

Study of Feasibility on Functional Replacement of Old Industrial Buildings

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Abstract

With the industrial transformation and upgrading brought about by the rapid progress of scientific production technology in recent years, many old industrial districts and industrial buildings in urban areas have been discarded for the gradual loss of their original functions. For those old industrial buildings mentioned above, the traditional way of reconstruction is not optimal. A series of transformations should be carried out on them instead, so that while protecting the city's historical relics, it stimulates the functional and aesthetic needs that conform to the dynamic rhythm in modern cities. For these old industrial buildings, the government can adopt the methods of reconstruction, expansion, and modification in order to transform, utilize and replace the original functions, which can achieve the transformation of economic value and the continuation of cultural value.

Keywords: Old industrial buildings, space replacement, transformation and utilization

I. Introduction

The annual rings of history are always moving forward, so there is a large number of old industrial buildings all over the world that cannot satisfy modern industry but still retain value. The development always comes with the discard, but old industrial buildings are also alive, and they have also made a series of contributions to human society in their life course. Therefore, how to effectively deal with these old industrial buildings has become an unavoidable topic in the construction industry. The most effective method for these old industrial buildings is to transform and reuse them to achieve their economic and cultural values. This is the responsibility for the professionalism of architecture as well as for history [1].

II. The Objectivity of the Abandonment of Old Industrial Enterprises in Contemporary Cities

2.1 The development and change of functional concepts in modern urban planning

The industrial revolution in the 18th century changed the human living environment, the global urbanization process has been accelerating, the population has begun to increase exponentially, and various problems keep bothering people in the current society. In the mid-nineteenth century, people gradually began to think about planning and developing more rationally and scientifically. In the 20th century, various architectural ideas and urban planning had sprung up, making people more sophisticated in thinking about urban planning. In the 21st century, with the rise of high and new technology led by information technology and the resulting waves of the knowledge economy, economic globalization, and information society, the future development of cities has been pushed to a whole new stage. From the industrial age to the information age, earth-shaking changes have taken place in every field of the world, and the same is true in urban planning. Urban functions have changed, industrial industries face structural adjustments, and traditional industries will undeniably decline gradually in the future [2].

2.2 The development trend of modern industry

Due to the rapid development of modern industry, many complicated problems have been caused, such as global warming, thin ozone layer, severe environmental pollution, and the hottest topic this year-smog. Faced with so many problems, the development of the modern industry will bid farewell to the crude development methods of the past, and the development of the industrial economy has entered a new normal. Industrial growth will shift from high-

speed to medium-high speed, adjust stocks to make better increments, and develop methods to quality. Benefit-oriented growth momentum turns innovation-driven [3]. The factories that cause urban pollution are relocated to more scientific and advanced new industrial parks to avoid the contradiction between industrial production and the competition for resources in urban development.

III. The Historical Impression of Industrial Civilization in the Urban Process

3.1 Historical traces of old industrial buildings in urban construction

Most of the old industrial buildings in the city may no longer meet the functional needs of modern industry. However, these old industrial buildings are composed of different types of constructions in different cities and have extraordinary symbolic city impressions and memories. In urban planning and construction, these old industrial buildings are also witnesses and constituents, and they are also virtual exhibits in the city's industrial development. A large part of the old industrial buildings also carries the feelings and memories of a generation of urban residents. It is undeniable that not all old buildings have preservation value. Some buildings without preservation value need to be demolished and re-planned, and constructed, but this does not mean that we need to shovel all the old buildings [4]. For example, the Wuhan Exhibition Hall (Figure 1), built-in 1956, was originally a landmark building in Wuhan and was built with the aid of the former Soviet Union. The Wuhan Exhibition Hall covers an area of more than 100,000 square meters. During the 30 years of its establishment, more than 500 domestic and foreign exhibitions were held here. In the early 1990s, more than 40 exhibitions were held every year. The other three exhibition halls of the same style built in Beijing, Shanghai, and Guangzhou are well preserved. This exhibition hall is the witness of the friendship and cultural exchanges between China and the Soviet Union, the iconic building, and it's the childhood memory of the older generation in Wuhan. However, due to improper planning by the planners at that time, the Wuhan Exhibition Hall, valued at 600 million yuan, was demolished in 1995. Interestingly, the Wuhan Exhibition Hall, which was assessed as a crisis building first. The first blast did not collapse but only turned into rubble in the second blast. However, after five years, in 1999, to get re-started to build a new exhibition hall of Wuhan (Figure 2). The new Wuhan Exhibition Hall has lost its original historical significance and urban residents' urban culture and spirits. As a typical failed case of old industrial building renovation and reuse, Wuhan Exhibition Hall reminds future generations that the renovation and reuse of valuable old buildings in the city require detailed planning and various considerations and cannot be rudely demolished.

The functional attributes of the old industrial buildings will not be ruthlessly erased because they can no longer meet the needs of modern industry. In any case, they have left a particular historical value for human society. Architecture is not only reinforced concrete; it is alive; it is the epitome of urban development. We must rebuild and reuse these old industrial buildings based on respecting historical and cultural values and taking economic interests into account. The American architect Venturi once said: "For artists, spreading the new may mean picking and choosing from the old and existing things." The same is true for these old industrial buildings. We draw the available components from them and then appropriately introduce new components to form a unique unity. This way is the attitude that should be maintained towards old industrial buildings [5].



Figure 1. The old Wuhan exhibition hall

Figure 2. The new Wuhan exhibition hall

3.2 The aesthetics of old industrial buildings in personalized cities

The ancient Chinese sage Zhuangzi once said: "The heaven and the earth have great beauty without saying it, the four seasons have clear laws but do not discuss them, and everything is reasonable without saying it." There is no need to discuss clear rules and the changes in everything. This is also the reason why the aesthetics of old industrial buildings exist. Different types of production plant buildings and their sub buildings highly satisfy the requirements for the production functions of this category. In addition to achieving the functionality and the shape of the building, it also conveys spirituality and aesthetics. Architectural design is the pursuit of what they seem. Moreover, most old industrial buildings use raw materials such as stone, wood, or brick walls. Although this is regarded as falling behind in the industrial society, for it has poor heat insulation performance and unsatisfactory safety performance, these problems can be solved later. The process of transformation and reuse should be improved. In today's society where ecological aesthetics prevail, these raw materials and simple structures have their unique industrial atmosphere, which brings people unique ecological aesthetics [6]. Most of these buildings are simple in structure, large in space, and flexible. Large-scale productive spaces have brought people anomalies, leaving much room for transformation and utilization later. For example, industrial buildings with large internal spaces can be transformed into concert halls and museums. The relatively small space can be transformed into an artistic apartment or nursing home. As long as we turn material resources to good account, quite a large part of the old industrial buildings are still preservable. These old industrial buildings often reflect the style and aesthetics of the architectural art development of a specific historical period of a city. The volume, form, color, and materials used in them all contain the aesthetic value of the architectural aesthetics of this period. Their spirituality and aesthetics carry the sense of the times in memory, and the architectural design itself is also forward-looking, so these buildings have reasonable factors for the existence of the city and its current value.

IV. The Value of Functional Replacement of Old Industrial Buildings

The functional replacement of the old industrial building refers to integrating the single and static functional structure with suitable new functions so that the old industrial building can create more value in the limited life cycle.

4.1 Economic value

Today, when resources are increasingly scarce, we cannot blindly demolish old industrial buildings but need to transform and reuse them. This reflects both environmental benefits and economic benefits. According to different conditions and reasons for abandonment, we can adapt to local conditions through scientific and artistic methods to achieve their functional replacement. In this way, these old industrial buildings can be preserved, and this area's economic development can also be promoted. For example, the famous Ruhr Industrial Zone in Germany (Figure 3) is one of the most important industrial zones globally, and its functional value is unparalleled in the first half of the last century. The material basis on which Germany was able to launch the two world wars was provided by the Ruhr Industrial Zone, and the rapid economic recovery of Germany after the war was also the role of the Ruhr Industrial Zone. However, such an important and well-known industrial area, in the 1970s, with the decline of the traditional industry, the Ruhr area faced a structural crisis like other old industrial areas globally, and its functionality was significantly reduced in Germany. To this end, the Ruhr area has carried out regional remediation, adjusted the economic structure of the industrial zone; developed the relatively backward left bank of the Rhine River and the northern Ruhr area, and at the same time expanded the north-south transportation network to facilitate the development of the new area. Also, vigorously developed cultural, educational, and scientific research; promoted the original enterprises' technological transformation, remediated the environment, and eliminated pollution. The Ruhr Industrial Zone became an industrial garden, which directly promoted the development of the regional economy and culture.



Figure 3. Ruhr Industrial Zone

4.2 Historical value

The building itself is alive; a building is functional and has a spiritual. Architectural treatment should not lose the former; we can not blind categorically terminate its buildings' lives in urban planning but should respect the history of the building itself and its bearer. Because individual buildings carry the spirit of the times, people have no right to deprive human beings of the memory of the city's historic architectural landscape. As mentioned above, the Wuhan Exhibition Hall, because the people in power neglected the spirituality and history it carried, only paid attention to its economic benefits, and ruthlessly destroyed it, a living old industrial building disappeared. The memories carried in the hearts of old Wuhan residents also disappeared at the same time. However, the newly-built Wuhan Exhibition Hall has never been able to replace the critical position of the old one in the development of the city. Therefore, no old industrial building can blindly decide its future; it should be decided through various considerations. In contrast, the Bonnefanten Museum in the Netherlands (Figure 4) was designed by Aldo Rossi, a representative of "New Rationalism." The Bonnefanten Museum expresses Rossi's respect and understanding of traditions of industrial culture and historical cities. This area was originally an industrial area, and its soil texture is clay. Most of the original buildings have the characteristics of the industrial age. The historical context of the site and the industrialized architectural vocabulary of these old buildings became the starting point of Rossi's design. The appearance of the building is stern and straightforward, concise and regular. The rhythmic, repetitive technique appropriately reflects the characteristics of industrialization, which contrasts with the surrounding old buildings. However, it is designed according to the museum's requirements in terms of use and function [1]. Bonnefanten Museum, designed by Rossi, was built on the original industrial space using the surrounding environment, fully expressing respect and understanding of the history.



Figure 4. The Bonnefanten Museum

4.3 Cultural value

Reasonable functional replacement of old industrial buildings can enhance the city's image and spread the city's industrial culture. For example, the famous French Musée d'Orsay (Figure 5), the Musée d'Orsay is located on the opposite bank of the Louvre, and the winds of the art flow each other. The site is located inside the Orsay Railway Station, designed by Victor Laloux for the 1900 Universal Exposition. The Orsay Railway Station was one of the representatives of industrial architecture in the 19th century. In the following decades, the function of Orsay Railway Station gradually degraded, unable to play its due role, and was gradually forgotten by people. It was not until 1979 that the French government decided to rebuild and reuse it. The French ACT design firm was responsible for the design and reconstruction of the museum. A C T Design Office passed a comprehensive survey of the interior and exterior of Orsay Railway Station. Finally, the design concept was established, and the design maintained and maintained the classical style facade designed by Victor Laru. The final Orsay Museum retains the original art form of the Orsay Railway Station and creates an infectious artistic atmosphere. In the end, the Musée d'Orsay, along with the Louvre and the Pompidou Centre, were called the three major art museums in Paris. It dramatically enhances Paris's urban atmosphere and expands the scope of dissemination of Paris's art culture and industrial culture [7].

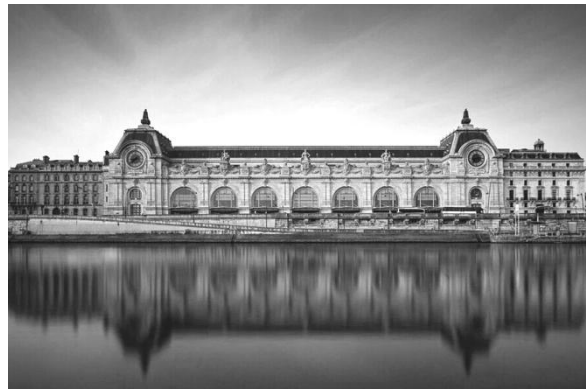


Figure 5. Musée d'Orsay

The map of the 798 Art District in Beijing (Figure 6) is also a well-known case of a successful renovation. 798 was initially composed of many dilapidated factories and was a Bauhaus-style industrial factory built with the aid of the former Soviet Union. However, due to the single functional structure and the decline of the enterprise, the buildings in the 798 Art District were slowly abandoned. In 2002, many artists chose this place as their art studio for photography, painting, and other art forms. Slowly, many art institutions also took a fancy to this place and regarded it as their art center, and then various commercial institutions also chose this place [3]. Today, the 798 Art District has become the most famous art district in China. The original industrial plant space in 798 was replaced by a famous art district, which has become one of Beijing's city images, and it also plays a massive role in disseminating art and culture. There is also the Hanyang Art Zone in Wuhan (Figure 7). The abandoned industrial plants used in the art zone were initially part of the Zhangzhidong Hanyang Armory and the 824 Factory during the Chinese Westernization Movement [8]. After space replacement, it has now become one of Wuhan's artistic images.



Figure 6. The 798 Art District



Figure 7. Hanyang Art Zone

4.4 Drive value

The transformation and reuse of old industrial buildings have promoted postmodern architecture primarily and have enriched today's diversified aesthetic trends. The Bonnefanten Museum designed by Rossi mentioned above represents the "new rationalism" architecture, and it plays an essential role in promoting the spread of the "new rationalism." The Shanghai Sculpture Art Center was also rebuilt from an abandoned industrial plant and became a gathering place for art, which promoted the spread of art and the development of postmodern architecture.

V. Conclusion

Old industrial buildings are the product of a city's history and cultural development and a microcosm of the development of a city's industry. Furthermore, every building has its own life. We cannot make a hasty decision on it. Instead, we should continue exploring and practicing based on the actual situation and accumulating the successful experience of replacing the old industrial building space and promoting the protection and reuse of old industrial construction groups in cities. The transformation and reuse of such a large number of old industrial buildings will slowly step into the track of a virtuous circle.

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