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Study on Reconstruction of Digital Media impowered Industrial Heritage under Urban renewal (Taking Changzhou Canal No.5 as an example)

Qualification work for obtaining the SVO«Master»

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The qualification work contains the results of one's own research

The use of ideas, results and texts of the rauthorsmustbe referencedtothe appropriatesource.

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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,andlife inhistory butalso forms an indispensablepart 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 reconstructionof industrialheritage inurbanrenewal.The industrialheritage 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 ofdisplayingtheindustrialheritage intoanactive mediainidentifyingthevalues of industrial heritage, interpreting historical information, organizing spatial narrative,creatingenvironmentalexperience,andpromotingpublicparticipation.
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 ChangzhouNo.5WoolTextileFactoryandCanalNo.5CreativeDistrict,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 CanalNo. 5 Creative District by carryingout low-impact,reversible, andlayered 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. ResearchTheme

This research revolves around the fundamental issue about how the use of digital mediamay facilitatethe reconstructionof industrialheritage undertheprocessof 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,historicalmemories ofproductions,spatialnodes,andpublic 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, whathistoricalinformationdigitalmediacanconvey, whatrelationshipstheycan create, and how they contribute to urban renewal.

2. ResearchObject

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.

Theresearchobjectscontainthreeaspects,eachconnectedwiththeother.

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, andcommunication createdbythe combinationof 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. ResearchPurpose

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 whilemaintaining the authentic features of the industrial heritage.

Several problems found in the existing situation include the fragmentation of the historicalinformationaboutindustrialheritage,lackofconnectionsbetween

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. ResearchObjectives

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,todefinetheheritagevaluesandexistingproblemsoftheresearchsite.

By analyzing the history of the site development, its spatial configuration, industrial heritage and current usage of Changzhou No. 5 Wool Textile Factory andCanal No. 5CreativeDistrict, theresearchwilldefine themain valueswhich 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.

Usingthe comparative analysisof therelevantdomestic andforeigncase studies, the research will analyze the ways in which the various digital media technologies(digitalarchiving,digitalnavigation,immersiveexhibition,

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. ResearchMethods

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 inductivereasoningareemployed toexaminetheconceptualrelationshipsamong 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,anddesignpractice,which guaranteesthe theoretical basis of design strategies as well as the specific situation of the research site.

6. ResearchSignificance

Asfortheoreticalresearch,thisresearchtriestobuildabridgebetweenindustrial 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.

Throughthe 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. ResearchInnovations

Fourkeyfeaturesembodytheinnovationthatisbeingadvocatedinthisstudy. 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,movingfromdigitalexhibitiontoanintegratedsystemofexperience.

By providing continuous digital narrative pathways linking entrances, alleys and streets, factory buildings, exhibition space and activity space, the research aimsat 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,integrationofminimalinterventiontheorywithdigitalmediatechnology.

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.

Chapter1LiteratureReviewinChinaandAbroad

CurrentResearchonIndustrialHeritageConservationandReuse

The development of research into industrial heritage conservation has been developing from conservation of individual buildings to regional cultural landscape conservation, as well as from conservation of material entities to the preservation of social and cultural values. Industrial heritage values areembodied not only in architectural structures, machinery, and productive facilities, but also in the spatial structure resulting from industrial production, memories of labor, technology, and relationships related to urban development. Thus, adaptive reuse has become an important tool for guaranteeing theexistence of industrial heritage. Its key purpose is introducing new functions in preserving the heritage features in order to make heritage transform from “an object to be viewed” into the space actively participating in the urban environment.

The Changzhou Canal No. 5 project is a very good example of such cases. The information from Changzhou Municipal Committee of the Chinese People’s PoliticalConsultativeConferencestatesthatCanalNo.5islocatedatSanbao

Street on the southern side of Beijing-Hangzhou Grand Canal. The project consists of three elements—"canal culture, industrial heritage, and creative industries," as well as conservation and reuse of industrial heritage such as the former Changzhou No. 5 Woolen Textile Mill or Hengyuanchang Factory. The total size of the first phase of the site is 36,388 sqm and construction area is 32,000 sqm, including several buildings of different years and typical textile factories of sawtooth-roof type. The experience sharedby National Development and Reform Commission demonstrates that Canal No. 5 has been able topreserve industrial constructions, machines, and documents during the conservation and reuse process. Moreover, the industrial heritage was revived and used for the organization of events such as cultural, artistic, and design.

Thus, it is necessary to say that the first stage of transformation of Canal No. 5 from the space of industrial production into the cultural and creative cluster has been completed. The following question will not be "how to use old factory buildings," but rather "how to make people understand old factory buildings."

CurrentResearchonDigitalMediaEmpowermentofCulturalHeritage

Technological advances in digital media give rise to new modalities in documenting, presenting, communicating, and interacting with cultural heritage. 3D scanning technology permits the establishment of digital databases of buildings and machines, GIS, and digital maps provide ways for organizing a location of heritage sites, and augmented reality (AR) allows updating historical content in the present-day environment. Virtual reality (VR) liberates people from tangible barriers; projection mapping turns possibility of transforming buildings, machines, and space into interactive channels for narration; and various interactive installations turn the audience into a participant instead of a consumer of the information. In recent years, Chinese studies are directed to the combination of digital preservation and digital storytelling. Du Yi states in her research "Internet + Industrial Heritage" that digitalization of industrial heritage leads to a transformation of values with the help of resource mining, connection, andcommunicationmatrices.Inaddition,LiangXufangandCaiXujiexplorethe issues of First Automobile Works District in Changchun and describe such methods of storytelling as digital storytelling, participatory storytelling, and transmediastorytelling.Consequently,theabovestudiesshowthatmediavalue

isnot onlyits ability toimprove a visual aspect of informationbut also its ability to create a new relationship between the information and its audience.

The view about designing space from digital media technologies perspective signals that when we build any space, we need to design the space itself including scale of space, distance of observation, stops, lighting conditions, circulation, placementofdevicesandorganizationofinformationinlinewiththe capabilities of digital technologies.

Newdigitaltechnologieschangethewaywedocument,share,communicate,and interact with our cultural heritage. In particular, 3D scanning helps to create authentic databases of buildings andother objects.GIS andmaps help to manage spatial distribution of heritage objects. Augmented reality superimposes the historical data on the actual environment. Virtual reality removes the limitations of physical space. Projection mapping turns any building, mechanism or space into an interface for storytelling purposes. Interactive installations allow the audience to participate in the storytelling process instead of merely receiving it externally.

In recent times, Chinese researchers have largely focused on combining digital conservation with digital storytelling. In this regard, Du Yi in his work "Internet+Industrial Heritage" highlights that the digitization of industrial heritage requires rethinking its value through resource mining and creation of interconnections and communication matrix. In their work on the historic and culturaldistrict of FirstAutomobile Works in Changchun,LiangXufang andCai Xujiapropose methods such as digital storytelling, participatory storytelling, and transmedia storytelling. All in all, these studies prove that digital technologies change the relationship between the information about heritage and its audience substantially.

For the design discipline, this shift carries important implications. Designers must consider digital media technologies during the spatial design process. They shouldnot treat these technologies asdisplay add-ons installed afterarchitectural construction is complete. Designers must coordinate multiple elements in conjunction with digital media. These elements include spatial scale, viewing distances, stopping points, lighting conditions, circulation routes, equipment placement, and information hierarchy.

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

Case 1: Zollverein Coal Mine Industrial Complex, Germany. As stated on its official web page, the complex of industrial heritage has been reported to utilize multimedia exhibits, interactive information terminals, mobile applications, virtual excursions, and audio guides for the connection of industrial cultural routes, historical buildings, and contemporary usage. Its Industrial HeritagePortal features the past, present, and future of industrial heritage using images, text,andsound,whilethedigitalapplicationsallowfor3Dmaps,thematicroutes, and historical information to be available. The case signifies that the digitalmedia can construct a system of information which coincides with the entire complex instead of being limited to a particular exhibition room.

Case 2: Shougang Park, Beijing. According to the Shougang Group sources, the RE Rui·No. 3 Blast Furnace Digital Museum was launched in 2025, getting the core of the No. 3 blast furnace as its key exhibit. Thanks to digital images, AIGC-based reconstruction of historical images and drawings, as well as 2.5D projection, the core of the furnace as well as the walls and floors become topics for immersive visual communication. In 2026, the Shougang Group also started the project of the artificial-intelligence digital museum for industrial heritage where 3D capture was done precisely and VR localization in spaces was done in the best way. The case signifies that large-scale industrial structures become “screens” for the digital communication providing for a symbiotic relationship between digital technology and heritage fabric.

Case 3 : Huaxin1907 Cultural Park, Huangshi,Hubei. According topublications of the Huangshi Municipal Government, Huaxin 1907 has been developing digital technologies in industrial heritage. Digital technologies are deployed in order to create immersive experiences, based on the use of VR technologies along with audiovisual media and electric interaction to tell the story ofindustrial development. Media information available in 2025 indicated an experience of finding treasures of industrial sites, based on using AR technologies, QR codes, AIGC, and mobile gamified technology. This case seemsimportantbycomparingitwithCanalNo.5asitturnsvisitorsfrom

passive observers into active participants of the process through the means of task-oriented digital storytelling.

Case 4 : SantralIstanbul Energy Museum, Istanbul. According to studies, this tourism site is based on the Silahtarağa Power Plant, built in the 1910s, in which the original equipment turbine room and control room was preserved. XR research discovered in 2026 incorporated this space into its experimental setting for using XR experience in industrial heritage context and improving custom experiencebyusinganchoringandinteractionconcepts.Thisprovestheideathat using the big equipment, large-size areas, and multiple-level fields of industrial heritage can form the grammar of spatial organization of XR experiences by themselves.

A comparison of different kinds of digital media empowerment of industrial heritage allows researchers to identify four main categories. First is the type called “digital archive” which is mainly aimed at heritage information preservation. The second type is known as the “digital navigation” one which helps to deal with spatial understanding and route management matters. Thethird type of digital empowerment method refers to the “immersive display” of various visual and auditory reconstructions of certain historical events. Finally, the fourthtype iscalled the “interactive narrative.” In the future, CanalNo. 5 has every possibility of employing them all, however it must avoid excessive technological accumulation.

Case1:ZollvereinCoalMineIndustrialComplex,Germany

The official website of Zollverein provides information on its digital strategies. Multimedia exhibits, interactive kiosks, mobile apps, virtual tours, and audio guides are used on the site. These tools unite cultural routes, monuments, and modern uses of the buildings. The site’s Heritage Portal presents the historical, current and future industrial heritage via pictures, texts, and audio system. In addition, digital technologies will also enable the creation of three-dimensional maps, specific routes, and historical information. The above case proves an important point. Digital devices may provide a continuous information environment across the whole site and not just within one expo hall.

Case2:ShougangPark,Beijing

Shougang Group's materials detail the park's digital projects. In 2025, RE Rui·No 3 Blast Furnace Digital Museum opened that revolves around the main partof theNo.3blast furnace.Themuseumappliesdigitalpictures,AIGC-based visual reconstruction of artifacts and sketches, and 2.5D video projection. Technique-wise, it turns the furnace's base, walls, and floor into visual instruments. In 2026, Shougang Group unveiled a new artificial-intelligence digital museum on industrial heritage that is based on high-level 3D scanningand large-space VR positioning. This case exemplifies another essential aspect. Large industrial structures themselves can serve as the "screens" for digital technologies. Thus, the relationship between digital technologies and heritage material is that of interconnectedness.

Case3:Huaxin1907CulturalPark,Huangshi,Hubei

Public materials made available by Huangshi Municipal Government describe the park's digital developments. Huaxin 1907 continues to develop its digital heritage technologies. The park utilizes VR technologies, audiovisual-electrical interaction, and digital exhibitions for narrating local industrial history. Public reports note in 2025 the additional technologies implemented at the site among which are the treasure hunt based on AR QR codes, AIGC, and games. Thiscase is of special significance for Canal No. 5 since it helps visitors move from passive observation to active engagement in the development process.

Case4:SantralIstanbulEnergyMuseum,Istanbul

Relevant sources published in academic papers tell the story of the development of the museum. The museum was transformed from Silahtarağa Power Plant constructed in the 1910s. The designers preserved the original turbine hall, the controlroom,andthelargeequipment.In2026,anumberofXRstudieswere

carried out in this place. The researchers applied VR technologies in the environment of industrial heritage and worked with the concept of personalized experience through spatial anchoring. The case illustrates the spatial principle of industrial heritage that large resources and spaces can form the spatial grammar of XR experiences.

The comparative analysis outlines four large categories of usage of digital technologiesforindustrialheritage. Thefirstistheone calledthe“digitalarchive type”, which is aimed at preserving heritage content. The second category is the “digital navigation type” that emphasizes space cognition and itinerary composing. The third category is the “immersive display type” intended for visual and audio restoration of the past scenes. The fourth is the “interactive narrative type” which stresses on participation, tasks, games, and user-driven content.It isplannedthatCanal No. 5willincludeallsaidapproaches. However, the designers should refrain from using too much technology.

ResearchonIndustrialHeritageSpatialRenewalandExperienceDesign

Industrial heritage spaces are places with a strong sense of place. They differ greatly from new buildings because of their unique omission of columns, their sawtooth roofs, their dilapidated walls, machinery, piping, and wear. Renovation design should follow several guidelines, including minimal intervention, legibility, reversibility, and communication between the old and the new. Digital media has functions that are difficult to perform through conventional physical methods. For example, projection is able to create various atmospheres of space without changing the surfaces of the building. AR is capable of bringing layersof information without additional walls. VR, on the other hand, reconstructs lost processes, without building the original equipment.

In order to renew an old space, one must build new relationships between space andplace.Theserelationsshouldbeestablishedbyhistorical,cultural,functional, behavioral,andotherfactors.Thesiswritingisorganizedaccordingtothe

following structure: “Introduction—Literature Review—Design Proposal—Conclusion—References—Appendix.” Chapter 2 of this thesis connects design concepts,functional zones,andspecific designsolutions together.The authorsof this thesis will preserve the structural logic of the thesis, but will focus on industrial heritage and digital media in the same frame of reference.

Chapter1 Summary

The literature review and case studies show a clear development of the industry. They show the move from “restoration” to “cultural renewal”. The use of digital media plays a special role in this process. It shifts the emphasis and starts speaking about “experience transfer” instead of “space reuse”. Digital media can becharacterizedbyfourfunctions,namely: preservation,explanation,interaction, and engagement. Canal No. 5 has found its place as a cultural district, now the question becomes how to see and understand the industrial heritage.

Chapter2DesignProposalfortheDigital-Media-EmpoweredRenovationof Changzhou Canal No. 5 Industrial Heritage

SiteOverviewandHistorical-CulturalCharacteristics

The Canal No. 5 Creative District is situated in Changzhou's Zhonglou District on Sanbao Street. The area is located on the Beijing-Hangzhou Grand Canal's southern bank. The Changzhou Municipal Committee of the Chinese People's Political Consultative Conference provides an account of the history of the district. Its creation is based on the combination of several sets of industrial remains. There are the remains of Changzhou No. 5 Woolen Textile Mill, Hengyuanchang Factory, Changzhou Comb Factory, and Changzhou Marine Instrument Factory. In addition to that, there are historical streets and lanes nearby. Theconstructionoftheindustrialsitestartedin2008.Theareaofthesite is approximately 36,388 square meters, and its buildings cover a total of around 32,000 square meters. Some of them were built in the 1930s. The sawtooth-roof building construction fully illustrates the textile industry and preserves its architectural style.

In 2019, the previous site of Hengyuanchang Factory has become a part of a list of national industrial heritage sites. The Canal No. 5 started a combination program,whichintegratesexhibitionactivitiesofartisticcharacter,design,

cultural tourism, and the creative industry into a whole. An announcement made by the Changzhou Municipality in 2023 states that Canal No. 5 is among themost illustrative cases in Jiangsu Province. The case is connected with usage of available objects and money investments in the right way. The occupancy rate of the Industrial District is over 92%. The revenue generated by Canal No. 5 amountedto more than66 millionyuan in 2022.ThesefactsprovethatCanal No. 5 is already at a high level of operational performance. This can be enhanced through digital transformation in the cultural sense without damaging theexisting commercial environment.

The area makes four big groups of cultural resources in total. The first one is the relation between different locations of the canal and industrial complex. The second group is an industrial visual component represented by old factory buildings, sawtooth roofs, chimneys, equipment, and old walls. The third groupissociallyremembered eventsconnected with thetextileindustry, theemergence ofenterprises, and the lives of workers.Lastly, the contemporary culture belongs to the group of new culture.

ExistingProblemsandUserNeeds

Issue one: The information about historical industrial development is scattered over the space. The industrial remains and historical data are gathered at Canal No. 5 facility. Nevertheless, the visitors perceive the space mainly through architectural forms, shops, and artistic activities. Consequently, they do not have anexperienceofinteractingwithindustrialproductionprocessesandthetimeline.

Issue two: There is a gap between static displays and real place. Conventional exhibition panels allow the presentation of texts and images but do not represent an effective means of communication concerning the interrelations between the textile machines, production processes, and factory space.

Issue three: The involvement of the young audience leaves much to be desired. The young generation knows smartphones, short videos, games, and social networks very well. Therefore, industrial heritage communication should move from "viewing exhibitions" to "exploring—interacting—sharing."

Issue four: The use of digital media can dominate over the heritage itself. The activeuseofLEDs,projectors,andcomplexequipmentcanconcealthematerial

characteristics of original industrial architecture. Therefore, it is necessary to minimize the usage of digital devices.

Issue five: The link between outdoor public space and industrial-historical story can become stronger. The standing factory buildings, streets, alleys, yards, and the waterfront already provide a solid spatial foundation for it. However, the entrance, facades, stopping points, and landscape facilities may have different stylistic characteristics, which means that visitors perceive them differently.

Issuesix:Visitormovement andrhythmarenotclear hierarchically. Thedistricts of industrial heritage involve large-scale factories with various types of routes, which leads to numerous transformations between indoor and outdoor spaces. Therefore, it may be difficult for a visitor who came for the first time to selectthe right route.

The user needs can be divided into six groups. These include cognitive needs (quick understanding of site history), experiential needs (immersing in the experience with the help of visual and audio effects), social needs (communicating and sharing the experience with others), spatial identification needs (realizing the site), route organization needs (selecting complete/short routes, night routes depending on visitor's age and time), and sustainable update needs (changing digital content constantly).

DesignConcept

The idea behind the design has been described as the “Digital Canal: RevitalizationofIndustrialMemory.”The primaryaimhere isnot aboutcreating a completely virtual world but about introducing a layer of information that can be activated in real life. The use of digital media makes it possible for the visitor to experience past activities, memory places, and urban development in the buildings of a former factory. Visitors can travel between real space and information about history.

The project creates a general framework that defines the structure. The framework has “one main industrial-memory axis, multiple themed nodes, multiple integrations of indoor and outdoor space.” The industrial-memory axis begins from the main entrance, passes through the main part of the factory, and thengoestotheWorkers’MemoryZone,CreativeLaboratoryforDigital

Development, and to the waterfront of the canal. The themed nodes provide for the realization of functions such as identification, display, immersion, resting, interactive activities, and night tours. That is to say, functions such as therenewal of external architecture, renovation of landscapes, and usage of digital media are no more independent parts of the design.

The narrative is four-layered as follows: “one canal, one factory, one city, one future.” “One canal” is an explanation of the historical canal and how it helped industrialization of Changzhou. “One factory” tells about the No. 5 Woolen TextileMill.“Onecity”isabouturbanizingprocessestakingplaceinChangzhou. “One future” is concerned with the reuse of industrial heritage in the age of digitalization.

DesignPrinciplesforDigitalMediaEmpowerment

1. Authenticity as a priority. The digital content must have grounded proof. Historical records, documents, photographic images, and oral accounts act as objects of proof. Designers must avoid fictional reinventions that have no reference from any source of evidence.

2. Minimalinterference.Digitaltechnologyshouldpreferlightweight,detachable, and movable objects. They shouldn’t leave permanent marks on the important historical monuments and structures.

3. Invisible technology. The technology should perform only as a device of telling a story and should not become a visual subject. Projectors, loudspeakers, sensors, and wiring must be included in the building structure wherever it is possible. The designers can additionally hide them inside reversibly added components.

4. Multi-sensory approach. The visual, sound, light, and motion interaction must be combined according to each of the places. Designers should steer clear of utilizing strong media, making use of it in all of the spaces.

5. Layered information. The typical visitors should be given a brief version of the information. The more involved visitors can access additional knowledge using mobile devices, AR, and digital records.

6. Eco-friendly renewal. A single database of digital content must be created. It must provide constant updates for festivals, shows, and educational activities.

DigitalMediaSpatialRenovationStrategies

Strategy 1: Create "Canal No. 5 Industrial Heritage Digital Archive." Historical documents, photos, equipment, buildings, and historical records must be researched,coded,and classified.Itisnecessary to createbothatwo-dimensional and a three-dimensional database about the heritage of the buildings and equipment as well as to model the important buildings and equipment in 3D. Visitors then will be able to get historical details (date, function, and people involved) through their mobile devices.

Strategy 2: Create "Timeline Entrance." An entrance with low-luminance digital timeline should be organized at the main entrance to the site. The timeline may be organized with the use of wall projection or on translucent digital media. It should illustrate the sequence of “industrial era—factory period—closure and transformation—creative district—digital age.” The timeline should not occupy large space but should serve as the beginning of the visit.

Strategy 3: Create "Immersive Industrial Production Space." One of thebuildingscouldbechosenasthekeyexperientialsite.Projectionmappingshould be arranged to combine the textile production process, machine movements, and worker’s actions with the existing architecture. The visual content should correspond spatially with the column grid, roof trusses, and location of the machinery. Therefore, the building would become a part of the story.

Strategy 4: Create Digital Industrial Heritage Guide. Visitors may scan various buildings,machinesoroldphotographsusingtheirmobiledevicesinordertosee the overlays of historical images with the contemporary space. The lost production equipment may be virtually reconstructed using augmented reality. Authenticand reconstructed partsof equipment may bedistinguishedvisually by the different levels of opacity of the images.

Strategy 5: Create "Workers' Memory Sound Map." Oral histories may be collected in the form of interviews with the local residents, retired workers, or practitioners in the same field. QR codes or near field interaction points may be placedatdifferentlocationsinthedistrict.Peoplemaylistentoworksoundsor

stories related to the particular location. It would create a place-based sound narrative.

Strategy 6: Create Digital Interactive Task System. The district could learn from the experience of Huaxin 1907. The area can be divided into a series of memory nodesbasedon thepast life of thedistrict which couldbe further explored by the visitors. The visitors would perform some tasks through their mobile devices (such as searching for the equipment, identifying buildings, matching historical photographs, or answering the questions). When they finish the tasks, they get personalized souvenirs or maps of the area which could be shared afterwards.

Strategy 7: Create Night Light Strategy. The night strategy of lighting must not be based on full illumination approach. Instead of that, localized low-luminance and programmable lights are suggested. It should highlight the chimneys, saw-tooth roofs, factory entrances, and the areas along the canals. Therefore, the industrial buildings might be visible during the night.

Strategy 8: Preservation-Based Rehabilitation of Building Facades. Red brick walls, saw-tooth roofs, original window and door openings, steel structures, and equipment parts all have industrial heritage value. Designers should repair and expose these original materials without a common "refurbishment" process. New entrance canopies, logo boxes for ads, equipment screens, and exhibition entries must use reversible light steel structures, perforated metal panels, or translucent components. New interventions should create a conversation and dialogue with old brick walls. Local information could be placed on new components using low-luminance projection, e-ink screens, or changeable light boxes to prevent damage to the raw material of the historical wall.

Strategy 9: Industrial Memory Landscape System. The area contains existing streets and alleys, yards, residuals, and waterfront boundaries of factory buildings. These should form the basis of landscape design. Designers must integrate paving, seating, planting, industrial elements, and small digital installations into a continuous landscape. Linear inlays, numbering, and directional marks in the paving could implement “yarn-weaving-cloth” textile manufacturing. Old machines, structures, and identifiable industrial symbols can act as narrative triggers on landscape nodes.

Strategy 10: Route and Wayfinding System. Overall structure should contain "primary loop + themed secondary routes + waterfront night route." Primaryloop connects entrance with industrial heritage exhibit, involving customers in industrialtheater,workers' memory, digital creative lab,and public artspaces on the waterfront. Themed secondary routes provide opportunities for deeper acquaintance, educational tours, and temporary exhibits. Night route focuses on smokestacks, saw-tooth roof factories, prominent facades, and waterfront.

SpatialZoningandExperienceRoutes

Space1 istheCanalMemory EntranceZone, servingthefunctionsoforientation, historical display, and digital mapping. In this space, visitors can have their first impression about the connection of the canal to the factory and the city.

Space2istheIndustrialHeritageExhibitionZone,wheretheoriginalmachinery, equipment, and buildings remain. In this space, augmented reality and small interactive screens provide additional information for visitors to understand how the equipment is built and how it works.

Space 3 is the Immersive Industrial Theater, located in a tall building, where a 360-degree visual experience is created. This performance is based on real records and conveys the atmosphere of the production process in the factory using sound, projection, and light.

Space 4 is the Workers' Memory Zone, where the oral archives, photos, audio records, and other materials construct the "human side of industrial heritage". Visitors can browse through the stories and share their photographs and stories for inclusion into the archive.

Space 5 is the Digital Creative Laboratory, which is a place for the students and young designers to gain experience. The laboratory holds workshops in different fields regularly.

Space 6 is the Canal Night Tour and Digital Public Art Zone, where the canaland buildings are decorated with low-input digital works of art.

The organization of the route follows a single visitor process—"recognition and understandingofthesite—takingpartinproductionprocesses—connectionto

people's memories—contribution into art works". After the Canal Memory Entrance Zone, visitors move to the Industrial Heritage Exhibition Zone, where the objects are shown. Then they go to the Immersive Industrial Theater and move to the Workers' Creation Zone while getting information about the industrial history and people's lives. The visitors finally reach the Digital Creative Lab and finish the route at the waterfront.

The time that a visitor spends varies. Therefore, three routes are provided in the design. The first one is a simple route, which takes around 45-60 minutes and includes entrance, exhibition, theater, and waterfront. The second one is a more complicated route that takes 90-120 minutes and adds Workers' Memory, AR, and digital creative lab information. The last route is a night journey, which focuses on buildings shapes and low-key lighting.

The three routes differ in information accuracy and provide visitors with the opportunity to learn and relax.

The design of the route is based on three principles: prioritizing pedestrians, continuous accessibility, and suitable division of operational traffic. The principal routes for pedestrians should avoid unnecessary backtracking as much as possible. Landmarks must be present at the corners, entry/exit points of the buildings, and other relevant intersections. Supply and maintenance routes must bypass the locations with many pedestrians. For overcoming differences inheight and narrow hallways, ramps, continuous handrails, seats for resting and access to information must be provided.

In terms of experience reconstruction, the overall road can be described ashaving five phases: "to see heritage – to understand heritage- to enter heritage – to participate in heritage – to restore heritage."

ArchitecturalExteriorandFacadeRenewalDesign

When people come to an industrial heritage zone, the first thing they see is outside architecture. This means that a facade is the first interface of a whole territory. An approach to facade improvement should not mean that factories are turning old. Instead, public visibility, users' comfort, and opportunities fordigital demonstrations should be improved. At the same time, old factories must lookold.Theapproachentailsfourstages:preservation,restoration,addition,

and activation. When it comes to preservation, it is mostly about walls, roof structure, openings, and other valuable industrial components. Specialists will keeptheseelementsclean,carryoutrepairsonlywhenitisverynecessary. Areas that need changes in terms of safeness and functionality will be renovated minimally.

At major entrances and important factory facades, one may observe restrained lightweight steel frames, canopies, or some other architectural elements. These additionswillmake the districtmore recognizableandprovideinformationabout events. They should not match traditional techniques used to build historical buildings. Instead, they should follow simple contemporary schemes using modern industrial materials. Thus, when new parts are added, new elements do not get lost among the existing ones.

The colors of facades should embrace several neutral tones, for example, brick red, concrete gray, and dark gray steel colors. New accents should not use saturated colors, at least while coloring great areas. New decorations can be bright, but they should be in small areas only like identification or informative zones. When choosing materials, it is crucial to pay attention to their durability and quality so that they can be repaired easily in case of needs.

In terms of lighting used for facades' decoration during night time, it issuggested to avoid any bright decorations and pay attention on creating silhouettes of buildings. Thus, components of the facade like sawtooth roofs, chimneys, and entrances will be illuminated. At the same time, ordinary walls remain not bright. Digital projection is suggested to be used only during special events and in a designated space of the facade.

LandscapeSpaceandIndustrialMemoryNodeDesign

Landscape renovation largely deals with the task of creating "habitable and livable industrial memory." Unlike conventional environmental greening methods,thatdon'tfocussolelyonachievingmoregreeneryorsimplydesigning beautiful landscapes. Rather, site paving methods along with industrial components, plantings, seating arrangements, lighting and even digital information help the movement and rest be organized properly. Five categories of the landscape system can be distinguished. They are entrance-identity landscape,factorystreetandalleylandscape,courtyardrestlandscape,industrial

memorynodesandcanalwaterfrontlandscape.Theoutdoorspacethusbecomes an integral part of industrial narrative.
The proposed layout includes an open Industrial Memory Plaza at the entrance. The paving is supposed to output true historical plans of the site, dates or logic of textile production in the form of linear patterns. Names of factories, dates of their foundation, major buildings present and route provided, for instance. This way visitors get acquainted with the site before entering the area. The entrance shouldbeofspecificheightandsizenotblockingviewsontotheoriginalfactory buildings at the same time reserving some space for temporary and exhibition events.
Streets, alleys and yards between factories should be designed with walking "read-and-walk"notioninmind.Linesonthesurfaceanditemnumberingwith use of different materials should be applied. Areas for rest can be provided at certain points, at crossroads, by old machines or near factory entrances. Industrialstyleshouldbeappliedtolandscapeitemssuchasbenches,railings, wastesortingbinsorlightingstructures.Anexampleofmaterialscanbeplain steel frames combined with wood or recycled materials in terms of seating choice. Landscaping relies on a single idea of preserving architecture being the major character of the site. Thus, the visual axis of buildings and façades should be keptwithtreesandshrubsproperlyarranged.Thesilhouetteofbuildingsshould be kept intact. Trees should provide mild daylight alongside some seasonal changes. Plant species chosen should fit the climate of Changzhou, be stable in time and have low maintenance needs. Classics of well-designed flower beds should be rejected as that weakens the industrial character of the venue. Thecanalwaterfrontactsasakindofpointoftransitionfrominternalindustry-based narrative to the public life of the city performed through the means of design improvements. The rather sophisticated layout of slow movement paths togetherwithquaysideseatsandstagelightingcreatesbridgestodigital areaof public art within framework of Space 6.

RoutePlanningandSpatialCirculationOrganization

Route planning relies on three principles: clarity, cohesion, and selection. Industrial heritage districts are spatially complex. Treating all activities the same may lead visitors to have a poor sense of direction. It may also cause them not to receive the most significant information. For that reason, the plan creates a system with hierarchy. The structure includes “one main loop, numerous thematic secondary routes, as well as one night route.” The main loop allows first-timevisitorstocomprehendtheplaceproperly.Thesecondaryroutesserve

tocreate the opportunityof learningmore andperformingactivities ina thematic way. The night route implies using the canal edge and lighting around the building, which provides a different experience compared to daytime visits.

The main loop should include 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 and finishes in the community activity area. Hints on the ground, wall numberings, anddigital maps will help visitors to orient themselves in space. Some buildings are not suitable for public access. For these buildings, information can be provided through AR recognition or digital display windows. The route should not encourage unnecessary opening.

Secondary routes may be divided into three groups. The first is the "Industrial Architecture Observation Route," the second is the "Workers' Memory Route," andthe thirdisthe "DigitalInteractive LearningRoute." The firstonefocuseson buildings with sawtooth roofs, brick façades, steel constructions, equipment, and typical inside factory views. The second route combines oral history stories, old pictures, sound points, and places from everyday life. The last route consists of tasks, recognition points, and workshops suitable for student groups. By layering routes properly, the district can satisfy various demands of visitors at the same time.

Pedestrian traffic has to prevail in the traffic organization, while bicycles and needed vehicles are to be managed by time or zoning. This will help to reduce conflicts with visitors. The most important entrances, parking points, accessible entrances,restrooms, sitesforrelaxations,andexitshavetobemarkeduniformly. Adequate buffer zones in the front of the main exhibition and immersive places should be provided. Queues should not block the main streets, and during peak hours, the routes can be modified thanks to the use of digital reservations or real-time information about the crowd at the place with the help of directionalbanners.

WayfindingSystemandVisualIdentityDesign

One of the key aspects of the wayfinding system is its role as a device that establishesaconnectionbetweenthephysicalsphereandtheworldofdigital

information. The basic visual language is based on such concepts as industrial numbering, textile weaving, equipment nameplates, and factory buildings. In reality, the historical images are not directly replicated but instead become the basis for the modern and clear information system. Six elements are part of this system – the district overview, guidance, numbering, interpretation of history, indicators of digital communication, and information about safety/services. The visual aspects of the typography, colors, icons, and installation height have to be completely uniform.

It is recommended to use overview maps in the main entrances and some important intersections using the wayfinding model “You Are Here + Recommended Route + Estimation of time + Accessibility information.” It is needed to apply a uniform numbering method for the buildings and landscape points of interest while keeping this way of numbering complete correspondence to the navigation of the mobile application so that visitors could scan QR codes or touch the NFC points. Even visitors who do not have any smartphones will be able to do the basic tour through the text and pictures.

This type of tourism should always involve language support. The main wayfinding content should be available in English and Chinese. The volume of the text and hierarchy of information should be controlled. The historical interpretation should be based on the headings, short paragraphs, andillustrations but in-depth materials should be given on the digital interface.

IntegratedIndoor–OutdoorDigitalMediaandLandscapeInteraction

People face many problems in life one of them is fragmentation. The inside of the space is an exhibition area; the outside is an ordinary landscape. The solution to this problem is to organize digital communication through visitor behavior. The placement of information is going to be done in the entrance, the paths leading to the building, the facades of the building, the interiors of the building and the waterfront. The entrance provides the understanding of the history of the area. The path gives the information depending on where the tourist is. After the tourist leaves the exhibition, the audio, augmented reality and light continue the narration. The structure of communication is as follows: the "preview—entry—success—reflection—sharing".

The management of digital content should be based on a unified backend logic, whichmeansthatthenodesofthecontentastheinformationshouldbepresented in each space only. One historical photo can be a proof of chronology in the entrance history timeline. The photo can also be projected as an augmented reality image on the existing building. The picture can be also used to illustrate the personal experience of people in Workers' Memory Zone. The same image can be projected fragmentally on the wall during the night time. Such decision leads to the minimization of the media, production expenses.

PhasedImplementationandOperationalRenewalRecommendations

Restoration of industrial heritage encompasses preservation, functioning, and technical support. Implementation strategy is suggested to be phased. At the first phase, the primary task is to conduct root works, which consist of the organization of historical information, surveying of present buildings and environment, elaboration of the main visitor route, conception of entrance signage, restoration of necessary facades, and development of the digital archive's basis. These activities hurl funds in a constant way but will instantly improve the visibility of a site. The second phase implies the establishment ofthe Immersive Industrial Theater, AR navigation, the Workers' Memory Sound Map, and important landscape points. The full digital experience will be created then. The third phase can enrich the nighttime tour content, digital public art, youth creative programs, and temporary exhibitions. Content renovation requires a cycle of actions. This cycle is "historical content evaluation — creation of digital content — spatial publication — visitors' feedback - provision of regular update." Before making their way into the digital archive, historical materials should be checked regarding their reliability of sources. Interactive installations and event content can change in accordance with quarterly or yearly themes.

Chapter2Summary

This chapter presents a comprehensive environmental rehabilitation scheme for CanalNo. 5, which hasbeen supportedby digital technologies andappliedto the historical, spatial, and operational context of the site. The objective of the proposal is not only to add more devices, nor is it simply about refreshing façades. The main aim is to form a holistic industrial-cultural narrative system,aswellasapublicspacethatpeoplecanperceivecontinuously.Theproposalhas

several aspects or dimensions, which include digital archives, façade renewal oriented towards preserving the buildings, creating the identity of the entrance, landscape space, hierarchy of routes, wayfinding systems, immersive images, augmented reality reconstruction, sound maps, interactive tasks, night-time lighting, and digital creative platforms. Thus, material content, historical memory, spatial experience, and modern usage will be combined. The proposed scheme develops a design model that works in accordance with the principle "protect authentic space—optimize external environment—organize continuous routes—supplement information digitally—activate experience interactively—update content continuously." The proposed design model works as a tool for improvement for Canal No. 5, as well as for the transformation of this area from a cultural and creative district into an industrial heritage public cultural spacethat involves active participation of the public.

Conclusion

The key matter in the renewal of industrial heritage is not only the fact that buildings' functions change. Rather, it is about understanding how cultural meanings might still be created and communicated under the changed social conditions. The example of Changzhou Canal No. 5 tells a lot. A new achievement of industrial heritage value has already been realized, utilizing architectural restoration, functional transformation, and cultural & creative industries. Digital media make possible a second achievement. The second achievement is movement from "reusing industrial space" to "re-experiencing industrial memory".

This research compares different cases in practice. Zollverein in Germany is highlightedfortheuseofdigitalnavigationandmultimediainformationsystems. In Shougang Park in Beijing great importance is given to the merger of massive industrial spaces and immersive digital images. Huaxin 1907 uses AR, AIGC, and cool gamification. At the same time, SantralIstanbul shows the effective mix of XR and large-scale industrial spaces. All these cases demonstrate one thing. Digital technologies develop the visibility of industrial heritage and the possibility of interaction with it. However, technology alone would not create culturalvalue.Digitalmediaacquiretheirimportanceforheritagesafeguardand

cultural communication only in case their content relies on genuine historical sources and authentic spatiotemporal properties.

The future renovation of Canal No. 5 should thus include six lines of development. First, create a trustworthy and comprehensive digital archive of industrial heritage. Second, implement the facade renovation without rebuilding red-brick factories, sawtooth roofs, industrial elements, and trances of material use. Third, improve public spaces of landscape value. The spatial environment includes public areas like entrance square, factory streets and lanes, inner yards, and canalside starting point. Fourth, ensure the organization of paths for visitors and orientation in space. Fifth, make use of buildings and equipment for AR, immersed images, soundmaps, and quests. Sixth, ensure the possibility of modificationof the content through unifiedmanagement and public participation. In this way, digital media, construction renovation, landscaping, and wayfinding may allow to ensure the communication of the cultural value of industrial heritage.

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ANNEXA.(Tablesanddiagrams)

常州大學 CHANGZHOU UNIVERSITY

Techniques for adapting industrial heritage through design

—— (on example of Changzhou Canal No. 5)

通过设计活化工业遗产研究技术

—— —以常州第五毛纺织厂为例

Name: **Wang tancai** English Name: **Matthew** Full Name of Supervisor: **Olena Sharlai** Student ID: S24101357058



·01

Research Background and Significance

Urban Renewal · Industrial Heritage · Digital Media

From "Space Reuse" to "Experience Reproduction"

1.1 Research Background

① **Urban Renewal Shifts to Stock Optimization**

Urban renewal is shifting from outward expansion to optimization of existing urban space. Old factory areas are no longer merely targets for demolition, but are redefined as public cultural resources carrying city memory and local identity, requiring careful preservation and creative transformation.

② **Industrial Heritage Needs Cultural Interpretation**

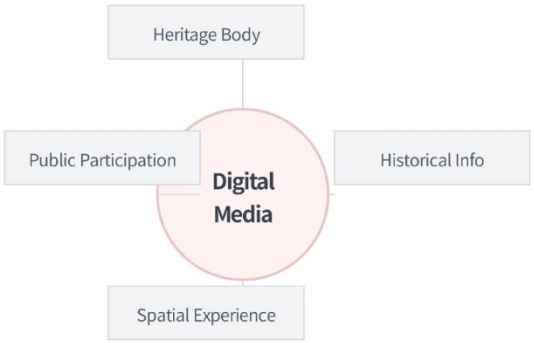
The tangible remains—architecture, equipment, production processes—and intangible workers' memories are often scattered and fragmented. They need to be organized into an understandable and engaging narrative system through professional design to resonate with the public.

③ **Digital Media Provides a New Interface**

Digital imaging, AR/VR, interactive projection, sound maps, and smart guides can bring dormant historical information back to the original site, creating immersive, interactive experiences that bridge the gap between the past and present visitors.

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

1.2 Research Significance



On the basis of protecting the authenticity of existing factories, equipment, and historical environments:

- Establish a systematic media framework that interweaves heritage preservation, historical narrative, spatial perception, and public engagement into a cohesive whole.
- Bridge the disciplinary gap between traditional industrial heritage conservation and modern digital media spatial design, fostering interdisciplinary innovation.
- Transform static industrial relics into dynamic, interactive public cultural spaces, revitalizing their social and cultural value in the contemporary context.

Digital media should serve as an integrative layer — not decorative technology

1.3 Research Object & Purpose

Research Object

Focus: Changzhou No.5 Wool Textile Factory & Canal No.5 Creative District (Jiangsu, China)

01 Physical Heritage

Preserved old factory buildings, iconic saw-toothed roofs, red brick walls, industrial chimneys, and original textile machinery as core physical carriers.

02 Spatial Environment

Interwoven streets, alleys, inner courtyards, the factory entrance, and the unique waterfront landscape along the ancient canal.

03 Info & Experience

Intangible textile industry history, collective memories of workers, digital navigation systems, immersive exhibitions, and interactive visitor engagement.

Research Purpose

To explore the synergistic relationship between urban renewal, industrial heritage conservation, and digital media design. This study examines how digital technologies can innovatively support spatial regeneration, enhance cultural expression, and maintain the authentic historical features of industrial heritage sites for sustainable development.

→ Fragmentation of Info
Disconnected historical narratives and scattered archival data hinder the formation of a coherent heritage context.

→ Static Exhibition Gap
Traditional static displays create a disconnect between visitors and dynamic historical space, lacking depth.

→ Youth Engagement Deficit
Insufficient interactive elements fail to attract younger generations to engage with industrial heritage.

1.4 Research Objectives & Methods

Five Research Objectives

1. Construct a robust theoretical basis for digital media interventions in industrial heritage renewal, integrating heritage conservation theories with media technology.
2. Identify and define the core heritage values (cultural, historical, aesthetic) and diagnose the existing spatial, functional, and operational challenges of the research site.
3. Analyze the interactive relationship between digital media applications and industrial heritage spaces through cross-cultural case studies and comparative analysis.
4. Develop a systematic design framework for digital-media-empowered reconstruction, outlining key principles, implementation strategies, and evaluation metrics.
5. Validate the framework's validity and feasibility through a practical design intervention project at Changzhou No.5 Wool Textile Factory.

Research Methods

01 Theoretical Level
- Literature review: Systematic analysis of heritage studies and media theories.
- Case study: Comparative analysis of global digital heritage practices.
- Logical synthesis: Inductive reasoning to form theoretical constructs.

02 Practical Level
- Empirical research: On-site investigation and spatial mapping.
- User-centric: Behavioral observation and stakeholder interviews.
- Design practice: Visual documentation and prototype implementation.

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”。

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.

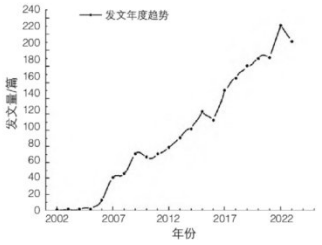
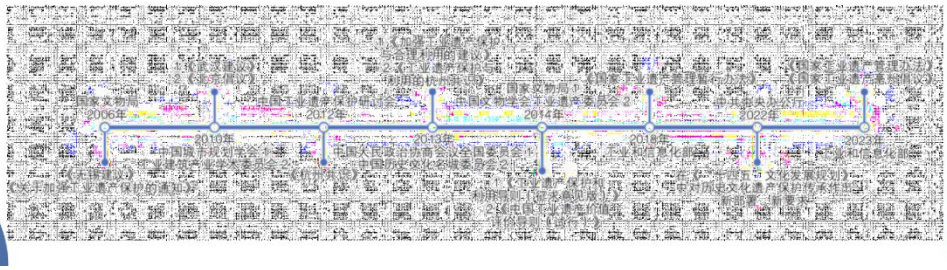


图3　2002—2023年工业遗产改造期刊发文年度趋势





02

Example from practice

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

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

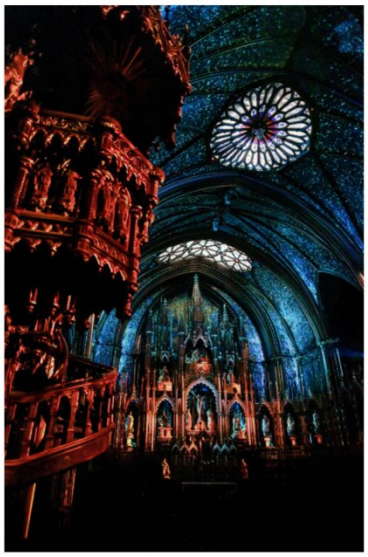
Montreal

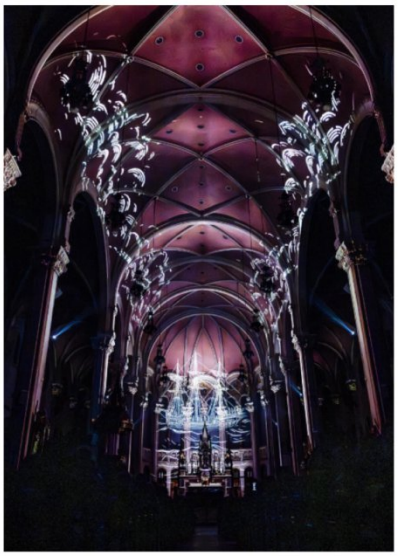




These immersive experiences breathe new life into heritage sites after dark, transforming their indoor spaces by illuminating centuries of tradition, artistry, and craftsmanship in new and unexpected ways.

Fusion of historic ornament and digital imagery







03

View the project

Problems in the surrounding area

01 Degradation of building performance

02 Lack of barrier-free facilities

03 Mixed traffic in the neighborhood

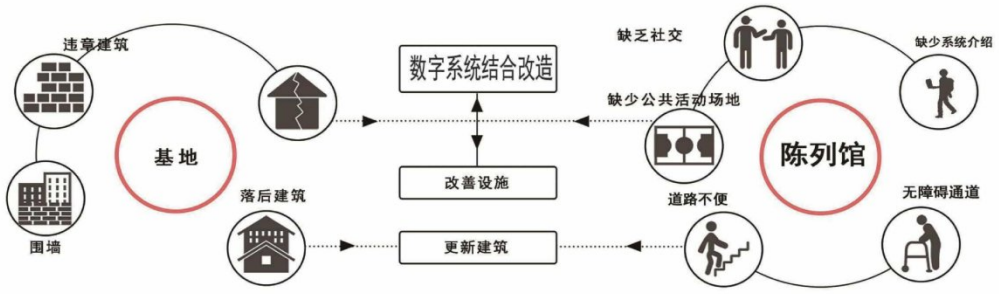
04 Spatial chaos and scarcity

05 The safety management is worrying

06 Loss of community culture

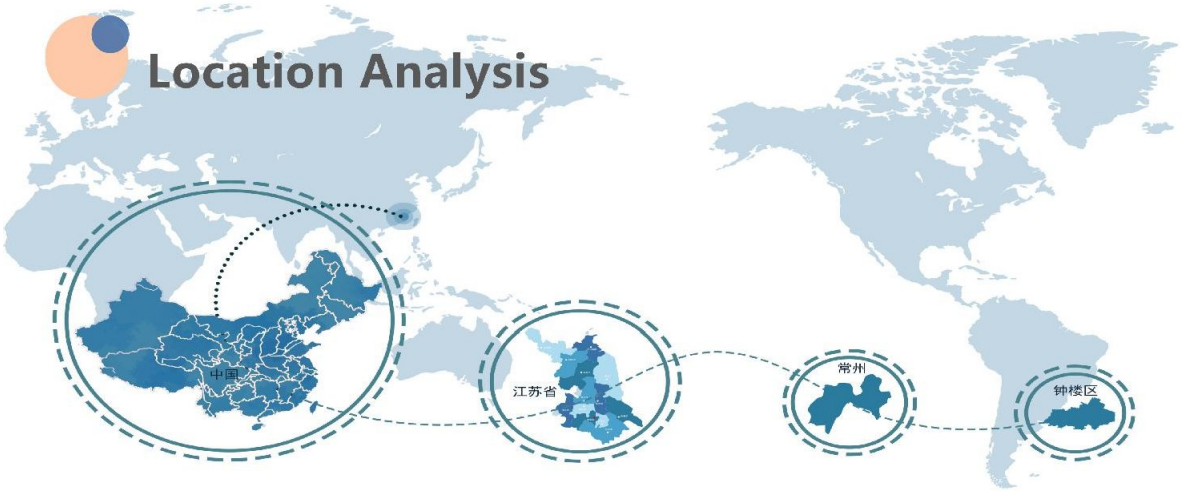


transformation strategy



Improve the service system → Route planning and layout → Introduce advanced intelligent systems → Strengthen overall planning and construction → Integrate local characteristics

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



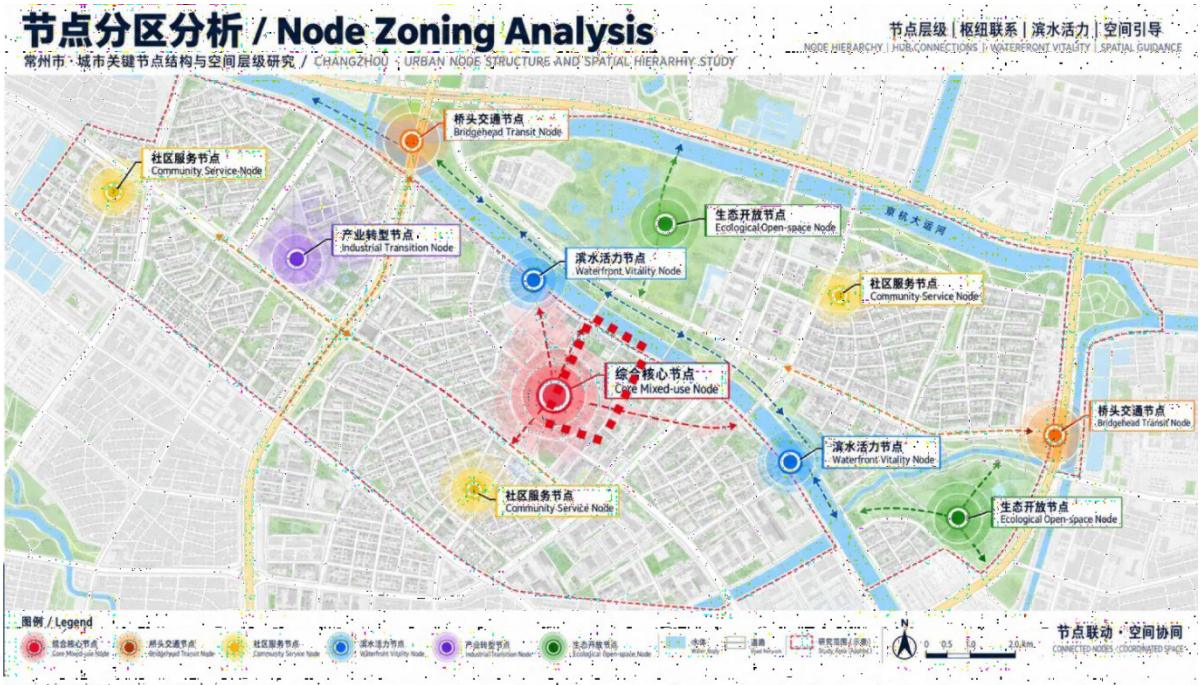


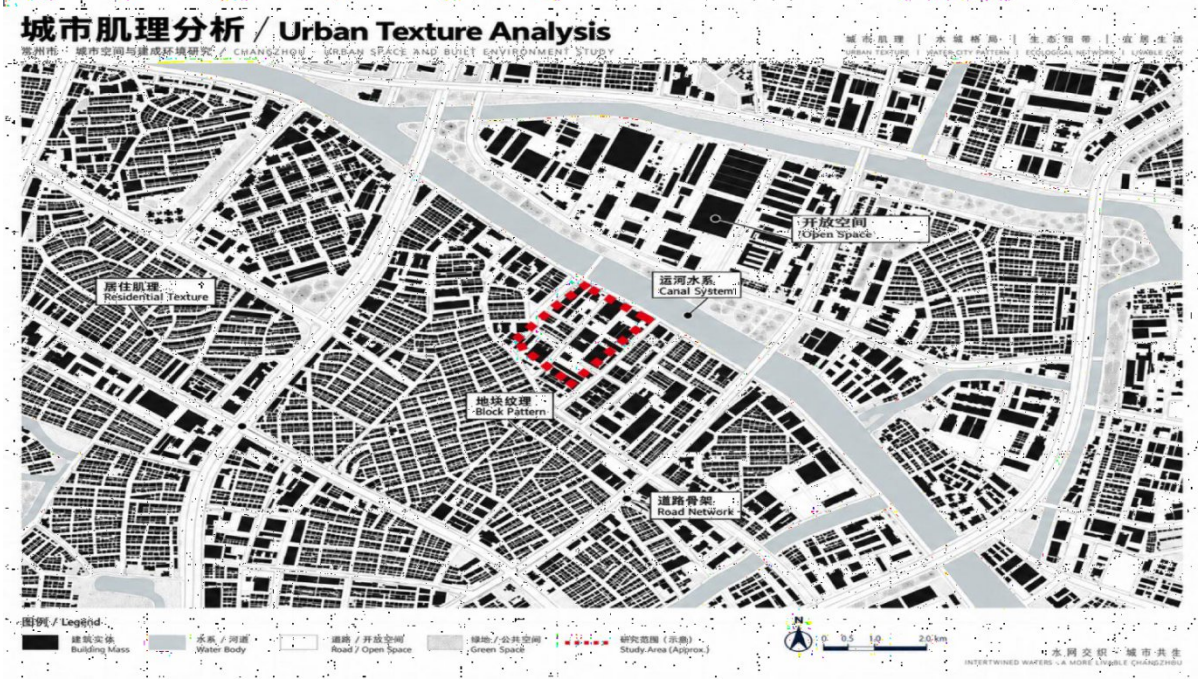


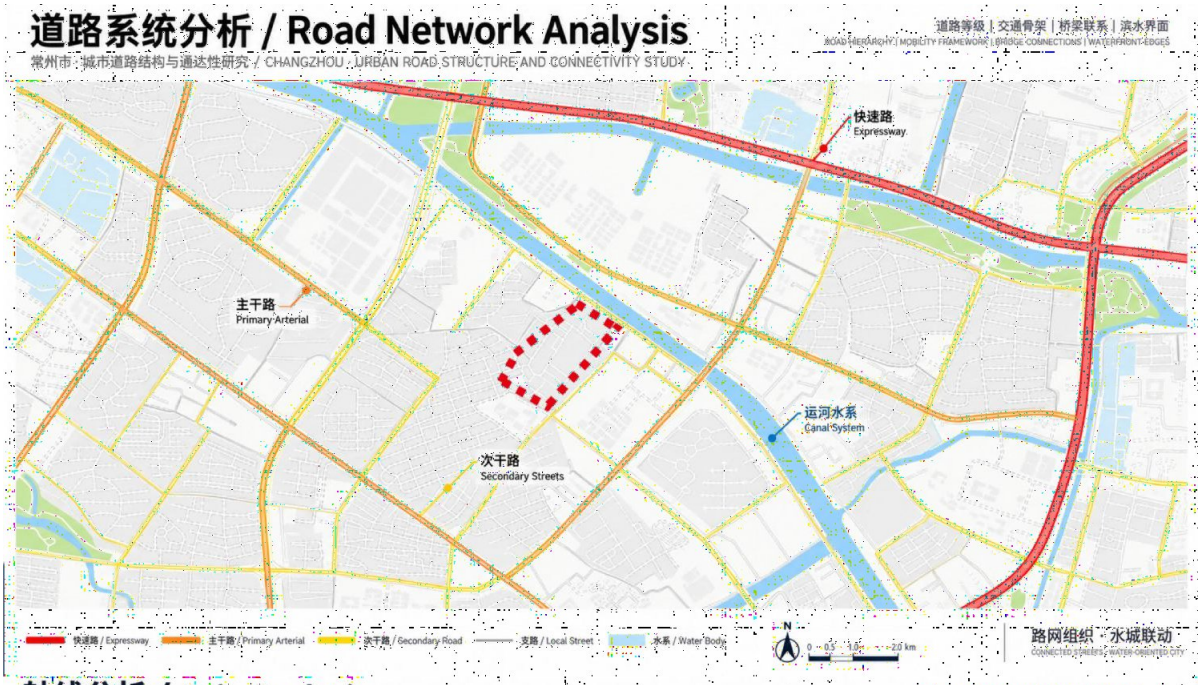


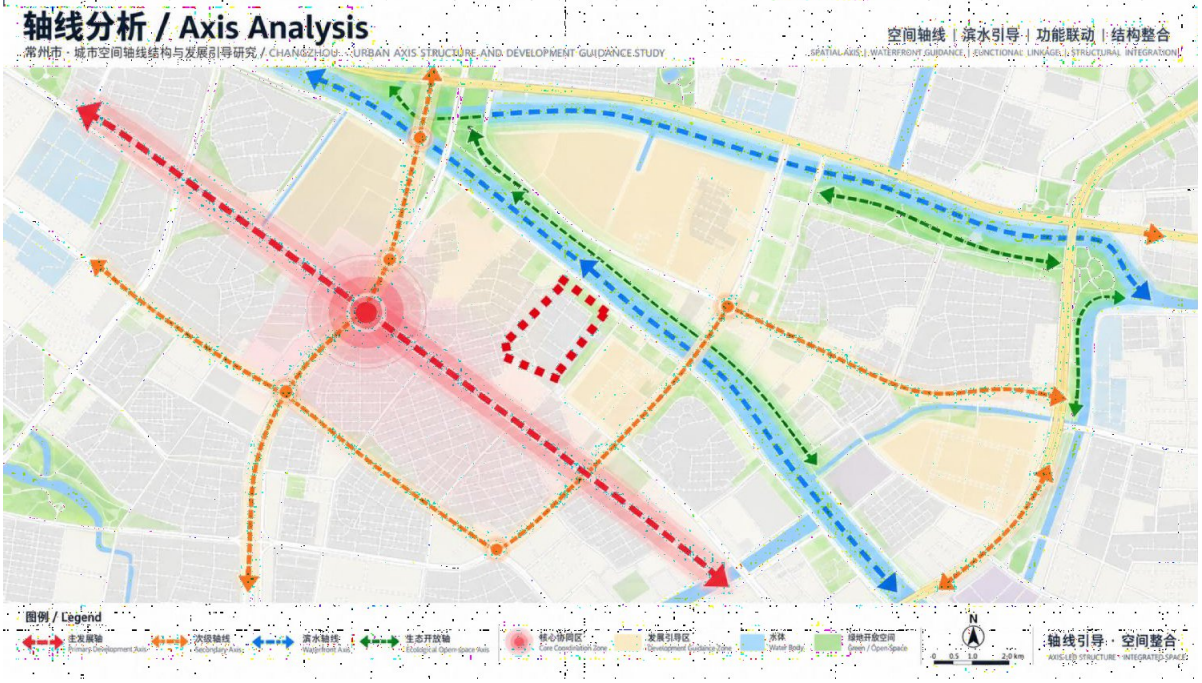





节点分区分析 / Node Zoning Analysis
常州市 · 城市关键节点结构与空间层级研究 / CHANGZHOU · URBAN NODE STRUCTURE AND SPATIAL HIERARHIY STUDY
节点层级 | 枢纽联系 | 滨水活力 | 空间引导
NODE HIERARCHY | HUB CONNECTIONS | WATERFRONT VITALITY | SPATIAL GUIDANCE
桥头交通节点
Bridgehead Transit Node
社区服务节点
Community Service Node
产业转型节点
Industrial Transition Node
生态开放节点
Ecological Open-space Node
滨水活力节点
Waterfront Vitality Node
京杭大运河
综合核心节点
Core Mixed-use Node
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
开放空间
Open Space
运河水系
Canal System
居住肌理
Residential Texture
地块纹理
Block Pattern
道路骨架
Road Network
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（示意）
Study Area (Approx.)
水网交织 · 城市共生


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
运河水系
Canal System
次干路
Secondary Streets
快速路 / Expressway
主干路 / Primary Arterial
次干路 / Secondary Road
支路 / Local Street
水系 / Water Body
N
0 0.5 1.0 2.0 km
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
核心协同区
Core Coordination Zone
发展引导区
Development Guidance Zone
水体
Water Body
绿地开放空间
Green / Open Space
N
0 0.5 1.0 2.0 km
轴线引导 · 空间整合
AXIS-LED STRUCTURE · INTEGRATED SPACES




常州运河五号工业遗产更新
CHANGZHOU CANAL NO.5
INDUSTRIAL HERITAGE RENEWAL
历史在此生长 · 未来与此相遇
WHERE HISTORY LIVES
WHERE THE FUTURE MEETS
2020
1980
1958
CANAL NO.5
INDUSTRIAL
CULTURE
CREATIVE
LIFE
五号烟囱
NO.5 CHIMNEY
— 1958
1958
见证运河工业的
时代印记
A WITNESS TO
THE INDUSTRIAL ERA
OF THE CANAL
运河五号
CANAL NO.5
AR 导览
AR GUIDE
五号烟囱
历史展厅
文创步集
运河步道
INDUSTRY
CULTURE
PEOPLE
A NEW LIFE
展览馆
EXHIBITION
文创市集
CULTURAL MARKET
运河步道
CANAL PROMENADE






INDUSTRY CREATES A BRIGHTER TOMORROW
工业记忆 城市新生
1950
1980
2000
2020
PEOPLE INDUSTRY CITY FUTURE
INDUSTRIAL HERITAGE REIMAGINED
让历史 继续发光
MORE THAN A PAST A BRIGHTER TOMORROW
ART MUSIC IDEAS COMMUNITY
起源 ORIGIN
1953
常州第五棉纺织厂成立
The establishment of Changzhou No.5 Textile Factory
建设 DEVELOPMENT
1958–1978
机器轰鸣 织就城市的工业基调
The roar of machines wove the industrial base of the city
运河五号 纺织厂
CANAL NO.5 TEXTILE FACTORY CHANGZHOU
一座纺织厂 一座城市的记忆
A TEXTILE FACTORY A CITY'S MEMORY
辉煌 PROSPERITY
1978–1990
产品远销海内外 成为城市的骄傲
Products were exported at home and abroad, becoming the pride of the city.
转型 TRANSFORMATION
1990–2005
从生产到城市更新
From production to urban renewal
新生 REBIRTH
2005–至今
工业遗产焕发新生 融入城市生活
Industrial heritage finds new life and integrates into urban life.
常州市第五棉纺织厂
运河五号
INDUSTRY PEOPLE CITY HERITAGE FUTURE
机器与人 MACHINES AND PEOPLE
城市与生活 CITY AND LIFE


平凡的劳动者，
构筑了不平凡的时代。
Ordinary workers
built an extraordinary era.
工人
记忆区
WORKERS'
MEMORY
让记忆，成为工业的延续。
Let memory
be the continuation
of industry.
他们，
是这座城市的
建造者。
也是它的记忆。
They are
the builders of this city.
And also its memory.
"工业不仅创造了物质，
也留下了无数人的人生。"
Industry creates not only material wealth,
but also countless lives.
口述史
ORAL HISTORY
声音档案
SOUND ARCHIVES
记忆提交
SHARE YOUR MEMORY