Construction of Public Participation Cloud Platform for industrial heritage protection under the background of smart city

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ABSRTACT: **At present, the construction of smart city is an important means to improve the level of urban governance, and it also provides digital means for the protection of industrial heritage, taking the rationality of public participation in the theory of Industrial Heritage Conservation as the starting point, the cloud platform of public participation in the protection of industrial heritage in the context of smart cities in terms of theory, technology and methods is set up, exploring Public Participation in Cloud Platform Industrial Heritage Data visualization, the materialization of public participation in industrial heritage conservation and reuse planning, and the modernization of urban governance, furthermore, the protection and regeneration of Industrial Heritage are systematically, intelligently and socially displayed and disseminated, so as to reconstruct the life and vitality of the urban industrial cultural organism, promote cultural sharing and meet the public's multi-level cultural needs. And helping to modernize the level of urban governance. Taking the industrial heritage community of Han River Eco-economic Zone in Hubei Province as the Research Object, this paper discusses how to develop and set up the public participation information linkage platform for similar cross-regional large-scale and multi-level industrial heritage in the construction of smart city, in order to provide a practical solution for public participation in the protection of industrial heritage.**

Keywords: Smart City; Digitalization of Industrial Heritage Protection; Public Participation Cloud Platform; regional cloud platform construction

I. INTRODUCTION

A. The origins of the smart city concept

A smart city is a solution that uses information and general technology to achieve innovative urban development. By sensing and analyzing, it integrates all the key information of the core means of city operation, so as to respond intelligently to all kinds of demands including people's livelihood, environmental protection, public security, city service, industrial and commercial activities. Generally speaking, smart city is not only based on one technology, but also a comprehensive application solution including cloud, artificial intelligence . The term "smart city" is a direct translation of the English word "smart city"[1] . In wikipedia, "smart" is an adjective, used to describe a person or animal with high intelligence, and is widely used as an adjective in products, engineering, technology, business, social undertakings, entertainment and other fields. Subsequently,

"Smart city" was gradually used to describe an information technology-based urban development model to promote the operation of urban innovation. In practice, with the development of information technology, people gradually link the application of information and communication technology with the development of future cities, especially in the United States, Europe and many cities in Asia (such as San Diego in the United States, Ottawa in Canada, Southampton in the United Kingdom, Singapore in Southeast Asia) , when they use emerging information technologies to transform or upgrade one or more areas of a city, smart city represents an intelligent, user-driven, self-responsive approach to urban management and services.

Therefore, smart city is the basic starting point of upgrading urban core operation system by using new information technology, which is the deep integration of industrialization, informatization and urbanization.

B. The evolution of smart cities

The emergence of Smart City is the inevitable result of the development of human productivity and the progress of science and technology. From the perspective of Urban Development, technological progress has driven changes in the form of production organization, which has also led to changes in the form of society, urban management model and development model. For example, in recent years, the development of information technology has seen a new break, the Internet of things, the new generation of mobile broadband networks, the next generation of the Internet, cloud computing and other new round of rapid development of information technology in-depth applications, realizing the connection and real-time interaction between Urban Physical Space and Virtual Cyberspace, and making the connection between people and people and objects more real-time, ubiquitous and transparent, pushing human society into a form of Cyber Society, the city has also entered the "intelligent" stage of development. With the development of sensor network technology, cities have "nerve endings" , which can acquire and transmit real-time Data and information from the urban physical world, to help city managers, service providers and participants in various activities to achieve more intelligent and scientific decision-making, so that the city system becomes a more decision-making and real-time feedback control system.

A. Public participation

In essence, public participation is an effective form of management, in which the public changes from passive acceptors to active participants[2]. In the 1990s, the United Nations Agenda 21 for Sustainable Development clearly stated that "one of the basic preconditions for achieving sustainable development is broad public participation in decision-making" . With the increasing importance of this system in the field of human settlements protection, the formulation of other relevant public policies or laws and regulations has begun to take more and more into account public participation. In China, the concept of public participation has also been welcomed by the academic community and recognized by the political circle, in areas such as administrative legislation, policy making, environmental protection, urban planning, and cultural heritage protection, public Participation has become a hot topic.

In 1998, the Aarhus Convention gave a clear definition of public participation: "public" means one or more natural or legal persons and, in accordance with national legislation or practice, an association, organization or group of such natural or legal persons. According to Professor China University of Political Science and Law Cai Dingjian, "public participation" means that public power is exercised through open and transparent ways and means by public authorities in legislating, deciding public affairs or conducting public governance, the process of obtaining information, hearing opinions, and interacting with feedback from the public and interested individuals or organizations to influence the decision-making and governance of public authorities.

B. Protection of industrial heritage

Industrial Heritage from the scope of the definition, can be divided into a narrow and broad sense of two understandings. The narrow sense of industrial heritage refers to the fact that since the second half of the 18th century, industrial buildings, industrial wharves, industrial communities and other industrial relics after the industrial revolution characterized by the adoption of new materials such as steel, new energy sources such as coal and oil, and the production of machines[3]. In China, mainly refers to the late 19th century, the early 20th century since the process of modernization left over by various types of industrial heritage. The industrial heritage in a broad sense includes not only the industrial heritage of the modern machine industry era, but also the traditional industrial fields before the industrial revolution, such as handicraft industry, mining industry, manufacturing industry, processing industry and so on, as a kind of cultural type which appeared in the post-industrialization background, industrial Heritage is a late type of world cultural heritage.

China's industrial heritage was mainly formed in the four stages of the ancient handicraft industry period, the late Qing Self-Strengthening Movement and the National Industry Period of the Republic of China, the "three-line construction" from the founding of the People's Republic to the 1960s and the mid-1960s period, and the early stage of reform and opening up, covering coal, metallurgy, machinery, raw material processing, equipment manufacturing, National Defense Science and

Industry and other basic industries and fields of the national economy. The protection and utilization of industrial heritage in foreign countries has long been a precedent. In the 1970s and 1980s, Western countries faced the pressure of economic development and transformation, and there was a process of economic restructuring, gradually forming an economic development model with culture as its core. In some European countries, a wave of building "tourist factories" arose, the abandoned factory will be renovated for visitors to experience the site. Such as the industrial site of Iron Bridge Gorge in Shropshire, UK, and the Ruhr in Germany, the status of conservation use is illustrated in figure 1 below.
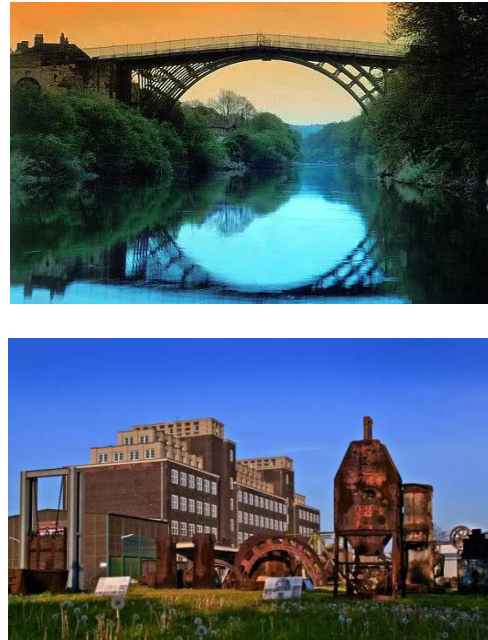

Figure 1. Conservation and regeneration of industrial heritage in Western countries, Source: Internet

C. Public Participation under the protection of the industrial heritage

The public nature of cultural heritage determines that its protection is related to the public interest, and this kind of interest diversification makes public participation an inevitable trend. As an important part of cultural heritage, industrial heritage has been paid more and more attention since the end of the 20th century, and its effective protection can not be separated from the sound protection system and mechanism, the public participation mechanism is one of the most important mechanisms, its bottom-up protection features and the government top-down management mechanism complement each other, making the protection system more perfect. The following author will try to analyze the general situation of public participation in the protection of cultural heritage at home and abroad from the perspective of cultural heritage, which belongs to industrial heritage, with a view to providing a reference for public participation in the protection of the country's industrial heritage. As one of the countries with the most complete categories of world heritage and the largest number of cultural and natural heritage sites in the world, China should widely mobilize the enthusiasm of all parties involved.

The protection of heritage is not only directly related to the construction and sustainable development of China's cultural and natural ecological environment, but also directly affects the international image of the country and the nation, in order to better promote China's world heritage protection work smoothly. Relevant departments should carry out various forms of publicity and education on world heritage protection knowledge so as to let more members of the public know about world heritage. Only in this way can we make the public participate in the work of world heritage protection in our country better, we must constantly improve the legal norms of world heritage protection and open the information of world heritage protection. As a relatively marginal type of cultural heritage, the awareness of public participation in the protection of industrial heritage in China is still very weak. At the same time, due to the current special regulations on the protection and management of industrial heritage in China are not very sound, the government protection of some industrial heritage sites is also insufficient, in order to obtain higher economic benefits, the phenomenon of over-development and utilization.

III. THE SIGNIFICANCE OF PUBLIC PARTICIPATION IN CLOUD PLATFORM CONSTRUCTION OF INDUSTRIAL HERITAGE PROTECTION IN THE CONTEXT OF SMART CITY

A. *Public Participation Visualization of industrial heritage*

1) *Publicity and popularization of industrial heritage culture—Public participation in the reception and dissemination of Protection Awareness*

The ways to enhance the public awareness of industrial heritage protection include the following six points: launch various forms (such as publicity, exhibition, commentary, questionnaire survey) of Industrial Heritage Protection Knowledge Education; Let the public go into more industrial heritage sites or sites to visit; establish and improve the legal system of industrial heritage protection; cultivate social organizations and volunteers for industrial heritage protection publicity; strengthen the guidance of experts to the public; Establishment of Industrial Heritage Protection Advisory Organizations.

2) *Public data collection for Industrial Heritage Survey— The public becomes the initiator of heritage discovery*

To strengthen the protection and salvage of industrial heritage, to realize the inheritance of historical industrial culture and the integration of industrial transformation in the context of the new normal economy, public participation and support are indispensable, and the public should be encouraged to actively participate in the protection of industrial heritage, in the survey and collection of industrial heritage data, we should call on the public to participate and let the public become the initiators of industrial heritage discovery, identification and protection.

3) *Public Promotion and recognition of industrial heritage—Public Participation in the game of rights*

In the traditional top-down Conservation Planning, most of the promotion, identification, protection and regeneration of historic buildings and industrial heritage are mainly led by government departments, and commissioned design units and developers of industrial heritage protection planning design and specific update design implementation, in which the public is mainly informed and asked about the status. Although the statutory stage of public consultation is open to the public, the public can not put forward their own ideas and suggestions in the process of preliminary objective study and mid-term design because the decision on the proposal has almost been completed, public Participation has had little effect. Therefore, in the following protection work, the public should participate together with experts and scholars, city managers, owners and other stakeholders, and carry out the whole process of industrial discovery-identification-protection classification-reuse renewal-protection transformation, city managers should give the public more say from discovery to confirmation.

4) *Public feedback on early-warning monitoring of "salvage protection" of industrial heritage—Providing a platform for public participation and feedback*

History versus interest, confrontation versus convergence, and this kind of game is happening at every industrial heritage site. Behind every city, there is a rich and introverted history and culture. The city represents the culture, and the culture deduces the national and national cultural attributes. To the public, how much of a city's inherited value has been lost to the city that inherited the historic value of the building, and how much of the deep sediment remains for those who were not destroyed by war, but destroyed by today's industrial heritage, what kind of attitude should the public, as one of the subjects of interest, face? What can we do to salvage the fragile industrial heritage? If the public, as the masters of the city, can voluntarily monitor the industrial heritage of the city where they live under the guidance of the above-mentioned protection awareness and report to the relevant protection departments, the relevant protection departments then carry out scientific and effective monitoring on the environment of the heritage, the preservation of the body, the safety of the heritage and so on.

The above four points provide practical significance for the materialization of public participation in industrial heritage conservation and reuse planning. In the process of public participation in conservation, the public need to know the planning information and fully participate in the discussion of the program, and the final implementation of specific industrial heritage protection planning supervision and feedback

B. *Realizing the modernization of industrial heritage protection and management in smart city*

1) *Public participation in smart city: from "passive" to "active"—Increasing the diversity of public participation*

The National Development and Reform Commission, the Ministry of Industry and Information, the State-owned Assets Supervision and Administration Commission and other departments jointly issued the implementation plan for promoting the protection and utilization of the industrial heritage of the old industrial cities, which aims to take the protection and utilization of the industrial heritage of the old industrial cities as an entry point, to Guide the urban renewal and transformation, to promote the old industrial city from "industrial rust belt" to "life show belt"[4] . At present, the protection and utilization of China's industrial heritage is relatively weak, especially some industrial heritage has been destroyed, damaged or even died, so it is urgent to take measures for effective protection and rational

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utilization. It is necessary to accelerate the protection and utilization of the industrial heritage of the old industrial cities in the light of the development reality of the old industrial cities, and promote the overall revitalization of the old industrial cities by cultural revitalization. In this context, advocating public participation in the transformation of the "life show belt" , with regard to the promotion of the protection of the industrial heritage of the cities in which they are located, the upgrading and transformation of the economic and industrial structure, the renewal and utilization of land in old industrial zones, the ecological treatment and restoration of industrial and mining wastelands, the integration of regional cooperation and development of industrial heritage tourism and the green and sustainable development of cities, therefore, it is of great practical significance to realize the coordinated development of ecology and economy of smart city. Through the protection and renewal of the industrial heritage, increasing the channels of public participation, so that the public can participate in the governance and planning of the city, and experience the change from "passive" to "active" , it aims to promote the economic and cultural transformation and development in digital, intelligent and intelligent cities, change the cityscape, revitalize industrial heritage, and achieve sustainable development in areas such as public production, life and the environment.

2) Realization of digitalization and intelligentization of heritage protection—The convergence of public power in new technologies

At present, the Smart City spatio-temporal information cloud platform has realized new high-tech means such as ubiquitous network, sensor equipment, intelligent computing, etc. , a geographic information service platform that integrates all kinds of spatio-temporal information in real time to form a more transparent, interconnected, intelligent decision-making, more intelligent service and more secure and reliable geographic information service platform, it is an important spatial information infrastructure for smart city construction. The Smart City spatio-temporal Information Cloud Platform is based on the geographic information at every moment, which is fully covered and refined, is connected with the real-time perception of the Internet of things, and uses cloud computing technology, the intelligent space-time carrier of smart city is to provide geographic information data, develop interface and function software service on demand in ubiquitous application environment to serve the construction and operation of smart city[5]. Under such opportunities, it is a general trend for the public to participate in the construction of spatio-temporal information cloud platform of industrial heritage. The public participation in heritage protection cloud platform of smart city makes the public and other stakeholders, the inner city, the city and the city, even the realization of cross-provincial regional public participation platform has become possible, governments at all levels of industrial heritage protection regeneration is no longer decentralized, fragmented, homogeneous development and protection can also be effectively controlled, it provides a technical platform for systematic research on industrial heritage sites, industrial enterprises, historical industrial districts, industrial heritage towns and even large-scale regional industrial heritage.

IV. CONSTRUCTION OF PUBLIC PARTICIPATION CLOUD PLATFORM FOR INDUSTRIAL HERITAGE PROTECTION IN THE CONTEXT OF SMART CITY

A. The participation mode and technical support of public participation in cloud platform

1) Twitter Platform

Smart City needs spatio-temporal data construction. As the most widely used social media platform in China at present, the advantages of micro-blogging platform mainly lie in its very wide dissemination area and its influence which can not be underestimated in China. It has now evolved into an important way of information dissemination, to a certain extent, it is the most direct contact with the public to collect spatiotemporal data fragments, through the micro-blog platform to a certain extent, the public and even the national public to understand the historical blocks, historical buildings, industrial heritage and the protection of the status quo and transformation content.

2) Wechat account

Since the media era, the influence of wechat public accounts is huge, some heritage planning wechat platform, but also in the protection of historical and cultural heritage has played a role. Through the establishment of channels and communication platforms, the public began to actively participate in the discussion of social affairs and policies, and became an important channel for the public to participate in the information acquisition of urban construction, these platforms (figure 2) provide the public with a platform and a rallying point for diverse ideas and for understanding public opinion.

Figure 2. Wechat Public Account, Source: The Internet

3) APP(Application)

The APP has also been used to provide information and publicity about historic buildings and industrial districts, making it easy to find nearby historic buildings using the phone's GPS location feature. At the same time, the function of explaining the building, including pictures, text and audio, is integrated to introduce the background of historic buildings and historic industrial blocks to the public, so as to facilitate the public to understand the historical and cultural information, it helps to cultivate public awareness of cultural heritage protection. For example, the LAOIS heritage APP. (figure 3)
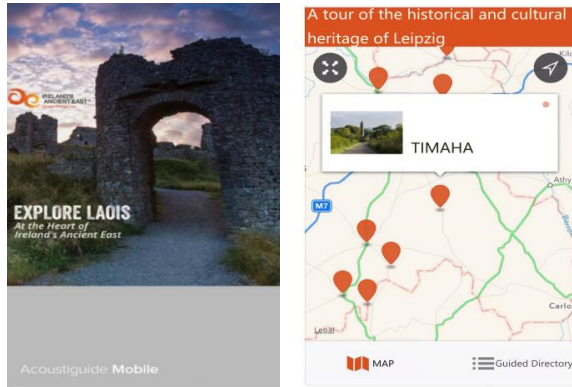
Figure 3.   LAOIS APP Platform , Source: The Internet

At the same time, the technology of Qr Code scanning Application, LBSN (Location-base Social Network) , API (Application Programming Interface) , Application Programming Interface, 3d modeling, Panorama display and virtual reality (VR) are widely spread, it also makes the industrial cultural heritage digital protection, public participation in the construction of space-time information cloud platform with technical support.

B. *Content composition and technical framework of Public Participation Cloud Platform for industrial heritage protection*

1) content composition

a) Speed up the construction of a unified industrial heritage database in the city or region

Through online and offline public participation platforms, relevant historical pictures, texts, books, audio and video and other historical information and historical clues are widely collected for the society, with the public as the main body, to set up a database of industrial heritage resources in cities where the public are, including the social, cultural, political, economic, personal and event data related to industrial heritage, and will help the estate management and the Socialization Service Thorough Development Estate Management data information two big aspects.

b) To strengthen the publicity and education of public history and industrial culture

Scientifically using technologies such as geographic information maps and immersive VR displays to provide the public with detailed information on the history of industrial historic buildings, historical industrial technological processes, advanced technologies and anecdotes of celebrities, as well as the development history of industrial heritage sites from site to site, showing all-round features of historical industrial sites. At the same time, experts, scholars and cultural conservationists will be invited to disseminate knowledge on science popularization, cultural protection and planning so as to enhance the public and tourists'awareness of industrial heritage protection.

c) Recommendation and cognizance of industrial heritage

Through the voluntary application of recommendations, public network voting, and other ways to participate in the promotion of good industrial heritage activities, and invite third-party organizations such as NGO to investigate and identify the material and intangible industrial heritage projects.

d) Building a public monitoring network platform for industrial heritage protection

In addition to the traditional form of public supervision, which involves taking photos, uploading them, commenting on them, and reporting acts of destruction in the process of protection and regeneration of cultural relics protection units and excellent industrial heritage buildings, by building ubiquitous sensing networks, the Internet of things, that are accessible and accessible to the public, the public will have a greater sense of ownership, through the application of cloud platform sensing technology, more quantitative data of industrial heritage can be obtained, so as to realize real cloud monitoring and heritage cloud protection

e) Intensify efforts to build an industrial heritage public library and an online museum[6]

In the construction of Industrial Heritage Data Resource Cloud Platform, firstly, the principles of public welfare, openness and moderate commercialization of the platform are defined. Secondly, using the sharing technology, integrating the basic database of industrial cultural heritage, and other relevant systems to generate or user-generated data, constitute a mass of big data, forming a digital resource layer for public participation. Thirdly, by using the cloud computing ability of the data resource platform, data mining and analysis are carried out, and the data fusion layer of the dynamic semantic network of industrial cultural heritage is formed. Then the digital application service layer is formed to realize the intelligent application of public participation in industrial heritage information and meet the users'resource and service requirements.

2) Technical framework and operation mode

The overall framework of the platform consists of four layers: perception layer, network layer, platform layer and applicationlayer
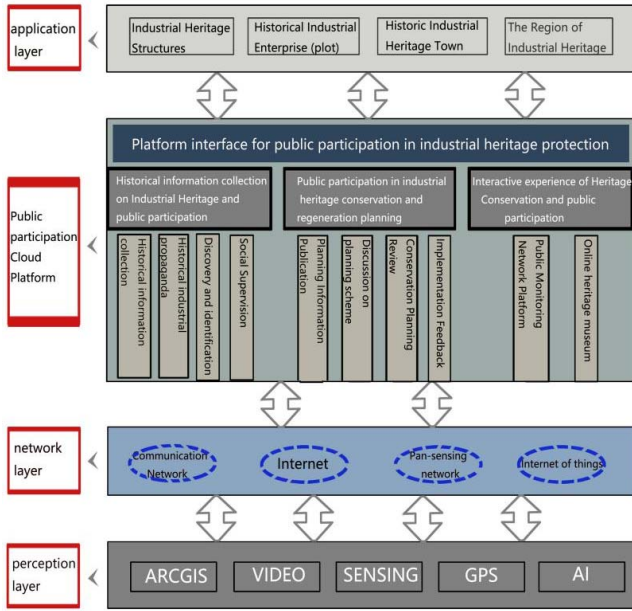
Figure 4.   .Industrial Heritage Conservation Public Participation in Cloud Platform Construction Technology Framework, Source: Author self-drawn

V. AN EMPIRICAL STUDY ON PUBLIC PARTICIPATION CLOUD PLATFORM OF INDUSTRIAL HERITAGE IN HUBEI HAN RIVER ECO-ECONOMIC ZONE

In 2015, the overall plan for the opening-up and development of the ecological economic belt of Han River, Hubei, was officially issued. The Han River River Basin of Hubei Province has seen a great opportunity for development. In the social process of the provincial strategic initiative of "the cities along the belt and road work together to promote the economic integration of the Han River River Basin, " It is urgent to excavate the elements with common cultural characteristics and technical essence from the historical and cultural heritage, so that they can not only meet the needs of the overall protection of cultural heritage, but also meet the needs of social and economic development, for the multi-level industrial heritage communities along the eco-economic belt in Han River, Hubei Province, it is undoubtedly of cultural, economic, scientific and practical significance for the public to explore the charm of the industrial heritage along the belt.

VI. RESULTS&CONCLUSION

Therefore, it is particularly urgent to set up a spatiotemporal integrated information service based on the public census platform of industrial heritage data in the ecological economic belt of Han River, Hubei. First, it is necessary to establish a grading process for the identification and registration of the industrial heritage at different levels in the main cities and towns along the route, to clarify the relationship between the blending and spreading of the industrial culture between cities, and at the same time to pay attention to the co-development of co-ordination and difference Then, on the basis of reviewing the development of historical industry, and based on the principles

of industrial heritage protection, an early warning and monitoring system for the People's heritage of the towns along the route will be set up, and at the same time, the administrative territorial entity barriers of industrial heritage protection of the towns along the route will be broken down, real-time data sharing of the interregional industrial heritage regeneration model is realized, thus facilitating the planning, implementation and management of Industrial Heritage Conservation with the participation of the public along the route. Smart City is an advanced form of urban development in the future. Under this form, the protection of cultural heritage, including industrial heritage, obviously plays a unique role, and even has the function of establishing the city as the foundation and cultural business card, at the same time, the subject of its protection is transformed into civil society. Taking the multi-level industrial heritage communities along the eco-economic belt of Han River, Hubei Province as an example, the cross-regional large-scale multi-level industrial heritage information linkage platform was developed under the guidance of the concept of smart city, in order to promote the digital protection of industrial heritage along the "mechanism cluster" innovation-driven development[6], with a view to such public participation in the establishment of cloud platform, for all kinds of social public welfare organizations to participate in the protection of industrial heritage to create good conditions, promote the effective formation of long-term protection mechanism of industrial heritage.

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