologist Margaret Mead, in her book *Culture and Commitment*, summarized social and cultural orders into three types—pre-figurative culture, co-figurative culture, and post-figurative culture—based on intergenerational age. In the post-figurative culture stage, young people pay more attention to innovation and uniqueness. Entering the new era, young people’s demand for space is not only about functional use, but also the spiritual power brought by cultural value and innovative value. Based on the survey on the protection demands of Hanyang Iron Works’ industrial heritage, the activation design of Hanyang Iron Works focuses on young people’s cultural needs, combines industrial culture with youth cultural symbols such as digital technology and art culture, creates a youth theater and a youth science and technology innovation exhibition hall, and builds a cultural base with a sense of the times and regional characteristics.

The mobile theater module adopts a lightweight aluminum alloy frame and a long-span glass curtain wall design, and develops activities such as immersive theater and multimedia art exhibitions in combination with the characteristics of the venue. Based on the century-old history of Hanyang Iron Works, classic scenes such as Zhang Zhidong’s establishment of the factory and workers’ resistance against the Japanese to protect the factory are reproduced through live performances and light and shadow effects in the mobile theater. On this basis, the theater can develop activities such as the “Iron Works Music Festival” and the “Youth Art Biennale”. The Iron Works Music Festival invites independent musicians to create original songs with industrial culture as the theme, integrating light shows and mechanical installation art to attract a large number of young audiences.

The Youth Science and Technology Innovation Exhibition sets up themed exhibition areas such as “Industrial Heritage Re-creation” and “Future Steel Laboratory”, encouraging artists to interpret industrial culture through digital art, installation art and other forms. These activities are promoted through social media and short video platforms to create popular topics such as “New Youth of Hanyang Iron Works”. Through the in-depth integration of industrial culture and youth cultural IP, Hanyang Iron Works has not only become a cultural check-in spot for young people, but also built a unique brand image of historical heritage + youth culture, providing a replicable cultural integration practice for the activation of industrial heritage.

4 Conclusion

Taking the activation of Hanyang Iron Works' industrial heritage as an example, this paper focuses on issues related to the activation of industrial heritage against the backdrop of stock renewal and proposes specific strategies for the activation of Hanyang Iron Works. The activation of industrial heritage needs to break through the traditional protection model, be guided by young people's needs, and achieve value enhancement from "material preservation" to "spiritual inheritance" through spatial function reconstruction, integration of technology and culture, and dynamic operation mechanisms. The practice of Hanyang Iron Works shows that the activation strategy from the perspective of stock renewal can continue the urban industrial memory, and can also add new impetus to urban sustainable development by activating idle space and cultivating innovative industries. Its experience has certain reference value for similar industrial heritage projects. Future research should strengthen interdisciplinary collaboration and community participation mechanisms, promote the construction of localized theories and long-term operation of industrial heritage activation, analyze the problems faced by Hanyang Iron Works, propose corresponding activation strategies and conduct practical verification, highlight the key role of strategies such as integrating young people's needs, innovative space design, and integrating technology and culture in industrial heritage activation, provide theoretical and practical references for the development of industrial heritage under the background of stock renewal, and have positive significance for promoting urban cultural inheritance and innovation.

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