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Analysis of Building Renovation Methods and Contemporary Advancements in The Modern Era

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Abstract. Changes in the primary forms of remodeling and renovation of buildings and the current development of remodeling and renovation of buildings in modern cities. As the pace of urbanization is accelerating, the renovation of old buildings has become a way to change the appearance and cultural geography of the city and to improve the quality of life of its inhabitants. In addition, building renovation can be linked to the modern development trend of sustainable development, and the renovation of buildings can be done in an environmentally friendly way. In this study, a case study of a building lobby and the HSBC Tower in London was conducted. An overview of the current state of building renovation is given. In today's rapidly developing urban environments, building renovation has become a vital design practice, with building renovation and remodeling focusing not only on the form of the building but also on the redefinition of functional, cultural, and social values. Literature on building remodeling and renovation was also systematically reviewed. In these processes, there are two points worth discussing in the study of architectural renovation: whether architectural renovation changes or destroys the cultural value of the building itself and whether economic reasons affect renovation in architectural renovation and retrofitting.

Keywords: Architectural design; building renovation; sustainable development.

1. Introduction

This study focuses on building remodeling and renovation and developing this practice in modern times. This study is very relevant to developing contemporary building remodeling and renovation. The study focuses on the problems and developments in modern building remodeling and renovation. Literature analysis was used to find and read relevant materials and literature, which analyzes the current development of building renovation and refurbishment and facilitates the research. The ultimate goal of this study is to explore the current situation of building renovation and remodeling and to provide some suggestions for improvement. To achieve this goal, some existing building renovation case studies were conducted.

2. Overview

In today's rapidly developing urban environments, building renovation has become a vital design practice, whereby building renovation and remodeling focus not only on the form of the building but also on the redefinition of its functional, cultural, and social values. In building renovation, designers must carefully evaluate the history, structure, materials, and surroundings to ensure that the finished building does not fit into the environment or destroy the cultural values of the original building. In the modern era, building renovation and refurbishment is becoming more and more sustainable.

In today's modern urban environment, where the pace of urban life is accelerated and business models are constantly changing, the remodeling and reconstruction of buildings have become critical design practices. In terms of the significance of architectural remodeling on the cultural level, it perpetuates the history and memory of the city. Excellent building renovation should not only meet the needs of contemporary production and life but also reflect the characteristics of the contemporary era while not destroying the historical and cultural significance of the city and passing on regional

characteristics and humanistic feelings. This practice helps maintain the town's uniqueness and cultural continuity so that the city retains its traditional characteristics during modernization [1].

From the perspective of economic value, building remodeling can bring significant financial benefits. The adaptive reuse of old buildings can not only avoid the waste of resources but also evoke people's beautiful memories and enhance the market value of old buildings [2]. When the local old buildings or other types of buildings are remodeled, the appearance of the city will be greatly improved, which can be a great improvement for the development of tourism in the city.

From the viewpoint of building renovation on sustainable development, contemporary with the popularization of sustainable development, reusing old industrial buildings has become an essential element of urban development [3].

From the point of view of modern technological development, the decisive entry of the Building Information Modeling (BIM) method into the construction field seems to be an effective paradigm shift [4]. This method utilizes user ecosystems for research activities. The investigation of users entails the creation and dynamization of user-based communities that generate social and cultural capital [4]. Digitalization, especially BIM, can address the challenge of achieving an efficient retrofitting process, thus optimizing the retrofitting process of buildings and improving the whole construction industry [4].

3. Case Studies

3.1. Hyparschale Architectural Hall - Renovation and Conservation / GMP Architects

This study takes the example of GMP Associates, whose Hyparschale building hall in Magdeburg, Germany, is undergoing renovation work. From 2019 to 2024, the GMP team renovated and remodeled the building, which had been vacant for 20 years. Instead of changing the structure of the building, they made more user-friendly changes to the layout of the interior space. They designed the four corners of the space as 15*15 cubes and provided bridges for easy access. This allowed the Hyparschale building hall to have more small spaces for workshops. They also improved the roof's strength with modern materials such as carbon fiber and used steel and glass for the new façade design, without the original façade layout.

These cube spaces not only enhance the building's practicality but also add a modern and artistic touch to the entire lobby. Each cube is uniquely designed and decorated to make it an individual work of art. These cube spaces can be used for a variety of events, such as exhibitions, lectures, and small performances. In addition, the cubes can be moved and reassembled as needed to meet different needs.

In addition to the cubic space, the GMP team also improved the roof's strength with modern materials such as carbon fiber. It used steel and glass for the new façade design without changing the layout of the original façade. This design not only modernizes the building's look but also improves its durability and safety.

During the renovation process, the GMP team also focused on preserving the design aesthetics of the original building. They retained some original architectural elements and incorporated them into the renovation and refurbishment. As a result, the Hyparschale building lobby retains its original architectural aesthetic and is revitalized. In classic architectural aesthetics, visual beauty is almost a dominant element. Light and shadow, color and shape in space are all communicated to the visitor visually [5].

All in all, GMP Associates put a lot into the renovation of the Hyparschale building hall. They have revitalized the building, which has been vacant for 20 years, by humanizing the interior layout, using modern materials and techniques, and preserving the aesthetics of the original architectural design. This project not only provides an excellent public space for the residents, but is also an excellent example of architectural renovation.

3.2. HSBC Tower, London - Renovation and Conservation / KPF Architects

Another example of a project in this study is the renovation of the Foster-designed HSBC Tower in London by KPF Architects. Scheduled to take place in 2027, when the HSBC lease expires, KPF will demolish much of the HSBC building to create terraces or provide planting. The project will transform the building into a sustainable mixed-use building. The terraces and other sustainable features will offer more vibrancy for the staff and the building.

KPF Architects have announced their latest project, a renovation plan for the HSBC Tower in London. The building was designed by world-renowned architect Norman Foster and has been one of London's landmarks since its completion. However, over time, KPF became interested in remodeling the building to make it better suited for future use.

The renovation program is expected to be implemented in 2027 when the HSBC Tower lease expires.KPF's architectural team will be responsible for demolishing a large portion of the building's structure to make room for the new design. These demolished sections will be used to create terraces and provide space for planting, making the building a more pleasant and sustainable environment and helping to improve the building's energy efficiency. The building sector is a top priority in terms of maximizing energy efficiency because the most cost-effective energy savings can be found in The building sector is a top priority in terms of maximizing energy efficiency because the most cost-effective energy savings can be found in the residential and commercial building sectors. Because the building sector accounts for up to 40% of global [6].

During the renovation process, KPF will transform the building into a sustainable mixed-use building. This means that the building will not just be a traditional office space but an integrated place to work, live, and play. This design concept will make the building more flexible and able to meet the needs of various uses.

In addition, the terrace and other sustainable modifications will provide more vitality to the building's staff. For example, the terrace can serve as a space for rest and relaxation, helping staff relieve work pressure. At the same time, the space for planting can also provide a more comfortable environment, which will help to improve staff productivity and satisfaction with the working environment.

Overall, this renovation plan by KPF will completely upgrade the HSBC building in London, making it a more modern, environmentally friendly, and user-friendly office space. When this project is implemented, it may be a new highlight for London.

4. Discussion

4.1. Alterations in the Cultural Significance of the Edifice Due to Architectural Renovation

Architectural remodeling is a complex and multidimensional process that changes a building's cultural value. It involves several historical, cultural, technological, and social aspects. The information found shows that remodeling not only enhances a building's functionality and adaptability but also dramatically influences and reshapes its cultural value.

Building renovation can be used as a form of cultural inheritance. Through repairing and reusing old buildings, historical culture can be preserved and promoted, and the city's cultural identity and sense of belonging can be enhanced. For example, in the renovation of the London Coal Yard, the uniqueness of the building is that the most damaged areas were selected for innovative design, which transitioned the traditional architectural form to a modern style. The new building was constructed while integrating with the old structure, trying not to destroy the original structure [7]. In addition, through renovation, old buildings can be given new functions to continue to play a role in modern society, thus realizing the continuous inheritance of culture.

However, building renovation may also bring some challenges and conflicts. On the one hand, the renovation must balance the relationship between the old and new elements to avoid over-

modernization and loss of the original cultural characteristics. On the other hand, the renovation may involve changes to the original architectural style and materials, leading to different views and controversies among the public and experts.

When remodeling a building, designers and decision-makers should fully consider the building's historical background, cultural significance, and social needs. The existence of the old building should have its functional importance and historical significance, which is the value of its existence. Architecture, like a history book made of stone, is a spatial continuation of history and a record of time, reflecting the social activities of the period, including politics, economy, culture, etc., and is an essential carrier of human civilization [1]. Moreover, by adopting appropriate design methods and techniques, architects can preserve the original cultural value of the building while improving the environment through some technical means; with the growing emphasis on sustainable development, the Life Cycle Assessment (LCA) technique has gained importance in architectural and engineering practices. LCA can be used to evaluate the environmental impact of a building across its entire life cycle, guiding informed decision-making on design solutions that can enhance a building's environmental performance [8].

In conclusion, building renovation is a comprehensive work involving many aspects, which is not only the updating of the physical form of the building but also the reinterpretation and endowment of its cultural connotation. Through scientific and reasonable renovation strategies, the cultural value of the building can be effectively protected and inherited, while meeting the development needs of modern society.

4.2. Renovation Economic Considerations and Modifications to Structures

The economic element is a significant factor in building remodeling and renovation. Financial issues are usually one of the factors that can hinder the remodeling and renovation of a building. The longevity of building components is one of the more common problems in the later stages of building renovation and refurbishment. A methodology proposed by Farahani is that the ability to predict the forthcoming maintenance and renovation expenditures would enable the property managers to efficiently utilize resources to maintain an acceptable building performance and lower the budgetary pressure. A key parameter required for a proper life-cycle cost analysis is the life expectancy of building components under different maintenance strategies [9].

The economy is also an essential factor in building retrofits' sustainability and energy efficiency. The economic factor will lower the cost of building renovation and refurbishment. When the price is lowered, architects do not usually change the design and materials of the building because design and materials are the soul of the building. Still, the thermal energy loss of the building is a more critical part of the energy efficiency retrofit and economic factors. This is because the structure and characteristics of the building are some of the factors that affect heat loss when retrofitting a building. The factor is that the energy consumption of both residential and non-residential buildings is continuously growing, and around half of the residential energy consumption is connected to space heating. District heating is one of the sustainable solutions to meet the demand for heating and DHW [10].

5. Conclusion

The findings of this study are that building renovation needs to focus not only on its economic benefits but also on its environmental and social impacts. From this, it further concludes that its research is that building retrofitting needs to be combined with modern technology and sustainable concepts for building retrofitting, which can achieve efficient use of resources and environmental protection. This study provides many valuable references for future research in this direction, mainly influencing modern architects in the field of contemporary architectural renovation and refurbishment not only to consider the cultural value created by architectural renovation but also to consider the economic factors and how architectural renovation can follow the modern trend of sustainable development,

and should focus more on the internal relationship between architectural renovation and sustainable development in future research.

References

[1] L. Hui, New thoughts on the remodeling of old buildings—Talking about abandonment in the remodeling of old buildings, Northeast Normal University, Jilin, 2011.

[2] L. Jianan, Talking about the regeneration and utilization of old buildings from the perspective of decorative transformation, Jiangxi Building Materials 20 (2016) 34.

[3] S. Xiaorui, Research on the remodeling of old industrial buildings under the concept of sustainable development, Construction Technology Research 7(2) (2024).

[4] Lasarte N., Elguezabal P., Sagarna M., et al., Challenges of digital building retrofitting for process efficiency—A case study in Spain, Sustainability 13(21) (2021) 12139.

[5] Liu Xueqing, Miao Jun, Some implications of the reconstruction of two architectural sites for the renewal design of historic buildings, Southern Architecture 5 (2015) 113-117.

[6] A. Passer, C. Ouellet-Plamondon, P. Kenneally, et al., The impact of future scenarios on building refurbishment strategies towards plus energy buildings, Energy and Buildings 124 (2016) 153-163.

[7] Pan Yudan, Chen Yong, Architectural innovation in historic urban regeneration—An example of London's coalfield conversion project, New Architecture 2 (2020) 62-66.

[8] Grossi F., Ge H., Zmeureanu R., et al., Assessing the effectiveness of building retrofits in reducing GHG emissions: A Canadian school case study, Journal of Building Engineering (2024) 91109622.

[9] Farahani A., Wallbaum H., Dalenbäck J.O., Optimized maintenance and renovation scheduling in multifamily buildings—a systematic approach based on condition state and life cycle cost of building components, Construction Management and Economics 37(3) (2019) 139-155.

[10] Viktória V., Miklós H., The effect of building refurbishment and changing occupancy on the district heating consumption of multifamily buildings: Case study of Miskolc, Hungary, Journal of Building Engineering 81 (2024).