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# On Adaptability Evaluation and Strategy Research of Historical Block

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**Abstract:** The concept of adaptability was originated from the “theory of evolution” of biology. Based on the concept of adaptability, there are some literature achievements in the relevant research of historical blocks in China, which are worth summarizing and carding certain existing literature. The adaptability evaluation of historical block is a method for evaluating the integrating degree between the existing environmental condition and the current production and living demand, used for comprehending the actual condition of objective environment. The research on adaptive renewal strategy of historical blocks often uses field research to summarize the renewal optimization strategy for specific regions, specific block types and specific building functions. Therefore, this paper summarizes and classifies the development direction of adaptability evaluation and protection and renewal strategies of historical blocks, summarizes the conventional research methods and steps, in order to help the future research related to the adaptability of historical blocks. The paper is composed of four parts, the first part introduces the concept of adaptability; the second part focuses on figuring out systematically the development direction of adaptability evaluation of historical block, and summarizing the research procedures and research methods of historical block’s adaptability evaluation; the third part focuses on summarizing and classifying the adaptability protection renewal strategy of historical block and introducing the common research methods; the last part describes the author's thoughts and suggestions.

**Keywords:** Historical Block Adaptability, Evaluation Method, Renewal Strategy

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## 1. Introduction

The concept of adaptability was originated from the “theory of evolution” of biology, namely the favorable characters mostly adapting to environment, on the basis of the measurement by time, are selected out continuously in the intergenerational substitution process and finally become the characters common to the entire biotic population [1]. Therefore the result of adaptability is evolution. However, the post-evolution developmental biology proposes that environment and living body interacts each other and constitutes a whole part, and are commonly adapting in their growth process. In the building industry, the concept of adaptability was mentioned [2] early by the architectural theorist Violler•le•duc in the work titled by *Habitations of Man in All Ages* in 1875. Research on the adapting mechanism of city was started early. In the beginning of the

20th century, Howard, in the works titled by “*Tomorrow: path of peace directing to authentic reform*”, proposed to set permanent green land outside a city to control the unlimited expansion of city and divert surplus population to neighboring city when the city reaches a certain scale. The achievements of domestic researches on existing historical block adaptability in China are mainly concentrated in the protection renewal strategy, with obvious purpose and limitations, so the evaluation systems are far to the perfect ones.

Based on the concept of adaptability, there are some literature achievements in the relevant research of historical blocks, which are worth summarizing and carding. Therefore, this paper summarizes and classifies the development direction of adaptability evaluation and protection and renewal strategies of historical blocks, summarizes the conventional research methods and steps, in order to help the future research related to the adaptability of historical blocks.

## 2. Adaptability Evaluation of Historical Block

### 2.1. Classification of Evaluation Direction

In China, the evaluation focus of historical block adaptability evaluation is climate and microclimate, recycle of existing building, safety risk prevention, commercial degree.

#### 2.1.1. Climate and Microclimate

The research of climate and microclimate usually focuses on the evaluation objects of building or public space, with the measured results as the evaluation basis. Xia Wenyuan divided the main gray space of traditional coastal blocks in the South China into four types, namely architectural gray space, self-built gray space, small ornament gray space and vegetation gray space, and investigated the sense and expectations of the masses for temperature, humidity, wind speed, radiation and the objective physical measured environmental parameters via the subjective questionnaire as required by the thermal scale rating method, and finally acquired the overall evaluation results of typical coastal gray space types of traditional blocks in old cities in the summer's hot areas in South China, as well as their climate adaptability building strategy [3]. Yang Jinchun analyzed the microclimate, courtyard size, storey number, roof slope, color of building space of traditional quadrangle courtyard from four aspects, namely temperature, humidity, natural lighting and ventilation, and proposed the design strategy for climate adaptability of building in the renewal process of historical block in Beijing [4]. Zhang Xi adopted the thermal environmental research as the entry point, measured the space of street, and established the model to make simulation analysis, and finally proposed the optimizing measures for the thermal environment in summer in street and lane space and node space [5].

#### 2.1.2. Recycle of Existing Building

This research focuses on the judgment of the current value of existing individual building and their recycling potential, and can help to determine the renewal sequence, key points, degree of retention and renewal strategy of adaptability. Shan Wen established the comprehensive evaluation system of existing modern building adaptability from two aspects, namely material and non-material; on one hand, its current situation evaluation includes the general overview, building component, space and structure, material and technology, environment and facility; on the other hand, its value evaluation includes the historical value, culture value, social value, art value, technical value, economic value and environmental value [6]. Ma Lingbo, aiming at the building entity, utilized the tools of FRAGSIM and ArcGIS to establish the comprehensive evaluation model and dynamic scenario simulation on the basis of the "current situation - potential" matrix from five aspects of function value, culture value, economic value, physical value and ecological value, and finally proposed the strategy of comparative maintenance, renewal, function replacement, demolition, new construction,

high performance, as well as the optimized combined strategy [7].

#### 2.1.3. Safety Risk Prevention

This research focus covers the risk source affecting the safety of blocks and buildings, it aims at seeking for the balance point of safety protection and spatial protection and formulating the targeted solution strategy. Wang Xuefei summarized the basic hazard type of historical block, the common safety risk evaluation method and content in the field of building and planning, and determined the best evaluation method [8] from five aspects, i.e.: architectural and civil engineering quality, building fire safety, block fire safety, block's rainstorm and waterlogging disaster risk, safety of the public. Gao Chao summarized the existing safety issues, analyzed the conflicts between block space and prevailing specification, summarized the influencing factors of historical block's disaster and space, and established the safety evaluation system on three aspects of safety risk, vulnerability, prevention and control and the commutating method evaluating the synthesis of indicator values [9]. Wang Yi utilized the fire accident tree analysis method and the GIS-based multiple-factor weight analysis method to evaluate the degree of fire to the different areas in the block, and thereby proposed countermeasures and guarantee measures with adaptability and purpose [10].

#### 2.1.4. Degree of Commercialization

This research focus requires to use the design method and regulations of modern business street for reference and concern about the judgment on the suitability degree of commercialization before historical block is reconstructed and the judgment on the adaptability degree of commercialization after historical block is reconstructed. Zhang Qing extracted the factors influencing the suitability degree of business street based on three aspects of city (site layout, market positioning, functional structure, cultural characteristics), space (spatial form, spatial dimension, spatial environment), landscape (ecological landscape, furniture landscape, color landscape), and finally worked out the evaluation indicators for the design specification of business block [11]. Ma Yu concerned about the degree of commercialization of historical cultural block and their influences, and combined the subjective and objective evaluation, as well as the qualitative and quantitative analysis to establish the evaluation indicator system for the business suitability of historical block from three aspects of overall environment, commercial atmosphere and people's livelihood atmosphere, and proposed the commercialized optimization strategy [12] for suitability of historical cultural block focusing on three aspects, i.e.: policy management, planning technology and community (society). Li Yanbing established the evaluation indicator system for commercialization improvement adaptability of the dominant historical block in which people are living in recent time and suitable [13] for auxiliary improvement judgment before reconstruction by aiming at the material part of blocks by combining the key design points and the researches on the

spatial evaluation of relevant blocks from different aspects of block's external environment, overall conditions, internal street and lane space, internal node marks and internal buildings, and made the empirical evaluation study on the historical block of Dongguan Street of Dalian.

### **2.1.5. Other Aspects**

Except for the four research directions aforesaid, the other research focus generated only the single research papers and did not involve in further improvement. Xu Wei proposed that the heterogeneous architecture evaluation system should have four basic functions, i.e.: diagnosis, prediction, selection and guidance, and he utilized the research methods of system analysis engineering to establish the heterogeneous architecture adaptability evaluation system [14] of historical block possessing memorable value, practical value and historical feature coordinateness. Zeng Masai, by integrating the investigation and research results, analyzed the adaptability evaluation characteristics of Chongqing industrial heritage after reconstruction in view of their basic conditions, and then established the evaluation system based on three aspects, i.e.: function adaptability evaluation of statistical investigation evaluation method, traffic adaptability evaluation of participants' experience evaluation method, and spatial adaptability evaluation of cognitive evaluation method by adopting the integrating degree of surrounding cities and the judgment on using effect after reconstruction as the evaluation objectives and by borrowing the subjective evaluation method of as-built environment, and further proposed the after-reconstruction adaptability optimization strategy [15] of industrial heritage after making empirical evaluation research on 501 art base in Huangjueping, Chongqing. Hong Yan adjusted the influencing factors of modern adaptability evaluation of historical blocks in the downtowns of Hangzhou along The Grand Canal according to the interview questionnaires of the public, established the hierarchical structure of evaluation indicators by borrowing the hierarchical analysis method, and finally issued the AHP matrix judgment questionnaire and the interview questionnaire adopting the hundred-mark system for scoring to the experts and the public, then compared weighted to determine the final weights of every indicator, and established the modern adaptability evaluation system [16] of historical blocks in the downtowns of Hangzhou along The Grand Canal from four aspects of block's external environment, entire condition, internal elements, development sustainability. You Qunlin explored the inspection technology of enterprise value judgment and tourist value sensing consistency of historical and stylistic architecture served as tourism resources by borrowing the grid analysis techniques of the psychology on the basis of the dual nature as demanded by three aspects of historical culture value, ornamental value and technology use value of historical and stylistic architecture served as tourism resources, and finally proposed the corresponding development strategy and facility path capable of realizing the value of historical and stylistic building and tourist demands [17].

## **2.2. Overview of Research Procedures**

The research procedures of historical block adaptability evaluation are composed of three stages, i.e.: basis preparations, analysis of measured data, summarization and feedback.

### **2.2.1. Basic Preparations**

This stage includes two parts, namely data collection and establishment of evaluation system. The collection of data related to research object is usually realized by using the literature study method by summarizing the research progress at home and abroad, the development history and status quo of research object, key points and specifications of domestic same design. The establishment of evaluation system is usually realized by extracting influencing factors by using the historical block value evaluation system for reference by combining the status quo of case, and then further the historical block adaptability evaluation system is established on the basis of using the analytic hierarchy process, simulation evaluation method and by determining the evaluation factors and weights by integrating with the feedback provided by the questionnaires of experts and the public.

### **2.2.2. Analysis of Measured Data**

This stage covers data collection and analysis. Generally, the combined method of quantitative analysis and qualitative analysis, and of subjective evaluation and objective evaluation is adopted. There are two data acquisition sources. One is the objective data source, namely the objective condition, researchers are required to make observation, record and measured simulation on the current condition; the other one is the subjective evaluation, it focuses on the one of acquiring evaluation feedback via the questionnaires of the public and experts, or the field interview. The data analysis can be divided into two types, where the former is the model simulation analysis; the latter is the evaluation score's statistical analysis.

### **2.2.3. Summarization and Feedback**

This stage requires to summarize the existing problems and existing advantages of research object by borrowing the data statistics results of analysis stage, it discloses the actual demand of modern production and life, and proposes the targeted renewal strategy or optimization suggestions.

## **2.3. Overview of Research Method**

For the historical block adaptability evaluation, usually the literature analysis method, field investigation method, discipline crossing method are adopted to make pilot study, and the expert investigation method, questionnaire method, analytic hierarchy process, and fuzzy evaluation method are combined to determine evaluation factors and weights at the stage of basic preparations; however at the stage of analysis of measured data, usually the field measurement method and questionnaire method are adopted to acquire status quo data or evaluation data, and data are processed by using the combined method of quantitative simulation method and visualized

analysis, where the final evaluation results are determined by the comparative inductive method.

### 3. Adaptable Renewal Strategy of Historical Block

#### 3.1. Classification for Research Direction of Renewal Strategy

The research on the adaptable renewal strategy of historical block in China covers four directions, i.e.; public space, individual building, regional feature and planning standard.

##### 3.1.1. Public Space

This research direction concerns about the microclimate, landscape design, transitional interface design of public space, such as streets, lanes in historical block. Liu Xiaochen summarized the spatial form adaptability of building block of mosque from two aspects of concept explanation and elements, made comparative study on the adaptability contact of spatial environmental form of mosques and local city's blocks at home and abroad, and finally took Guangzhou Lighthouse Mosque as an example to analyze its spatial environment, function, marketplace adaptability structure and extract the adaptive phenomenon [18], Dang Qi summarized the general conditions of every historical block in Qingdao and their protection and development history, and combined the field investigation method to sum up and summarize the renewal strategy adapting to the self characteristics of historical blocks [19]. Chu Qiao figured out the status quo and problems of outside historical blocks, and finally summarized the adaptive mechanism of outside historical blocks from the relations between spatial configuration and latent movement, land distribution [20].

##### 3.1.2. Individual Building

This research direction concerns about the substitution of traditional spatial functions of individual building in historical block, and recycle of existing building and heterogeneous architecture. Song Shanshan figured out the adaptability improvement history, advantages and challenges of traditional houses in China and foreign countries, sum up the same points and integrating points between traditional residence and culture creativity industry development, and summarize the adaptability improvement principle, mode, method, problem and strategy [21] of traditional residence under the industrial background of cultural creativity. Wang Fei summarized the development, formation characteristics and morphological characteristics of courtyard-oriented building, and analyzed the adaptability recycled principle and method [22] of building's internal space, building form and courtyard function by combining multiple analysis. Du Yanli summarized the basic adaptability's regenerative elements of historical block, the characteristics and general situations of historical blocks of the ancient city Quanzhou, and proposed the adaptability regeneration styles of two kinds of historical blocks, namely the historical block oriented to commercial

tourism and the historical block oriented to residence from five aspects, i.e.: social regeneration, environmental protection, economic revival, cultural continuity, creative utilization.

##### 3.1.3. Regional Characteristic

This research direction concerns about the regional climate, geographic pattern, historical and cultural style and features. Zhang Zou made a deep analysis on the cultural ecology of coastal historical sites and the field investigations by using the adaptability theory of cultural ecology on the basis of theory of urban spatial cultural ecological system, and proposed the corresponding protection renewal objective, principle and strategy. Zang Xinyu summarized the green block design strategy and method adapting to the different ecological environment factors and different spatial environment factors from four aspects of climate conditions, land conditions, green land and water conditions, and stressed on the importance [23] of technical adaptability, ecological adaptability and climate adaptability. Liu Jingjing summarized the mountainous region adaptability characteristics of the one of using the stilted style as the mountainous building strategy from the aspects of free variability, cheap price, simple structure and technology easy to master, and proposed the method to carry out the concept of stilted style in renewal creation of modern building [24]. Chen Yuanyuan summarized the adaptive protection type, interaction relations, protection strategy and method of intangible cultural heritages and building environment in Xi'an, and divided them into three kinds of protection modes, namely integrated preservation, local transformational protection and adaptive renewal protection [25]. Lian Mao summarized the current conditions and problems of historical cultural blocks in the downtown of Chongqing, built the modern adaptive renewal method suitable for the historical and cultural blocks in Chongqing, and explored the adaptive renewal strategy [26] from six aspects, i.e.: modern residence, supply, travel, communication, culture and industry.

##### 3.1.4. Planning Specification

This research direction concerns about the compilation of planning specification and countermeasures of risky accident. Xiao Jiaqing analyzed the theory and practice of disaster prevention standards of historical sites in China and overseas countries by focusing on contents and characteristics, summarized the integrated disaster prevention characteristics, prevailing technical standards and their in adaptability of historical sites, and proposed the adaptability improvement suggestions [27] for the technical disaster prevention standard of historical sites by aiming at the fire control, anti-seismic property, flood control and other disaster preventions. Xue Kang summarized the current conditions and problems of traffic conditions of historical blocks, analyzed the traffic planning modes and problem solving strategy of historical blocks in China and overseas countries, and proposed the solution [28] for improving transportation conditions of historical blocks in Xiaogang, Qingdao.

### 3.2. Overview of Research Procedures

The research on the adaptability renewal strategy of historical block is usually conducted by making pilot study on prevailing laws, regulations, current conditions of cases, theoretical literatures by using the literature analysis method and the field investigation method, it focuses on summarizing and analyzing the existing problems, formulating adaptability renewal principle, and further proposing the targeted adaptable renewal strategy for historical blocks.

## 4. Conclusion

The adaptability evaluation factor selection and weight judgment on existing historical blocks depend on the suggestions of industrial experts or other evaluation systems, so they are scientific to some extent. However the purpose of adaptable renewal is the regeneration, so whether it can get success or not depends on the acceptance of the market and the public. From the perspective of author, there is needed to consider more the concerns and perceptibility of user, improve evaluation result accuracy, enhance renewal strategy practicability, and make renewal strategy, key design points highly matchable with the demands of user when the historical block adaptability evaluation from the angle of user researches the selection of evaluation factors.

There are many researches focusing on historical block adaptability, but none of them is so systematic due to their numerous and jumbled contents. The main reasons are the one that the essence of adaptability concept has the nature of target and epochal character, the research entity with different time, different area, different planning objective and different functional types require different adaptability evaluation factors, so the current situation research method needs to change accordingly and the researcher needs to select flexibly according to the actual conditions, so it is not the universal one for all of these researchers.

The existing as-built environment's subjective evaluation and historical block value evaluation system are rather mature and comprehensive, but the historical block adaptability evaluation system is still rather weak, and it needs to use the existing research results from the former for reference and combine the subjective and objective evaluation methods.

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