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**TECHNIQUES FOR ADAPTING INDUSTRIAL HERITAGE THROUGH
DESIGN (ON EXAMPLE OF CHANGZHOU CANAL № 5)**

Qualification work for obtaining the SVO «Master»
in the specialty 022 Design
OPP «Design of the architectural and landscape environment»

The qualification work contains the results of one's own research
The use of ideas, results and texts of other authors must be referenced to the
appropriate source.

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Abstract

As an important tangible element of urban industrial civilization, industrial heritage not only reflects the changes in production technology, industrial structure, and life in history but also forms an indispensable part of the collective memory and cultural identity of the city. With urban renewal shifting from the expansion of urban construction to the optimization of urban space, the preservation and use of industrial heritage have shifted from the traditional architectural preservation to a combination of spatial adaptive reuse, cultural revival, and public participation. In addition, the development of digital media technology has brought about changes in the way that industrial heritage is interpreted and experienced through digital image, projection, AR, VR, three-dimensional modeling, spatial sound, and navigation.

This paper will focus on the role of digital media technology in the reconstruction of industrial heritage in urban renewal. The industrial heritage site of Changzhou No. 5 Wool Textile Factory and the Canal No. 5 Creative District will be selected as the object of research. The specific issues that this paper will mainly investigate include how digital media can change from supporting means of displaying the industrial heritage into an active media in identifying the values of industrial heritage, interpreting historical information, organizing spatial narrative, creating environmental experience, and promoting public participation. The goal of this paper is to form a design logic and path for integrating digital media technology into industrial heritage renewal under the premise of the authenticity and integrity of industrial heritage and the current spatial features of industrial heritage.

The paper begins with literature review on theoretical background of industrial heritage preservation, adaptive reuse, urban renewal, digital heritage, and digital media design. Comparative analysis will then be conducted on several representative cases, including the Zollverein Coal Mine Industrial Complex in Germany, Shougang Park in Beijing, Huaxin 1907 Cultural Park in Huangshi, Hubei Province, and the SantralIstanbul Energy Museum in Istanbul. Based on the buildings, streets, alleys, public spaces, and operational conditions of Changzhou No. 5 Wool Textile Factory and Canal No. 5 Creative District, some

reconstruction strategies will be proposed based on the digitization of industrial heritage, visualization of production information, continuity of spatial narrative, and interaction of public participation.

It is argued that digital media technology in the renewal of industrial heritage sites should play an integrative role to connect heritage, historical information, spatial experience, and public participation rather than being a decorative technology. A digital interpretation and exhibition system can be established for Canal No. 5 Creative District by carrying out low-impact, reversible, and layered interventions to preserve the authenticity of its original factory buildings, equipment, industrial parts, and historical environment. Through such measures, the static industrial heritage can become public cultural spaces with historical depth and interactive experience as well as the ability to renew continuously.

Keywords: Industrial Heritage; Canal No. 5 Creative District; Digital Media; Digital Exhibition; Spatial Renovation; Immersive Experience; Urban Renewal

Introduction: Research Theme, Research Object, Research Purpose, and Research Objectives

1. Research Theme

This research revolves around the fundamental issue about how the use of digital media may facilitate the reconstruction of industrial heritage under the process of urban renewal. For this research, "reconstruction" does not denote the thorough transformation of old factories into new buildings or the conversion of the present physical environments of the industrial heritage into new ones by using digital media. It rather means the restructuring of the fragmented historical knowledge, historical memories of productions, spatial nodes, and public activity through the means of digital imagery, interactive projection, augmented reality (AR), virtual reality (VR), three-dimensional digital models, spatial sound, digital navigation, and digital archive.

In this way, the industrial heritage can transform itself into a living urban public cultural space which is identifiable, comprehensible, experienceable, and communicative.

The research changes its perspective from the application of digital media to whether digital media can be logically inserted into the present environments, what historical information digital media can convey, what relationships they can create, and how they contribute to urban renewal.

2. Research Object

The specific research objects of this study are the industrial relics of Changzhou No. 5 Wool Textile Factory and the Canal No. 5 Creative District where they exist.

The research objects contain three aspects, each connected with the other.

Firstly, the aspect of physical heritage involves old factory buildings, saw-toothed roof, brick walls, chimneys, industrial parts, relics of machinery, and other tangible objects that reflect the unique features of industrial architecture. Secondly, the aspect of spatial environment involves the streets and alleyways between factory buildings, courtyards, entrance, public spaces for activities, interface along the canal and the relationships among these spaces. Thirdly, the aspect of information and experience involves historical facts and collective memories related to textile manufacture, growth of the business, life of workers, and urban industrialization, as well as the navigation, exhibition, immersion, interaction, and communication created by the combination of digital media.

With an analysis of these three aspects all together, the study is able to prevent simplifying its research object into the renovation of a single building or installing of digital devices.

3. Research Purpose

The aim of this research is to make associations among urban renewal, the preservation of industrial heritage, and digital media design and to examine the possibility of using digital technologies in spatial regeneration while maintaining the authentic features of the industrial heritage.

Several problems found in the existing situation include the fragmentation of the historical information about industrial heritage, lack of connections between

static exhibitions and space, disruption of visitor experience, lack of opportunity to participate interactively by young visitors, and the possibility of digital technologies overshadowing the industrial heritage.

In order to solve these problems, this research tries to bring together historical content, spatial structure, media technology, and visitor experience as an integrated design system.

In this system, digital media should not only preserve and interpret historical information but also assist in circulation planning, organizing spatial narratives, interaction with public and cultural communication.

4. Research Objectives

Based on the research theme and objective mentioned above, this study sets out five research objectives which are connected with each other.

Firstly, to construct theoretical bases for the digital media interventions in the process of the renewal of the industrial heritage.

The review of relevant theories concerning the process of urban renewal, industrial heritage conservation and adaptive reuse, digital heritage and digital media spatial design will help to clarify the theoretical basis and boundaries for the integration of digital media into the process of the renewal of the industrial heritage.

Secondly, to define the heritage values and existing problems of the research site.

By analyzing the history of the site development, its spatial configuration, industrial heritage and current usage of Changzhou No. 5 Wool Textile Factory and Canal No. 5 Creative District, the research will define the main values which need to be preserved, interpreted, reconstructed and revitalized.

Thirdly, to analyze the relationship between digital media technologies and industrial heritage spaces based on the comparative study of case studies.

Using the comparative analysis of the relevant domestic and foreign case studies, the research will analyze the ways in which the various digital media

technologies (digital archiving, digital navigation, immersive exhibition, interactive narrative etc.) could be correlated with the industrial heritage space and its specific features.

Fourthly, to develop the design framework of the industrial heritage reconstruction with the use of digital media.

The design framework of the industrial heritage reconstruction using the digital media will be developed based on the interaction between the physical heritage fabric, historical information, spatial narratives, digital media and public participation.

Finally, to test the validity of the designed design framework within the design project of Changzhou No. 5 Wool Textile Factory.

With the application of the suggested design framework in the process of reconstruction design of Changzhou No. 5 Wool Textile Factory, the validity of this framework and design references for similar sites could be tested.

5. Research Methods

To achieve the objectives outlined above, this study adopts a combination of theoretical and practice-oriented research methods.

At the theoretical level, literature review, case study, comparative analysis, and inductive reasoning are employed to examine the conceptual relationships among industrial heritage conservation, urban renewal, digital heritage, and digital media design.

At the practical level, site investigation, behavioral observation, spatial analysis, visual documentation, and design translation are adopted to conduct a comprehensive examination of the buildings, streets and alleys, landscape nodes, visitor activities, and conditions for digital media implementation at Changzhou No. 5 Wool Textile Factory and Canal No. 5 Creative District.

The entire research methodology is organized in an order that includes the theoretical review, heritage value assessment, problem definition, comparative case study, strategy formulation, and design validation.

Such a research methodology sets up the relationship between theoretical analysis, site analysis, and design practice, which guarantees the theoretical basis of design strategies as well as the specific situation of the research site.

6. Research Significance

As for theoretical research, this research tries to build a bridge between industrial heritage protection and spatial design of digital media, which means expanding research perspectives, where the existing studies mainly focus on restoration and function change of industrial heritage protection.

Through the integration of digital media to the larger research scope of industrial heritage protection and urban renewal, this study tries to explore how historical information, space, digital technology and citizens' participation can be integrated together as a spatial design system.

On the other hand, the operation experience of Canal No. 5 Creative District is already relatively mature in the field of culture and creative industries, art and tourism. Therefore, the application of digital media does not mean building a completely new digital tourism destination. It should enhance the cultural values of the original industrial space through digital stories so that original factory buildings, equipment, material and traces of industrial production become the carrier of digital experience.

7. Research Innovations

Four key features embody the innovation that is being advocated in this study.

First, moving from addition of technology to narrative design using media.

The study stresses on the importance of using technologies to interpret and communicate the history of the industry rather than serving as merely a visual supplement. By incorporating historical data with spatial information, the digital media will play an important role in industrial heritage interpretation and narrative design.

Second, moving from digital exhibition to an integrated system of experience.

By providing continuous digital narrative pathways linking entrances, alleys and streets, factory buildings, exhibition space and activity space, the research aims at establishing coherent links between different spatial points thus improving the continuity of visitors' experiences.

Third, moving from static digitization to constantly renewable digital heritage system.

In order to expand and update historical data, exhibit contents, and interactive experience of the industrial heritage space, the study seeks to develop digital archives and content management system.

Fourth, integration of minimal intervention theory with digital media technology.

The research stresses on the importance of using removable, reversible, and updatable digital systems in order to reduce the physical intervention in significant historic buildings and industrial artifacts.

Chapter 1 Literature Review in China and Abroad

1.1 Current Research on Industrial Heritage Conservation and Reuse

Research on industrial heritage conservation has evolved from the protection of individual buildings toward regional cultural landscape conservation, and from the protection of material entities toward the preservation of social and cultural values. The value of industrial heritage is reflected not only in architectural structures, machinery, and production facilities, but also in the spatial patterns created by industrial production, labor memories, technological knowledge, and social relationships associated with urban development. Adaptive reuse has therefore become an important means of ensuring the continued existence of industrial heritage. Its basic goal is to introduce new functions while retaining significant heritage characteristics, transforming heritage from an “object to be viewed” into a space that continues to participate in urban life.

The practice of Changzhou Canal No. 5 is highly representative. According to materials from the Changzhou Municipal Committee of the Chinese People's Political Consultative Conference, Canal No. 5 is located on Sanbao Street on the south bank of the Beijing–Hangzhou Grand Canal. The project centers on three themes—“canal culture, industrial remains, and creative industries”—and protects and reuses industrial heritage such as the former Changzhou No. 5 Woolen Textile Mill and Hengyuanchang Factory. The first-phase site covers approximately 36,388 square meters with a building area of about 32,000 square meters, retaining buildings from different periods as well as sawtooth-roof factory buildings characteristic of textile-industry architecture. Typical experience published by the National Development and Reform Commission further indicates that Canal No. 5 has largely retained industrial buildings, equipment, and related archives during conservation and reuse, while revitalizing industrial heritage through cultural, artistic, and design-oriented activities.

It can therefore be seen that Canal No. 5 has completed its first value transformation from an industrial production space into a cultural and creative district. The next-stage question is no longer simply “how to use old factory buildings,” but “how to help the public understand old factory buildings.” This is precisely where digital media can provide its greatest value.

1.2 Current Research on Digital Media Empowerment of Cultural Heritage

New technologies of digital media provide new ways of documentation, presentation, communication, and interaction with cultural heritage. 3D scanning allows creating digital databases of buildings and equipment; GIS and digital maps allow arranging the location of heritage sites; AR enables putting historical content into the actual environment; VR helps to get rid of physical boundaries; projection mapping enables converting buildings, machinery, and space into

interactive interfaces for telling narratives; and interactive installations allow turning the audience into an active participant instead of an information receiver.

In recent years, Chinese research has paid more and more attention to the combination of digital conservation and digital storytelling. The study by Du Yi on “Internet + Industrial Heritage” claims that the digitalization of industrial heritage requires value transformation through resource mining, linking, and communication matrixes. In turn, the research carried out by Liang Xufang and Cai Xujia about the historic and cultural district of the First Automobile Works in Changchun suggests methods such as digital interactive storytelling, participatory storytelling, and transmedia storytelling. Thus, the above studies show that the value of digital media is not only improving the visual effect but changing the relationship between heritage information and its audience.

For the design discipline, it means that digital media technologies should be considered while designing space rather than being installed as display technologies after the construction of architecture. Scale of space, the distance of observation, stops, lighting conditions, circulations, placement of equipment, and information hierarchy should be designed in connection with digital media.

1.3 Case Studies of Digital Transformation of Industrial Heritage in China and Abroad

Case 1: Zollverein Coal Mine Industrial Complex, Germany. According to the official Zollverein website, the industrial heritage site uses multimedia displays, interactive information terminals, mobile applications, virtual tours, and audio guides to connect industrial cultural routes, historical buildings, and contemporary uses. Its Industrial Heritage Portal presents the past, present, and future of industrial heritage through images, text, and sound, while digital applications also provide 3D maps, themed routes, and historical information. This case demonstrates that digital media can form a continuous information system across an entire site rather than being confined to a single exhibition hall.

Case 2: Shougang Park, Beijing. According to Shougang Group materials, the RE Rui·No. 3 Blast Furnace Digital Museum, opened in 2025, takes the core of the No. 3 blast furnace as its centerpiece. Through digital imagery, AIGC-based reconstruction of historical images and drawings, and 2.5D projection, the furnace core, walls, and floors become immersive visual interfaces. In 2026, Shougang Group further introduced an artificial-intelligence digital museum project for industrial heritage, using high-precision 3D capture and large-space VR positioning to digitize industrial remains. This case shows that large-scale industrial structures can themselves become the “screens” of digital media, enabling an integrated relationship between digital technology and the heritage fabric.

Case 3: Huaxin 1907 Cultural Park, Huangshi, Hubei. Public materials from the Huangshi Municipal Government show that Huaxin 1907 is promoting the development of digital resources for industrial heritage and using VR immersive experiences, audiovisual-electrical interaction, and digital exhibitions to present the history of industrial development. Public reports in 2025 also introduced an industrial-site treasure-hunting experience based on AR QR codes, AIGC, and interactive games. This case is particularly relevant to Canal No. 5 because it transforms visitors from passive viewers into active explorers through gamified and task-based digital storytelling.

Case 4: SantralIstanbul Energy Museum, Istanbul. Relevant studies show that the museum was converted from the Silahtarağa Power Plant, built in the 1910s, while retaining the original turbine hall, control room, and large-scale equipment. XR research in 2026 further used this space as an experimental setting, integrating extended-reality experiences with the industrial heritage environment and exploring personalized experiences through spatial anchoring

and interaction mechanisms. This demonstrates that large equipment, long-span spaces, and multi-level platforms in industrial heritage can themselves constitute the spatial grammar of XR experiences.

Comparative analysis indicates that digital-media empowerment of industrial heritage can be broadly divided into four types. The first is the “digital archive type,” focusing on the preservation of heritage information. The second is the “digital navigation type,” addressing spatial cognition and route organization. The third is the “immersive display type,” focusing on visual and auditory reconstruction of historical scenes. The fourth is the “interactive narrative type,” emphasizing participation, tasks, games, and user-generated content. Canal No. 5 can integrate all four approaches in the future, but should avoid excessive technological accumulation.

1.4 Research on Industrial Heritage Spatial Renewal and Experience Design

Industrial heritage spaces possess a strong sense of place. Compared with newly constructed buildings, their irregular column grids, sawtooth roofs, aged walls, machinery, pipelines, and traces of wear all carry narrative value. Renovation design should therefore adhere to the principles of minimal intervention, legibility, reversibility, and dialogue between old and new. Digital media can accomplish tasks that are difficult through conventional physical renovation—for example, projection can temporarily transform spatial atmospheres without permanently altering building surfaces; AR can add layers of historical information without installing excessive wall panels; and VR can reconstruct lost production processes without physically rebuilding original equipment.

In the renewal of old spaces, new place relationships should be established through historical and cultural elements, spatial functions, behavioral needs, and public activities, and theoretical ideas should be verified through specific design

strategies. The thesis structure follows the sequence of “Introduction—Literature Review—Design Proposal—Conclusion—References—Appendix,” while Chapter 2 further connects design concepts, functional zones, and specific strategies. This thesis adopts the same structural logic, but applies it to industrial heritage and digital media.

Chapter 1 Summary

The literature and case studies show that industrial heritage renewal has moved from the stage of “architectural restoration” to that of “cultural revitalization,” while digital media further advances the process from “spatial reuse” toward “experience reproduction.” The core functions of digital media can be summarized as preservation, interpretation, connection, and participation. For Canal No. 5, a cultural and creative district function is already established; what now requires greater attention is how industrial historical information can be seen, understood, and participated in. Digital media should therefore form a closed loop of “content—space—technology—user” together with the industrial heritage fabric.

Chapter 2 Design Proposal for the Digital-Media-Empowered Renovation of Changzhou Canal No. 5 Industrial Heritage

2.1 Site Overview and Historical-Cultural Characteristics

Canal No. 5 Creative District is located on Sanbao Street in Zhonglou District, Changzhou, on the south bank of the Beijing–Hangzhou Grand Canal. According to records from the Changzhou Municipal Committee of the Chinese People’s Political Consultative Conference, the district is composed of industrial remains including the former Changzhou No. 5 Woolen Textile Mill, Hengyuanchang Factory, Changzhou Comb Factory, and Changzhou Marine Instrument Factory, together with surrounding historic streets and alleys. Established in 2008, the

original industrial site covers approximately 36,388 square meters with a building area of about 32,000 square meters. Some buildings date back to the 1930s, and the remaining representative sawtooth-roof factory buildings reflect the architectural characteristics of the textile industry.

Around 2019, the former Hengyuanchang Factory site was included in a national industrial heritage-related list. Canal No. 5 subsequently developed a mixed program of art exhibitions, design services, cultural tourism, and creative industries. Public information released by the Changzhou Municipal Government in 2023 shows that Canal No. 5 was selected as a typical Jiangsu Province case for revitalizing existing assets and expanding effective investment. The district's occupancy rate exceeded 92%, and its operating revenue in 2022 surpassed RMB 66 million. This indicates that Canal No. 5 already has a relatively mature operational foundation, and future digital transformation should serve to enhance its cultural value rather than replace the existing commercial ecosystem.

The site's most important cultural resources include: first, the spatial relationship between the historic canal and the industrial complex; second, the industrial visual characteristics created by old factory buildings, sawtooth roofs, chimneys, equipment, and aged walls; third, the social memories formed by textile production, enterprise development, and workers' everyday lives; and fourth, the new culture generated by current creative industries and artistic activities. The key design task is to connect these four types of resources.

2.2 Existing Problems and User Needs

Problem 1: Industrial historical information is spatially dispersed. Canal No. 5 contains rich industrial remains and historical materials, yet visitors mainly perceive the place through architectural forms, shops, and artistic activities. The

industrial production process and historical timeline are therefore not necessarily understood in a complete manner.

Problem 2: There is a gap between static displays and real space. Conventional exhibition panels can provide text and images, but they are less effective in explaining the relationship among textile machinery, production processes, and factory spaces.

Problem 3: There remains room to expand participation by younger visitors. Younger groups are highly familiar with smartphones, short-form video, games, and social media. The communication of industrial heritage should therefore expand from “viewing exhibitions” to “exploring—interacting—sharing.”

Problem 4: Digital media can easily overwhelm the heritage itself. Extensive use of LED screens, high-intensity projection, and complex equipment may obscure the material qualities of the original industrial architecture. The number of digital devices should therefore be controlled, and technology should be concealed within spatial structures wherever possible.

Problem 5: The connection between outdoor public space and industrial-historical narratives can be further strengthened. Existing factory buildings, streets and alleys, courtyards, and the canal waterfront already provide a strong spatial foundation. However, if entrance identity, building facades, stopping points, and landscape facilities lack a unified design language, visitors may understand them merely as separate commercial or exhibition spaces and fail to develop a continuous perception of the industrial heritage place. Outdoor environmental renovation should therefore shift from “updating individual buildings” to “constructing a district-wide spatial narrative,” enabling facades,

paving, planting, lighting, furniture, and digital media to jointly communicate information.

Problem 6: Visitor circulation and experiential rhythm lack clear hierarchy. Industrial heritage districts often feature large factory scales, multiple route branches, and frequent transitions between indoor and outdoor spaces. If navigation relies only on conventional commercial-district wayfinding, first-time visitors may struggle to choose routes, miss core nodes, or repeatedly backtrack. The design should therefore establish a route system combining a primary route, secondary routes, and a night route, supported by ground markings, node numbering, digital maps, and visualized wayfinding.

User needs can be summarized into six categories: cognitive needs, meaning rapid understanding of the site's history; experiential needs, meaning immersion through visual, auditory, and interactive means; social needs, meaning exploration and sharing with companions; spatial-identification needs, meaning a clear sense of place from the entrance and streets to building facades and the waterfront; route-organization needs, meaning that visitors of different ages and available time can choose complete, short, or night routes; and sustainable-update needs, meaning that digital content can continuously change in response to exhibitions, festivals, and research outcomes.

2.3 Design Concept

The design concept is “Digital Canal · Regeneration of Industrial Memory.” Its core is not to reconstruct an entirely virtual world, but to establish an activatable layer of digital information within real industrial heritage spaces. Digital media allow former production activities, personal memories, and urban development to reappear within the original factory buildings, enabling visitors to move continuously between real space and historical information.

In terms of spatial structure, the proposal develops an overall framework of “one main industrial-memory axis, multiple themed nodes, and continuous indoor–outdoor integration.” The main axis extends from the primary entrance to the core factory buildings and continues toward the Workers’ Memory Zone, Digital Creative Laboratory, and canal waterfront. The themed nodes respectively support identification, display, immersion, rest, interaction, and night-tour functions. Through this structure, architectural exterior renewal, landscape renovation, and digital media are no longer treated as separate design components, but work together along a unified narrative route.

The overall narrative adopts a four-layer structure of “one canal, one factory, one city, one future.” “One canal” explains the relationship between the historic canal and Changzhou’s industrial development; “one factory” focuses on the No. 5 Woolen Textile Mill and related industrial remains; “one city” discusses the impact of industrialization on Changzhou’s urban life and industrial structure; and “one future” explores the reuse of industrial heritage in the digital era. The four narrative layers can form a complete visitor route or operate independently as separate digital content modules.

2.4 Design Principles for Digital Media Empowerment

1. Principle of Authenticity First. All digital content should be based on verifiable historical materials, photographs, archives, equipment, and oral histories, avoiding unexplained fictional reconstructions of history.
2. Principle of Minimal Intervention. Digital equipment should prioritize movable, detachable, and lightweight structures and should not cause permanent damage to significant historic walls or components.

3. Principle of Invisible Technology. Equipment should function as a narrative tool rather than as a visual focus. Projectors, speakers, sensors, and wiring should be integrated into the building structure or into newly added reversible components wherever possible.

4. Principle of Multisensory Experience. Imagery, sound, light, touch, and motion interaction should be combined according to the characteristics of each space, while avoiding the simultaneous high-intensity use of digital media throughout all spaces.

5. Principle of Layered Information. General visitors should receive concise information, while more engaged visitors can access deeper material through mobile devices, AR, and digital archives, allowing people of different ages and interests to obtain appropriate levels of experience.

6. Principle of Sustainable Updating. A unified digital content database should be established to support continuous updates for festivals, exhibitions, educational programs, and research results, preventing one-time digital projects from becoming quickly outdated.

2.5 Digital Media Spatial Renovation Strategies

Strategy 1: Establish the “Canal No. 5 Industrial Heritage Digital Archive.” Buildings, equipment, historical photographs, factory signs, documents, oral histories, and other materials should be classified and coded to form both two-dimensional and three-dimensional spatial databases. Important buildings and equipment should be modeled in 3D, allowing visitors to access historical information, dates, functions, and associated figures via mobile devices.

Strategy 2: Create a “Timeline Entrance.” A low-luminance digital timeline should be installed at the main entrance, using wall projection or translucent

digital media to present the sequence of “industrial formation—factory production—shutdown and transformation—creative district—digital future.” The timeline should occupy little physical space and function as the starting point of the visit.

Strategy 3: Develop an “Immersive Industrial Production Space.” A representative factory building should be selected as the core experiential venue. Projection mapping should combine textile production processes, machine movement, and workers’ activities with the existing architectural structure. Visual content should be spatially adapted to the column grid, roof trusses, and machinery locations so that the building itself becomes part of the narrative.

Strategy 4: Develop an AR Industrial Heritage Guide. Visitors can scan buildings, machines, or old-photograph markers with mobile devices to overlay historical images onto the present space. Lost production equipment can be virtually reconstructed through AR, with different levels of transparency distinguishing “authentic remains” from “digital reconstruction.”

Strategy 5: Establish a “Workers’ Memory Sound Map.” Oral histories should be collected through interviews with retired workers, local residents, and relevant practitioners, and QR codes or near-field interaction points should be placed at different locations in the district. At specific sites, visitors can hear work sounds, everyday stories, and historical narratives associated with that location, forming a place-based sound narrative.

Strategy 6: Establish a Digital Interactive Task System. Drawing on exploration models such as Huaxin 1907, the district can be divided into a series of “industrial memory nodes.” Visitors complete tasks via mobile devices such as finding equipment, identifying buildings, matching historical photographs, and

answering questions. After completion, they receive a personalized digital souvenir card or route map, encouraging secondary sharing and dissemination.

Strategy 7: Construct a Nighttime Digital Lighting Environment. Rather than comprehensive illumination, the night-lighting strategy should use localized, low-luminance, and programmable lighting to emphasize chimneys, sawtooth roofs, factory entrances, and canal-facing interfaces, giving industrial structures renewed nighttime legibility. Digital lighting should avoid masking the original material qualities of the industrial architecture.

Strategy 8: Conservation-Oriented Renewal of Building Facades. Red-brick walls, sawtooth roofs, original window and door openings, steel structures, and equipment components with industrial heritage value should be repaired and their authentic materials exposed rather than uniformly “refurbished.” New entrance canopies, signage frames, equipment screens, and exhibition interfaces should use reversible light-steel structures, perforated metal panels, or translucent materials to create a dialogue between new interventions and old brick walls. Localized digital information can be attached to new components through low-luminance projection, e-ink displays, or replaceable lightboxes, avoiding direct damage to historic walls.

Strategy 9: Establish an Industrial Memory Landscape System. Existing streets and alleys, courtyards, residual spaces, and waterfront interfaces between factory buildings should be used as the basis for integrating paving, seating, planting, industrial components, and small digital installations into a continuous landscape. Linear inlays, numbering, and directional markings in the paving can translate the textile-production sequence of “yarn—weaving—cloth.” Old equipment, structural foundations, or verifiable industrial symbols can become narrative triggers at landscape nodes. The landscape design should emphasize

low maintenance, opportunities for stopping, and participation, while avoiding excessive garden-like treatment that would weaken the industrial character of the site.

Strategy 10: Construct a Hierarchical Route and Wayfinding System. The overall structure should combine “a primary loop + themed secondary routes + a waterfront night route.” The primary loop connects the entrance, industrial heritage display, immersive industrial theater, workers’ memory, digital creative laboratory, and waterfront public-art spaces. The themed secondary routes support in-depth visits, educational study tours, and temporary exhibitions. The night route focuses on chimneys, sawtooth-roof factories, principal facades, and the canal edge. Physical signage, ground coding, QR/AR points, and mobile digital maps should use a unified numbering system so visitors can identify their current location, next destination, and remaining route at any time.

2.6 Spatial Zoning and Experience Routes

Space 1: Canal Memory Entrance Zone. The main functions are orientation, historical timeline display, and digital mapping. Visitors develop an initial understanding of the relationship among the canal, the factory, and the city.

Space 2: Industrial Heritage Exhibition Zone. Original machines, equipment, and architectural components are retained, supplemented by AR and small interactive screens so visitors can understand equipment structures and production processes.

Space 3: Immersive Industrial Theater. A tall factory building is used to create a 360-degree visual experience, with spatial sound, projection, and localized lighting simulating the textile-production environment. Based on authentic

archives, the content focuses on the relationship among machinery, workers, production rhythms, and urban life.

Space 4: Workers' Memory Zone. Oral histories, photographs, sounds, and digital archives are used to construct the "human dimension of industrial heritage." Visitors can browse personal stories and submit old photographs or memories in their possession, which can enter the digital archive after review.

Space 5: Digital Creative Laboratory. Open to young designers and students, the space regularly hosts workshops in digital art, industrial design, AI-based visual creation, AR, and industrial culture, transforming industrial heritage from a historical display venue into a platform for contemporary creation.

Space 6: Canal Night Tour and Digital Public Art Zone. Low-intervention digital art nodes are established along the canal edge and building facades, forming a nighttime experience route extending from the interior of the district to the canal landscape.

In the specific route organization, the complete visitor sequence follows "entrance recognition—historical understanding—production experience—personal memory—creative participation—waterfront extension." Visitors first obtain a site map and timeline information in the Canal Memory Entrance Zone, then enter the Industrial Heritage Exhibition Zone to understand buildings, equipment, and production processes, followed by the Immersive Industrial Theater for a sensory experience. They then move into the Workers' Memory Zone, where macro-level industrial history is connected to individual lives. Finally, the route passes through the Digital Creative Laboratory and reaches the canal waterfront, returning the visit from interior exhibition spaces to the urban

public realm. The route thus forms a progressive relationship from cognition to experience and from history to the present.

To accommodate differences in visitor dwell time, three route modes are provided. The first is a basic route of approximately 45–60 minutes, including the entrance, industrial exhibition, immersive theater, and waterfront as four core nodes. The second is an in-depth route of approximately 90–120 minutes, adding workers’ memory, AR tasks, digital archives, and creative-laboratory content to the basic route. The third is a nighttime experience route focusing on building silhouettes, localized lighting, the canal interface, and digital public art. The three routes share major nodes but differ in information depth and experiential pacing, increasing adaptability to everyday tourism, educational study activities, and nighttime consumption.

The route design follows the principles of pedestrian priority, continuous accessibility, and appropriate separation of operational traffic. Major pedestrian routes should minimize unnecessary backtracking, with recognizable nodes placed at turns, indoor–outdoor transitions, and important junctions. Logistics, equipment maintenance, and commercial-supply routes should avoid peak visitor nodes wherever possible. Differences in level, thresholds, and narrow passages should be supplemented by ramps, continuous handrails, rest seating, and accessible information signage so that digital experience remains consistent with physical accessibility.

The overall experience route forms five stages: “see heritage—understand heritage—enter heritage—participate in heritage—re-create heritage.” The route emphasizes user behavior rather than simply arranging equipment.

2.7 Architectural Exterior and Facade Renewal Design

The exterior architectural image is the first interface perceived by visitors entering an industrial heritage district. The goal of facade renewal is therefore not to make old factories “look new,” but to improve public legibility, user comfort, and digital display capacity while retaining traces of time. The proposal adopts a four-level intervention method of “preserve—repair—add—activate.” Walls, roof profiles, openings, and industrial components of historical value are primarily preserved, cleaned, and repaired only where necessary. Areas affecting safety and use are minimally updated. New components remain clearly distinguishable from the old architecture, while digital media provide nighttime identification and content updating through removable interventions.

At major entrances and important factory facades, restrained light-steel frames, canopies, perforated metal panels, translucent layers, or freestanding signage structures can be added to carry the district name, node numbers, event information, and digital projection equipment. These additions should not imitate the construction methods of the old buildings, but use simple contemporary industrial materials that contrast with existing red brick, concrete, and steel, making the relationship between old and new clearly legible. For existing commercial storefronts, overly standardized advertising signs and high-brightness screens should be controlled through unified rules for sign scale, installation position, brightness, and color temperature, ensuring that commercial information remains subordinate to the overall image of the industrial heritage district.

Facade colors should be based on the existing neutral palette of brick red, concrete gray, and dark-gray steel. New interventions should avoid large areas of highly saturated color, limiting accent colors to small identification areas such as entrance signage, wayfinding codes, and interactive nodes. Material selection

should emphasize durability, replaceability, and recyclability, including light steel, perforated metal, weather-resistant materials, and transparent or translucent panels. Repaired old walls should retain appropriate mottling, repair traces, and material differences so that the “layer of time” becomes part of the visual content rather than being erased through uniform repainting.

Nighttime facade lighting should adopt a strategy of “silhouette recognition + key nodes + low-luminance digital content.” Sawtooth roofs, chimneys, major entrances, and canal-facing facades are emphasized through linear lighting, wall washers, or programmable localized illumination that outlines the industrial structure. Ordinary walls remain at lower brightness to avoid uniformly lighting entire buildings. Digital projection appears only during event periods and on designated surfaces, featuring historical photographs, factory names, timelines, production graphics, and artistic creations. This creates a changeable nighttime image while preserving the material texture of the architecture.

2.8 Landscape Space and Industrial Memory Node Design

Landscape renovation centers on making “industrial memory inhabitable and stayable.” Unlike conventional park-style greening, the proposal does not treat increased greenery or formal landscape composition as its sole goals. Instead, site paving, industrial components, plants, seating, lighting, and digital information jointly organize movement and pause. The landscape system is divided into five types: entrance-identity landscape, factory street-and-alley landscape, courtyard rest landscape, industrial memory nodes, and canal waterfront landscape, making outdoor space an important component of the industrial narrative.

An open Industrial Memory Plaza is proposed at the entrance. The paving can translate verifiable historical site plans, dates, or textile-production logic into

linear patterns and embedded markers. Factory names, dates, major buildings, and route information can be locally incorporated to create the first layer of understanding before visitors enter the district. Entrance structures should control their height and mass so as not to block views of the original factory buildings, while also reserving space for temporary exhibitions, festivals, and guided-tour gathering.

The streets, alleys, and courtyards between factory buildings should support a “read while walking” experience. Continuous ground guidance lines, node numbering, and material changes can guide circulation, while small stopping points can be placed at corners, near old equipment, and at factory entrances. Landscape seating, railings, waste-sorting facilities, and shading structures should adopt a unified industrial language, such as simple steel frames with timber or recycled-material seating surfaces, meeting contemporary needs while avoiding pseudo-historic styling. Old components that can be safely retained can be interpreted through information panels, QR codes, or AR overlays, linking landscape facilities to industrial remains.

Planting design emphasizes “letting architecture remain the protagonist.” Trees and shrubs should be controlled in major sightlines and in front of historic facades to retain clear building silhouettes. Rest areas can use canopy trees, shade-tolerant groundcovers, and ornamental grasses to provide moderate shade and seasonal variation. Plant species should be selected for their suitability to Changzhou’s climate, low maintenance, and long-term stability. Overly refined formal flower beds should be avoided so as not to weaken the industrial character of the site. Rain gardens, permeable paving, and sunken green areas can be introduced locally to improve the outdoor microclimate and integrate ecological strategies naturally into the site.

The canal waterfront is an important interface where the district transitions from internal industrial narratives to urban public life. The design can provide continuous slow-mobility paths, waterside seating, viewing platforms, and low-level night lighting, connected to the digital public-art nodes of Space 6. Waterfront digital media should remain low-intervention, using sound triggers, mobile AR, localized projection, or updatable information lightboxes so that visitors can understand the relationship among water transportation, industrial production, and urban development while viewing the canal.

2.9 Route Planning and Spatial Circulation Organization

Route planning follows the principles of “clarity, continuity, and choice.” Industrial heritage districts are spatially complex, and treating all functions equally can weaken visitors’ sense of direction and cause core content to be missed. The proposal therefore establishes a hierarchical system of “one primary loop, several themed secondary routes, and one night route.” The primary loop provides first-time visitors with a complete understanding of the site, the secondary routes support in-depth visits and thematic activities, and the night route uses the canal edge and architectural lighting to create an experience distinct from daytime visiting.

The primary loop is recommended to connect the following spaces in sequence: Canal Memory Entrance Zone—Industrial Heritage Exhibition Zone—Immersive Industrial Theater—Workers’ Memory Zone—Digital Creative Laboratory—Canal Night Tour and Digital Public Art Zone, before returning to the district’s public activity space. Continuous ground coding, wall numbering, and digital maps establish orientation between nodes. For buildings that are unsuitable for long-term public access, information can be supplemented through

external AR recognition or digital display windows, avoiding unnecessary opening or alteration of the heritage fabric merely to complete the route.

Themed secondary routes can be further divided into an “Industrial Architecture Observation Route,” “Workers’ Memory Route,” and “Digital Interactive Learning Route.” The Industrial Architecture Observation Route focuses on sawtooth roofs, red-brick facades, steel structures, equipment, and typical factory interiors. The Workers’ Memory Route connects oral histories, old photographs, sound points, and spaces related to everyday life. The Digital Interactive Learning Route includes task points, recognition points, and workshops and is particularly suitable for student groups. By overlaying different routes, the district can accommodate multiple visitor purposes without changing its overall spatial structure.

Pedestrian movement should dominate the traffic organization, while bicycles and necessary vehicles should be managed by time restriction or zoning to reduce conflicts with visitors. Major entrances, parking arrival points, accessible entrances, public restrooms, rest areas, and emergency evacuation directions should be uniformly identified within the wayfinding system. Appropriate buffer areas should be provided in front of core exhibition and immersive spaces to prevent queuing from blocking principal streets and alleys. During peak events, digital reservations, real-time crowd information, and temporary directional signage can be used to adjust routes and improve operational flexibility.

2.10 Wayfinding System and Visual Identity Design

The wayfinding system is the fundamental medium connecting physical space and digital content. The overall visual language draws from industrial numbering, textile warp-and-weft lines, equipment nameplates, and factory structures, but does not directly reproduce historical graphics. Instead, these

elements are translated into a concise contemporary information system. Wayfinding is organized into six levels: district overview, directional guidance, building numbering, heritage interpretation, digital interaction markers, and safety/service information. Typography, color, iconography, and installation height remain unified throughout.

Overview maps should be placed at major entrances and key junctions, using a structure of “You Are Here + Recommended Route + Estimated Time + Accessibility Information.” Buildings and landscape nodes should use continuous numbering fully corresponding to the mobile digital map. By scanning QR codes or touching NFC points, visitors can access the historical archives, old photographs, audio, and AR content associated with each building. Visitors without smartphones should still be able to complete the basic visit through physical text and graphics, preventing the digital system from becoming a new barrier to use.

To support cultural-tourism communication, major wayfinding and core exhibition content should be bilingual in Chinese and English, while controlling text volume and information hierarchy. Historical interpretation should use concise headings, short paragraphs, and graphic support, with in-depth materials transferred to the digital interface. Nighttime wayfinding should remain legible through low-luminance self-illuminated elements, reflective materials, or localized lighting coordinated with the architectural nightscape, avoiding a commercialized neon appearance.

2.11 Integrated Indoor–Outdoor Digital Media and Landscape Interaction

To avoid the fragmentation in which “the interior becomes a digital exhibition while the exterior remains an ordinary landscape,” the proposal distributes digital media according to visitor behavior across entrances, routes, building facades,

factory interiors, and waterfront spaces. The entrance establishes the historical framework; outdoor routes provide orientation and fragmented information; indoor spaces offer in-depth interpretation and immersive experience; and after visitors leave the exhibition spaces, waterfront sound, AR, and night lighting extend the narrative back into the urban environment. This creates a continuous media rhythm of “preview—entry—immersion—reflection—sharing.”

Digital content management should adopt a unified backend logic, while each space draws only the content relevant to its own node. For example, the same historical photograph can serve as chronological evidence in the entrance timeline, be overlaid on the existing building in an AR guide, connect to a personal story in the Workers’ Memory Zone, and be transformed into short-duration visual content in nighttime projection. This approach reduces duplicated production while maintaining information consistency across different media.

In equipment layout, outdoor systems should prioritize weather resistance, low luminance, removability, and ease of maintenance. Indoor immersive spaces can use higher-performance projection, positioning, and sound-field systems, but interventions to historic structures should be reduced through concealed wiring, reversible suspension, and independent supports. Both landscape and digital equipment should reserve maintenance routes and replacement conditions, ensuring long-term operability and maintainability.

2.12 Phased Implementation and Operational Renewal Recommendations

Because industrial heritage renovation involves conservation, operation, and technical maintenance, a phased implementation strategy is recommended. The first phase should prioritize foundational work, including the organization of historical materials, surveys of existing buildings and landscapes, clarification of the primary visitor route, entrance wayfinding, repair of key facades, and

establishment of the digital archive framework. These interventions involve relatively stable investment and can immediately improve site recognition. The second phase should construct the Immersive Industrial Theater, AR navigation, Workers' Memory Sound Map, and major landscape nodes to establish a complete digital experience. The third phase can then expand night-tour content, digital public art, youth creative programs, and temporary exhibitions according to operational feedback.

For content renewal, a cycle of “historical-content review—digital-content production—spatial publication—visitor feedback—regular updating” should be established. New historical materials should be verified for source reliability before entering the digital archive, while interactive installations and event content can change through quarterly or annual themes. In this way, industrial heritage renewal shifts from one-time construction toward long-term content operation, allowing architectural appearance, landscape spaces, route systems, and digital media to be continuously adjusted according to the evolving needs of the district.

Chapter 2 Summary

Based on the historical, spatial, and operational foundations of Canal No. 5, this chapter proposes an integrated environmental renovation plan empowered by digital media. The goal is not to increase the number of devices or simply renew building surfaces, but to establish a complete industrial-cultural narrative system and continuously experienceable public space. The proposal operates across multiple dimensions, including digital archives, conservation-oriented facade renewal, entrance identity, landscape space, hierarchical routes, wayfinding systems, immersive imagery, AR reconstruction, sound maps, interactive tasks, nighttime lighting, and digital creative platforms, enabling the material

information, historical memory, spatial experience, and contemporary use of industrial heritage to work together. It ultimately constructs a design model of “protect authentic space—optimize the external environment—organize continuous routes—supplement information digitally—activate experience interactively—continuously update content,” providing a design basis for transforming Canal No. 5 from a cultural and creative district into an industrial heritage public cultural space that can be read, experienced, and participated in.

Conclusion

The core issue in industrial heritage renewal is not simply changing building functions, but determining how cultural meaning can continue to be produced and communicated under new social conditions. The case of Changzhou Canal No. 5 shows that the first transformation of industrial heritage value has already been achieved through architectural repair, functional replacement, and cultural and creative industries. Digital media make a second transformation possible: from the “reuse of industrial space” toward the “re-experience of industrial memory.”

Through comparison of real-world cases, this thesis finds that Zollverein in Germany emphasizes digital navigation and multimedia information systems; Shougang Park in Beijing emphasizes the integration of large industrial structures and immersive digital imagery; Huaxin 1907 emphasizes AR, AIGC, and gamified experiences; and SantralIstanbul demonstrates deep integration between XR and large-scale industrial space. Together, these cases show that digital technologies can increase the visibility, comprehensibility, and participatory potential of industrial heritage, but technology alone does not automatically produce cultural value. Digital technology has significance for

heritage conservation and cultural communication only when its content is based on authentic historical materials and spatial characteristics.

Accordingly, the future renovation of Canal No. 5 should follow six interrelated directions. First, establish a complete and reliable digital archive of industrial heritage. Second, carry out conservation-oriented facade renewal while preserving the original red-brick factories, sawtooth roofs, industrial components, and material traces. Third, improve landscape public spaces using the entrance plaza, factory streets and alleys, courtyards, and canal waterfront as the spatial framework. Fourth, organize clear visitor routes and wayfinding through a “primary loop + themed secondary routes + night route.” Fifth, use existing buildings and equipment as authentic narrative interfaces for AR, immersive imagery, sound maps, and interactive tasks. Sixth, establish a sustainable updating mechanism through unified content management, public co-creation, and phased operation. In this way, digital media, architectural renewal, landscape design, and route planning can jointly serve the renewed communication of the cultural value of industrial heritage.

References

- [1]Yang Z ,Li X ,An Q , et al. A Study on Spatial Narrative Strategies of China’s National Industrial Heritage: The Case of Nantong Guangsheng Oil Mill[J].Buildings,2026,16(7):1457-1457.DOI:10.3390/BUILDINGS16071457.
- [2]Wenjuan H ,Weidong G . Optimization of Design Resources in the Transformation of Industrial Heritage Space Environment[J].Information Resources Management Journal (IRMJ),2026,39(1):1-18.DOI:10.4018/IRMJ.406560.

- [3]Wang X ,Chen X ,Yang C , et al. Decoding perceptions and behavioral preferences in industrial heritage landscapes: a multi-source study of Shougang Park, Beijing.[J].Scientific reports,2026,DOI:10.1038/S41598-026-58997-8.
- [4]Alavi P ,Mashhadi J A ,Rouhparvar K , et al. A process model for industrial heritage adaptive reuse: integrating environmental remediation and structural assessment[J].International Journal of Building Pathology and Adaptation,2026,44(7):1843-1861.DOI:10.1108/IJBPA-09-2025-0244.
- [5]Bahrami B ,Samani E A F ,Nasirzadeh S . Regeneration of Polluted Urban Landscape Through Post-industrial Site Museum Design[J].International Journal of Environmental Research,2026,20(5):258-258.DOI:10.1007/S41742-026-01214-1.
- [6] Wang Wangming, Xiong Hao. Research on Balancing Architectural Heritage Conservation and Sustainable Utilization: Design Practice Centered on Industrial Heritage Transformation [J/OL]. China Architecture Knowledge Repository, 1–7 [2026-09-15]. <https://doi.org/10.27003/j.cnki.jhhs.20260831.003>.
- [7] Xu Mingwan. From “Industrial Rust Belt” to “Life Showcase Belt”: The Revitalization of Jilin Industrial Heritage from the First Five-Year Plan Period [N]. Gansu Science and Technology Daily, 2026-08-19(005).
- [8] Shen Mingjing, Sun Zhe, Yu Gang. Industrial Heritage Transformed into a “Cultural Back Garden”: Urban Renewal of the Historic and Cultural District of Xiangyang No. 609 Research Institute [N]. Xiangyang Daily, 2026-09-08(001).
- [9] Yang Xiaomei. Xi’an Explores a New Path for Integrated Development of “Industry + Tourism” [N]. All Circles Herald, 2026-07-24(003). DOI:10.28265/n.cnki.ngjdb.2026.000984.

- [10] Qi Yisheng, Bai Hua. From Industrial Rust Belt to Fashion Showcase: Industrial Heritage Renewal Practice at Chengdu Eastern Suburb Memory [N]. China Tourism News, 2026-07-22(001). DOI:10.28109/n.cnki.nclyb.2026.001849.
- [11] Li Sifan, Pei Mengjia, Hou Huiting, et al. Research on Cultural and Creative Product Design Empowered by Industrial Heritage and Cultural Genes in Anshan [J]. Screen Printing Industry, 2026, (7):103–105.
- [12] Qiu Yingyi. Empowering Immersive Experience through Formal Design [J]. Journal of Art and Design, 2026, (10):15–17.
- [13] Wang Zhe. A New Narrative of Industrial Memory: From Production Lines to Scenic Lines—Industrial Tourism Rewrites the Value of Labor [J]. Chinese Workers, 2026, (8):22–27.
- [14] Zheng Yiran, Yuan Shuai. Research on the Conservation and Reuse of Industrial Buildings under the Concept of Regenerative Architecture [J]. Architecture & Culture, 2026, (8):179–181. DOI:10.19875/j.cnki.jzywh.2026.08.056.
- [15] Wang Xuejie. Integration Design of Lacquer Art in Art Installations from the Perspective of Immersive Experience [J]. Shoe Technology and Design, 2026, 6(15):120–122.
- [16] Chen Qian, Luo Zhixia, Deng Jingwen. Research on Spatial Value Misalignment and Its Formation Mechanism in Historic Towns Driven by Digital Media: A Case Study of Xizhou Ancient Town, Dali [J]. South Architecture, 2026, (8):92–106.

- [17] Li Xiaonan, Liu Yuou. Digital-Intelligent Interpretation of Visual Symbols of Industrial Heritage in Northeast China [J]. Culture Journal, 2026, (7):35–40.
- [18] Chen Ye. Research on the Conservation and Renewal of Industrial Heritage in Changzhou [J]. Shanxi Architecture, 2026, 52(19):31–34. DOI:10.13719/j.cnki.1009-6825.2026.19.007.
- [19] Ruan Heping. Research on Immersive Emotional Experience Game Design Based on VR and Digital Olfaction [J]. Journal of Art and Design, 2026, (11):79–81. DOI:10.27066/j.cnki.yssjxk.2026.11.018.
- [20] Cao Yixia, Zhuang Shuhan. How Can Intelligent Technology Make Industrial Heritage “Live” in the Present? [J]. Shanghai Informatization, 2026, (7):24–28.
- [21] Zeng Yuqi, Jin Xi. Research on Industrial Heritage Revitalization Strategies Based on Space Syntax: A Case Study of Shenzhou Shipyard in Guazhizhou, Xiangtan [J]. Hunan Packaging, 2026, 41(4):105–108. DOI:10.19686/j.cnki.issn1671-4997.2026.04.025.
- [22] Qiao Xiujuan, Han Chao, Du Yifan, et al. Research on the Construction of Themed Routes for Industrial Heritage Cultural Relics [J]. Journal of Arid Land Resources and Environment, 2026, 40(10):129–141. DOI:10.13448/j.cnki.jalre.2026.168.
- [23] Li Man. Construction Paths for a High-Quality Demonstration Brand of Liaoning Industrial Heritage Driven by Digital Twins [J]. Journal of Liaoning Economic Vocational Technological Institute / Liaoning Economic Management Cadre Institute, 2026, (3):61–64.

- [10] Kurnaz A, Anıktar S. From Power Plant to Energy Museum: Spatial Perception of SantralIstanbul[J]. Digital International Journal of Architecture Art Heritage, 2023, 2(2).
- [11] Zollverein. Portal of Industrial Heritage[EB/OL].
- [12] Zollverein. Digital World Heritage[EB/OL].
- [13] Shougang Group. RE Rui·No. 3 Blast Furnace Digital Museum at Shougang Park to Open During the National Day Holiday [EB/OL]. 2025-09-19.
- [14] Shougang Group. Six-Dimensional Symphony: Gathering Synergy and Building a New Highland for Future Industries [EB/OL]. 2026-03-25.
- [15] Huangshi Municipal People’s Government. Materials on Digital Display and Metaverse Projects Related to Industrial Heritage at Huaxin 1907 [EB/OL]. 2025–2026.

ANNEX A. (Tables and diagrams)



01



Research background and significance

I. Research Background

The renewal of industrial heritage is evolving from "space reuse" to "experience reproduction"

Urban renewal shifts towards optimizing existing stock

The old factory area is no longer just a target for demolition and reconstruction, but a public cultural resource that carries the memory of the city and local identity.

Industrial heritage requires cultural interpretation

The architecture, equipment, production processes, and workers' memories are scattered and need to be organized into an understandable narrative system through design.

Digital media provides a new interface

Digital imaging, AR/VR, interactive projection, sound maps, and digital guides can bring historical information back to the scene.



Significance of the Study



Research significance: On the basis of protecting the authenticity of existing factories, equipment, and historical environments, a media system of "heritage body - historical information - spatial experience - public participation" is established.

Object of research



Renovation of industrial relics left over from the city

Starting from the new paths provided by digital media, with features such as "immersive experience", "dynamic interaction", and "data-driven", it can solve the problem of industrial heritage revitalization and achieve "dynamic reconstruction".

城市遗留工业遗迹的翻新

从数字媒体提供的新途径出发，借助“沉浸式体验”、“动态互动”和“数据驱动”等特点，可以解决工业遗产的振兴问题，实现“动态重建”。



02

Research status



Case Study

The Star Immersive Experience Space



This innovative platform transports art out of the gallery context and into the public realm. As meditative as it is spectacular, visitors are welcomed into an immersive moment that surrounds and envelops,





Case Study

The Star Immersive Experience Space



The immersive experience stems from a 25m, 8k resolution, interactive digital canvas at the centre. Curated to the human rhythm, the canvas expresses Sydney's light and movement through the digital artworks of local and international artists, animators and cinematographers.



Case Study

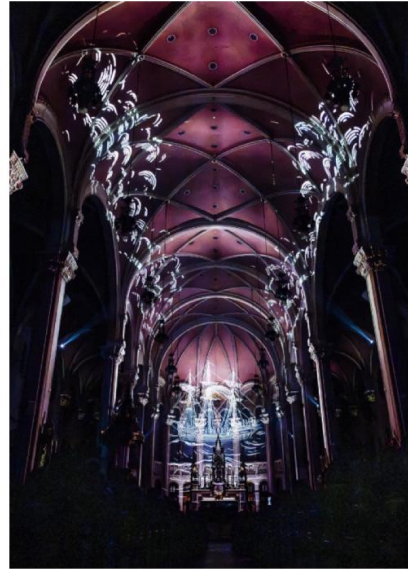
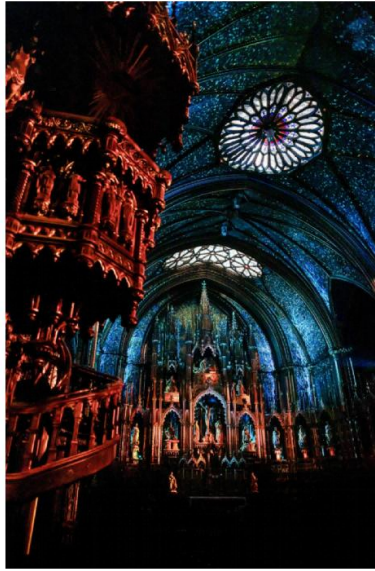
Montreal



These immersive experiences breathe new life into heritage sites after dark, transforming their indoor spaces by illuminating centuries of tradition, artistry, and craftsmanship in new and unexpected ways.



Fusion of historic ornament and digital imagery

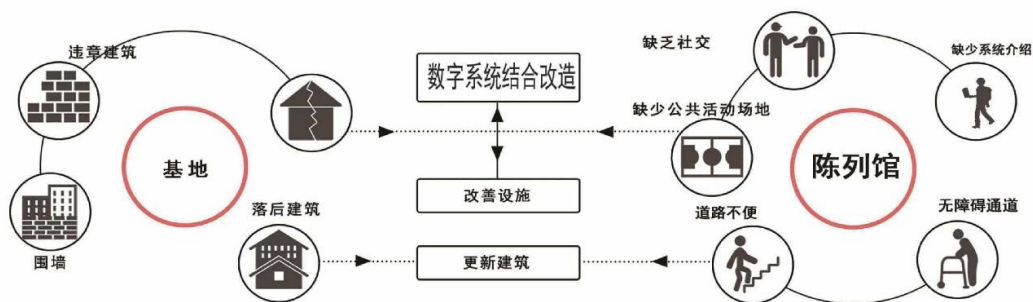


Problems in the surrounding area

- 01 Degradation of building performance
- 02 Lack of barrier-free facilities
- 03 Mixed traffic in the neighborhood
- 04 Spatial chaos and scarcity
- 05 The safety management is worrying
- 06 Loss of community culture



transformation strategy



研究主旨

工业遗产改造策略

通过整合工业遗产、协同发展、设计改造，提出可行的工业遗产改造设计策略、设计规划理念和设计原则

设计思路理论支撑

完善工业遗产改造的设计思路 and 理论支撑

Industrial Heritage Renovation Strategy

By integrating industrial heritage, fostering collaborative development, and engaging in design transformation, we propose feasible strategies, planning concepts, and principles for the renovation of industrial heritage

Design Approach & Theoretical Foundation

We aim to refine the design approach and theoretical foundation for the renovation of industrial heritage



03

Chronological boundaries of the research

Chronological boundaries of the research

Focusing on the construction practices of industrial heritage in China in recent years, the latest research findings on industrial heritage are based on the policies issued by the government at present.

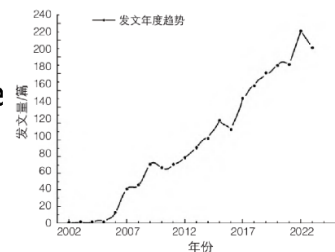


图3 2002—2023年工业遗产改造期刊发文年度趋势



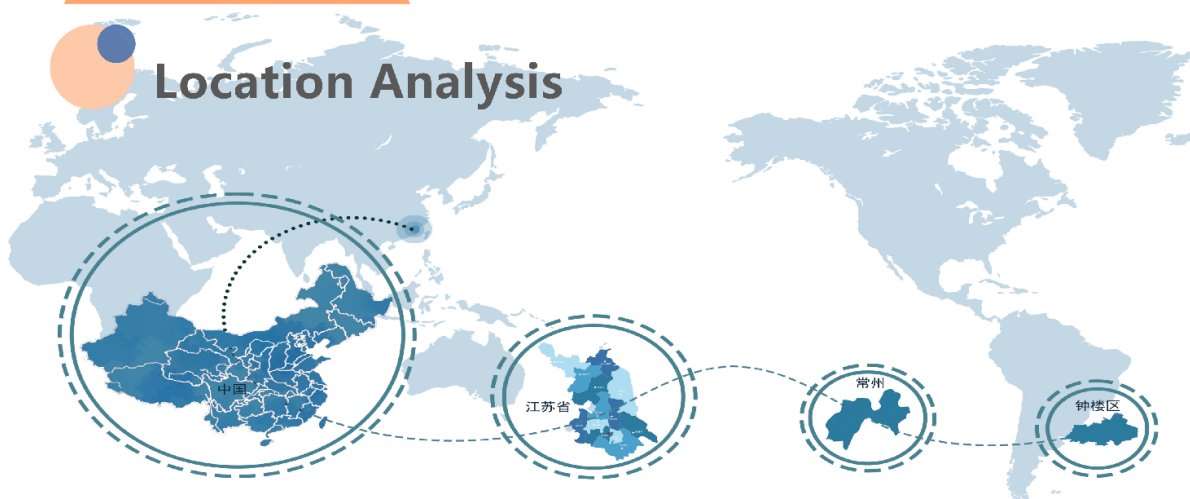


04

Geographical boundaries of the research



Location Analysis



Canal No.5 Creative District is located on Sanbao Street in Changzhou City, on the south bank of the Beijing-Hangzhou Grand Canal. It serves as a crucial node in Changzhou's implementation of the "Central Area Improvement" strategy and the construction of the "Canal Historical and Cultural Industrial Belt".



current situation overview



scene

Conduct research on the Changzhou Hengyuanchang and its surrounding areas



景观分析 / Landscape Analysis

常州市·城市景观结构与生态空间研究 / CHANGZHOU · URBAN LANDSCAPE STRUCTURE AND ECOLOGICAL SPACE STUDY

景观格局 | 水绿交织 | 生态廊道 | 开放空间

LANDSCAPE PATTERN | WATER-GREEN NETWORK | ECOLOGICAL CORRIDOR | OPEN SPACE



图例 / Legend



水绿相依·景观共生

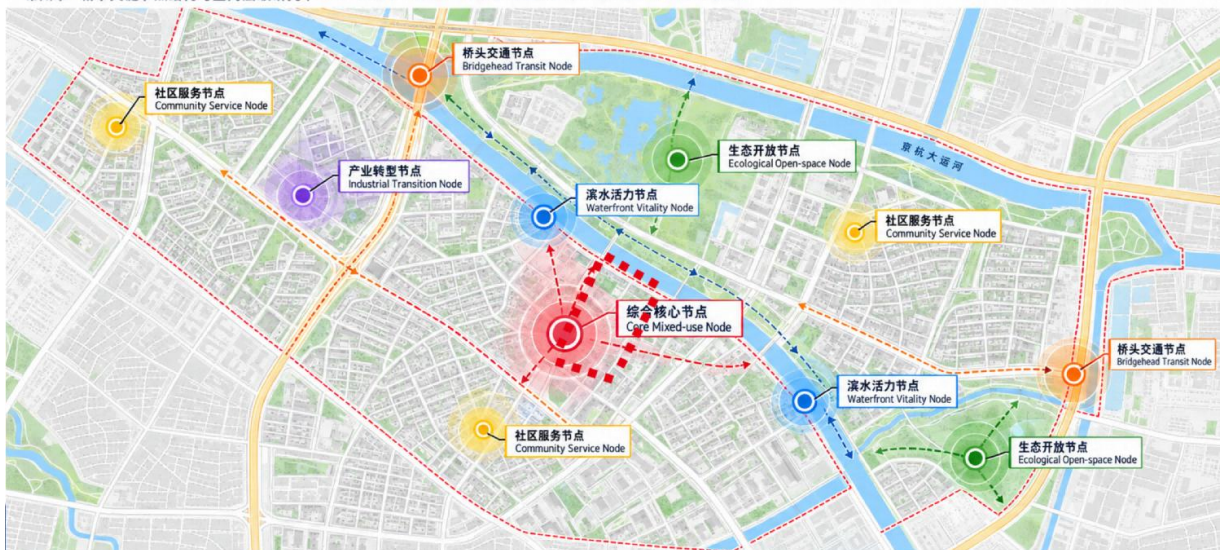
INTERWOVEN ECOLOGY · USABLE LANDSCAPE

节点分区分析 / Node Zoning Analysis

常州市·城市关键节点结构与空间层级研究 / CHANGZHOU · URBAN NODE STRUCTURE AND SPATIAL HIERARCHY STUDY

节点层级 | 枢纽联系 | 滨水活力 | 空间引导

NODE HIERARCHY | HUB CONNECTIONS | WATERFRONT VITALITY | SPATIAL GUIDANCE



图例 / Legend



节点联动·空间协同

CONNECTED NODES · COORDINATED SPACE

城市肌理分析 / Urban Texture Analysis

常州市 · 城市空间与建成环境研究 / CHANGZHOU · URBAN SPACE AND BUILT ENVIRONMENT STUDY

城市肌理 | 水城格局 | 生态网络 | 宜居生活
URBAN TEXTURE | WATER CITY PATTERN | ECOLOGICAL NETWORK | LIVABLE CITY



图例 / Legend

建筑实体 Building Mass 水系 / 河道 Water Body 道路 / 开放空间 Road / Open Space 绿地 / 公共空间 Green Space 研究范围 (研究) Study Area (Approx.)



水网交织 · 城市共生
INTERWIND WATERS · A MORE LIVABLE CHANGZHOU

道路系统分析 / Road Network Analysis

常州市 · 城市道路结构与通达性研究 / CHANGZHOU · URBAN ROAD STRUCTURE AND CONNECTIVITY STUDY

道路等级 | 交通骨架 | 桥梁联系 | 滨水界面
ROAD HIERARCHY | MOBILITY FRAMEWORK | BRIDGE CONNECTIONS | WATERFRONT EDGES



快速路 / Expressway 主干路 / Primary Arterial 次干路 / Secondary Road 支路 / Local Street 水系 / Water Body

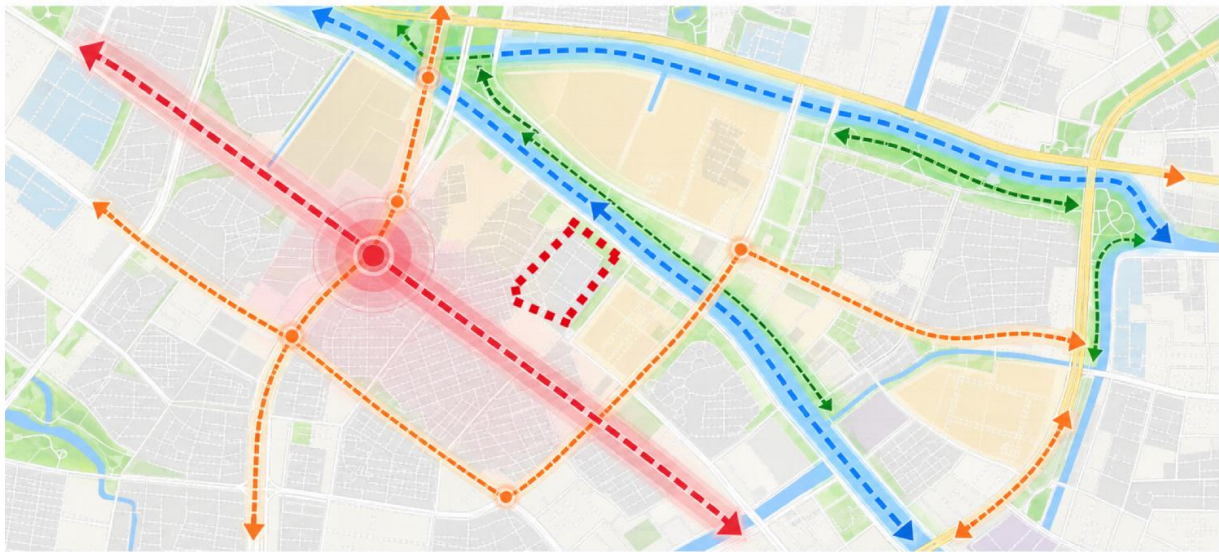


路网组织 · 水城联动
CONNECTED STREETS · WATER-ORIENTED CITY

轴线分析 / Axis Analysis

常州市·城市空间轴线结构与发展引导研究 / CHANGZHOU · URBAN AXIS STRUCTURE AND DEVELOPMENT GUIDANCE STUDY

空间轴线 | 滨水引导 | 功能联动 | 结构整合
SPATIAL AXIS | WATERFRONT GUIDANCE | FUNCTIONAL LINKAGE | STRUCTURAL INTEGRATION



图例 / Legend

主发展轴 Primary Development Axis
次级轴线 Secondary Axis
滨水轴线 Waterfront Axis
生态开放轴 Ecological Open-space Axis

核心协调区 Core Coordination Zone

发展引导区 Development Guidance Zone

水体 Water Body

绿地开放空间 Green/Open Space

轴线引导·空间整合
AXIS-LED STRUCTURE · INTEGRATED SPACE







