

Research on the Innovative Regeneration of Post-industrial Space in China

Jihui Qu¹, Xiuli Ge^{2,3,*}, Yanchen Liu⁴

¹School of Art and Design, Dalian Polytechnic University, Dalian, China

²Faculty of Engineering and Technology, Liverpool John Moores University, Liverpool, UK

³Southampton International College, Dalian Polytechnic University, Dalian, China

⁴School of Food Science and Technology, Dalian Polytechnic University, Dalian, China

*Corresponding Author: Xiuli Ge

Keywords: Post-industrial space; Innovative regeneration; Spatial application

Abstract: In the past few decades, with the industrial transformation and upgrading of many Chinese cities, a large number of obsolete industrial buildings have appeared in the central areas of the cities. Although these former industrial buildings have lost their original functions in manufacturing industry, they have great spatial structure and geographic locations. Some post-industrial areas also bear the expectations of the older generation since they have witnessed the historical changes, cultural transmission and development of the cities. Many western countries have experienced the transformation of post-industrial buildings earlier than China and some successful regeneration projects incorporated the transformation of post-industrial buildings with their national development plans and conducted in-depth theoretical studies and practical case demonstrations. Similarly, China has been actively conducting the research and practice for the transformation of post-industrial buildings in the past few decades. These former industrial buildings are effectively employed to maximize the economic benefits and enhance the historical values and cultural connotations of these old industrial buildings. This paper analyzes the purpose of innovative transformation of post-industrial building space and the significance of the transformation from the perspective of national economy, ecological environment, and national policy. It also explores the issues concerning the innovation of micro spatial change and cultural transformation.

1. Introduction

China enjoys a high reputation as the largest manufacturing nation in the world [1]. “Made in China” has already become a symbol of China’s manufacturing power and it also shows the pillar of modern Chinese economy. Since the beginning of industrial civilization in the middle of the eighteenth century, the development of one country’s manufacturing industry has been related to the country’s comprehensive strength. Without a strong manufacturing industry, there would be no national prosperity. Since the founding of country in 1949, China’s manufacturing industry has kept a rapid development and established a complete and independent industrial system, which strongly promotes the process of industrialization and modernization and supports China to become a world power. However, with the disappearance of China’s demographic dividend and the increase in labor costs, it has reduced the possibilities for traditional manufacturing industry which mainly relies on low cost advantage. Meanwhile, intelligent equipment represented by industrial robotics is bringing revolutionary changes to traditional equipment manufacturing and production methods in logistics and other related industries. What’s more, global economic integration has made competition in the domestic market fiercer. In China there are many manufacturing factories with a history of several decades, while many companies in western companies have developed for more than a hundred years. Therefore, Chinese manufacturing industry has to be fully prepared to face the international competition.

During the process, some Chinese manufacturers choose to adjust the industrial structure to

continue upgrading the industry and solidifying the foundation, while there are also some manufacturers who have to close the factories. To some extent, Chinese manufacturing industry has made great contribution to the country's economic development through manufacturing essential consumer and industrial products. The factories and buildings which have significant historical and social values are what we call post-industrial heritage. The innovative redevelopment of former industrial building space based on heritage protection and comprehensive development calls for the attention of researchers across the world.

2. Building Space in China's Industrial Development

Most of China's industrial buildings started in the early 20th century and continued developing to the 1970s, which experienced a span of about sixty to seventy years. Until now some of these buildings have a history of nearly a century. Many of these old industrial buildings are in poor conditions and not suitable for the production in the modern society due to the rapid social and economic development, the adjustment of industrial structure, industrial transformation, technological upgrading, and increasing ecological requirements. In addition, most of China's manufacturing companies emerged from family workshop factories. After experiencing a period of rapid development and due to the extension of the enterprise scale and the change in the living environment, this type of Chinese manufacturing enterprises has to change accordingly. In such a situation in China, the future development trend of these former industrial buildings is a practical problem that business owners and the whole society need to pay more attention and try to solve it. It calls for scientific attitude and critical judgment of the protection of former industrial buildings. Effective methods of protecting these sites also face new risks and challenges.

From the functional perspective, former industrial buildings can be divided into three categories. Firstly, there are obsolete or derelict manufacturing sites and buildings. Secondly, there are some industrial buildings which used to be the places for manufacturing. Thirdly, there are also places for industrial production have a long history or unique value [2]. Post-industrial sites have been abandoned or lost their original functions for various reasons. It includes both a large number of old industrial buildings and space with certain historical and cultural value.

Industrial building is an important type of architecture in the industrial society, and it is the material form of industrial civilization. With the development of the times, these industrial buildings have gradually lost their original functions of manufacturing and most of them are in a state of decline and abandonment. What's more, most of these post-industrial buildings still have solid physical structure and complete material properties. They have witnessed the development of industrial civilization of a region or a nation, which has great historical or cultural values. Therefore, the redevelopment of former industrial sites has great historical, cultural, economic and environmental significance. Industrial buildings in Europe and the United States lead the world in scale, number and quality. In the 1960s and 1970s, many countries in Europe and the United States have actively implemented effective measures to protect old industrial buildings, and many of them proved to be successful. These successful cases of regeneration of former industrial buildings provide some valuable experience.

3. Issues of Spatial Regeneration of Former Industrial Buildings

The regeneration of post-industrial building space can be roughly divided into several types. Firstly, some factories have been partly repaired and transformed on the original basis and continue to be used for industrial production. This type of the building space was usually built around the year when the People's Republic of China was founded. They are mainly large-scale industrial bases and other industrial buildings for different purposes. Secondly, some industrial buildings are developed into cultural and creative zones, museums, art galleries, design institutions, catering space, etc. In the process of functional transformation, the original industrial buildings are slightly modified in terms of structure and space and some regeneration work that emphasizes the design concept and artistic representation has been made. These industrial buildings have typical

architectural features, relatively high building quality and solid construction structure. Among them, there are some successful regeneration cases, including Beijing 798 Art District transformed from the former state-owned 798 factory and some factories of electronics industry, Qingdao Textile Museum transformed from former state-owned No. 5 Cotton Textile Factory, 1933 Shanghai transformed from a medicine company and slaughterhouse, and Zhujiang Party Pier Beer Culture and Art Zone transformed from former Zhujiang Beer Factory [3, 4]. Thirdly, the factory buildings are currently abandoned or subleased for various reasons such as long service time, unclear ownership, poor maintenance, and business transformation. In this situation, it is very likely that it will be demolished for redevelopment in the near future. In fact, many old industrial buildings have already been demolished for regeneration practices. What's more, this kind of industrial buildings calls for necessary research and proper sustainable regeneration strategies due to their social values. Actually, it is of great significance to "save" this kind of post-industrial buildings and space which need to be properly regenerated.

The redevelopment of former industrial buildings helps to realize the value of the architecture and endow it with new vitality. The key of architecture redevelopment lies in whether architects can capture the real potential of the existing buildings and give them new life. Currently in China, there are a considerable number of old industrial buildings that can continue to be used from the perspective of service life. These old industrial buildings can be redeveloped and given new functional space that meets the needs of the modern society when these buildings are well employed from social, economic, cultural and historical perspectives.

4. Possibility of Spatial Innovation in Post-industrial Zones

It is essential to find more scientific and appropriate strategies to the regeneration of former industrial buildings when talking about the innovative regeneration of old industrial building space. The redevelopment of post-industrial zones refers to the reuse of original physical structure and relevant resources of the architecture after adapting them according to the requirements of modern and future society. By doing so, the building can gain strong vitality and more practical functions. After redeveloping the old industrial building space, it is necessary to reduce the construction waste, decrease the construction period, and save energy and resources. A consensus can be reached with people's research on the theory and practice of the regeneration of former industrial sites [5]. For the regeneration of this kind of the industrial building, its function may or may not change. The purpose of innovative regeneration does not lie in the regeneration of old building space, while the basic way of regeneration is to reuse the old building space in an appropriate way. Innovation is the method and reuse is the purpose. These two aspects complement each other and form an organic unity.

There are also some things that need to be considered in order to implement the innovative spatial transformation of the old industrial building space. First of all, according to the differences of interior space, industrial buildings can be divided into three types: industrial buildings with large steel frames, shelving or arches; conventional industrial buildings with low heights and industrial buildings of irregular shaped space. Regardless of the difference of architectural styles, architects and designers can use their professional knowledge to complete more effective practical design and landscape planning. Therefore, the first step of the regeneration is the spatial application positioning of based on the existing building structure. For example, the planner of Qingdao Textile Museum in Shandong summarized the structural features of 19 buildings in one former state-owned cotton textile factory and redesigned 9 venues such as Textile Museum, Fiber Art Museum, Air Conditioning Museum, Fire Museum and Steam Exhibition Hall. The regeneration of Qingdao Textile Museum successfully created China's first 4A museum (5A is the best) with textile as the main theme, which integrated cultural and creative products, tourism, science and other functions and covers 9 exhibition halls and 19 landscape spots. This redevelopment has realized the effective layout and reasonable planning of "adjusting measures to local conditions".

In the second place, it needs to consider the regional characteristics, cultural heritage, social needs, and government planning from the perspective of the overall application of industrial

building space. In this situation, the overall layout and decision-making of the government need more attention. Regardless of the applicability of heritage buildings, the decision-making nature of the government is the core issue that determines the retention of this kind of the building space that temporarily loses its use. For a long time, China's urbanization process has been dominated by demolition and reconstruction. Old industrial buildings are often discarded or demolished for losing practical uses or developing new functions. The most important reason for the kind of regeneration is the lack of policy guidance from government agencies and the constraints of relevant laws and regulations. Although there are some successful building renovation cases in China, they are mostly carried out spontaneously and the theoretical system is not systematic, and the quality of transformation and utilization needs to be improved urgently. It is worth mentioning that under the guidance of the market economy, the redevelopment of some industrial buildings focuses on the economic benefits and ignores other possible sustainable strategies, such as the preservation of local history and culture, mixed use of land, use of energy-saving technologies, and affordability of different classes. Overall, the theoretical research and practice of urban regeneration, in particular the redevelopment of old industrial buildings in China, still need to draw some lessons from the successful regeneration cases in the UK, Germany and other western countries, which started urban regeneration earlier and could provide valuable experience [6]. National and local governments can provide some guidelines for the regeneration of industrial buildings for particular areas, encourage enterprises and developers to creatively carry on the regeneration of the industrial building space by fully considering the economic, cultural, environmental and social aspects. For example, areas with cultural and educational function, historical exhibition halls and leisure and entertainment complex can be built to improve the availability of these services and facilities. What's more, community involvement in the urban regeneration planning is encouraged to improve the efficiency and democracy of the decision-making process and further influence the government's investment and urban planning [7].

Nowadays in China, the redevelopment of former industrial buildings usually focuses on the following forms. Firstly, it can be transformed into museums which display the manufacturing process in the past. A typical example of this kind of transformation in China is that Qingdao Beer Museum, which integrates the display of the old-fashioned beer brewing process with the education of this brilliant history in the city's development. Secondly, leisure and entertainment facilities can be built based on the original equipment or manufacturing sites. Some entertainment facilities or landscape parks are built for the local community. For instance, the Ruhr area in Germany forms an industrial heritage site and the old factory buildings are transformed into a landscape park. Visitors can see the preserved industrial buildings, practice climbing, diving, walking, cycling and other activities. The unique light installations, fantastic views and cultural and art events also make it a great tourist attraction. Thirdly, expo and industrial exhibition centers are closely related to business and tourism development. The redevelopment of former industrial buildings is associated with commercial activities and tourism. For example, some buildings in Jiangnan Shipyard are renovated as one main zone in Shanghai Expo. During the renovation, some old industrial buildings are reserved and transformed into space for outdoor public exhibitions. The waterfront regeneration in Liverpool integrates museum, exhibition center, entertainment facilities and cultural events together to form a commercial complex. Fourthly, creative and cultural industry park is also a popular urban regeneration form. The incubation of creative and cultural industry and office integration can be achieved based on creative and cultural industry. For example, Beijing 751D·PARK is a successful regeneration project integrating design, exhibition, training, entertainment and providing a great public service platform for design and exhibition companies of different scales. Beijing 751D·PARK has become a landmark of the city and a model for other regeneration projects in China. Finally, building a commercial complex is a great form in the regeneration of former industrial sites. For this kind of regeneration, creative reuse of existing buildings, equipment and facilities is helpful in building innovative commercial complex, including shopping, hotels, leisure and entertainment, tourism. For example, four gas storage tanks in Vienna are transformed into a

hotel, a shopping centre, a concert hall and offices. It also becomes the local landmark and tourist attraction.

In the third aspect, the regeneration of old industrial building space should satisfy the demands of the local community, inherit regional cultural characteristics and fully consider the combination of heritage preservation and local economic development which is often overlooked by some designers or project developers. When too much emphasis is laid on the innovative planning and implementation of the project, it is easy to ignore the geographical and human aspects of particular areas and the feelings embedded in the buildings. One important aspect of the design and planning of the regeneration of old industrial buildings is the demonstration of local features. The regeneration which considers local industry can give the audience the sense of belongings as well as preserving the heritage buildings. For example, the regeneration of Qingdao Textile Museum tries to preserve the original layout and architecture details such as the passage, ventilation device and fire doors. The preservation and innovative reuse of these elements in the regeneration project are the group memory of the local residents, which can greatly gain their support for the project.

Finally, when emphasizing the innovative regeneration, it does not mean that all regeneration projects of old industrial buildings should carry on the redevelopment based on preservation. The critical evaluation of existing industrial building space is the prerequisite of the overall planning of the regeneration. Although some regeneration projects in China have successfully preserved the heritage and given new vitality to the regenerated area, many creative and cultural parks don't have strong potentials for long-term development. Not all regeneration projects really make the area revitalized. In other words, not all industrial buildings are worthy of transformation and preservation. The mixed use of land can help to develop new functions for the old industrial building space. However, the innovative application of industrial buildings can range from museums to theme parks, mini apartments, exercise plazas, etc. Compared with traditional models, these new models of transformation are more flexible, more cost-effective and closer to people's daily life.

5. Conclusion

Old industrial building space has different styles and some of them are incompatible with modern urban life. In the process of innovation and renovation, designers are much more constrained by technology than new buildings. Whether the old industrial building space can regain its vitality requires the policy support of the government, the operation of enterprises and the intervention in the social and cultural fields. The effective communication and cooperation among these core stakeholders of the regeneration projects can promote the smooth development of urban regeneration. Old industrial buildings are the integral part of the city's history, culture and heritage. The preservation and redevelopment of those industrial buildings with historical values can help to pass on the history, enhance the city's vitality and competitiveness and increase the economy. In the future, the regeneration of former industrial sites need to explore the potentiality of local culture, evaluate the feasibility of preserving the industrial heritage, improve the public's awareness in sustainable urban regeneration, and further increase the economic, environmental and social benefits brought by the regeneration of old industrial buildings.

Acknowledgements

This article is sponsored by The Educational Department of Liaoning Province. Project: On the Establishment of the Framework to Assess the Sustainability of Urban Regeneration --- A Case Study of Liaoning Province. Project number: J202076. Project: An Analysis of European Public Art in Post-industrial Spatial Redesign within the Context of Urban Regeneration in Liaoning Province. Project number: J2020032.

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