



AHP Evaluation and Intelligent Analysis of Environmental Effects of Innovative Industries Based on Big Data POI

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Abstract—The article builds a comprehensive evaluation index system for environmental performance auditing of innovative industries based on big data POI indicators, and uses the analytic hierarchy process to determine the weight of the indicator system, which is of great significance for improving the quality and efficiency of environmental performance auditing. Using AHP-fuzzy comprehensive evaluation method to comprehensively evaluate the high-tech industry of a certain province, the empirical research results of the ecological fund performance audit of a certain city show that the evaluation result of the index system can objectively reflect the actual situation of the city and county administrative district, and build on this basis The evaluation index system of urban innovation environment and the comprehensive evaluation model of urban innovation environment based on analytic hierarchy process show that the evaluation accuracy rate is as high as 97.2%

Keywords—AHP Evaluation, Environmental Effects, Innovative Industries, POI

I. INTRODUCTION

At present, my country's economic development has entered the "new normal". The innovation and innovation work led by "mass entrepreneurship and innovation" has become a national strategy. Among them, the urban innovation ecosystem with the entrepreneurial space as the core carrier will become the innovation driving force that promotes the sustainable development of my country's economy. . At the same time, from the perspective of my country's urban development stage, most cities are facing a gradual transformation from factor-driven, investment-driven to innovation-driven, in order to improve their own sustainable development capabilities and levels. As the capital, Beijing has the first national-level innovation demonstration zone—Zhongguancun Innovation Demonstration Zone. It is responsible for my country's innovation leadership. It is committed to exploring new ideas and new paths for the development of crowd-creation space, setting a benchmark for other cities to learn from. High ground [1-6].

To this end, this article evaluates the development environment of Beijing's Makerspace construction area, on the one hand, analyzes the relationship between Makerspace and the city's key innovation elements, and on the other hand, explores the advantage evaluation and priority division of the Makerspace development area. Contribute to the improvement and construction of the urban innovation ecosystem. The innovation environment is the space on which scientific and technological innovation depends for survival and development.

It determines the quality of enterprise scientific and technological innovation activities and is of great significance to the scientific and technological development of cities. The government should take the creation of a suitable innovation environment as the main means to promote technological innovation of enterprises. Therefore, discussing and studying the evaluation of the city's innovation environment is of great significance to the government's creation of a good innovation environment, the construction of an urban innovation system, and the city's future scientific and technological development. The concept of Regional Innovative Milieu (Regional Innovative Milieu) was first proposed by the European Innovation Research Group (GREMI) in 1985. The research group defined the innovation environment as: the main actors in a certain area cooperated with each other and Informal and complex social relationships established through collective learning [7-14].

The innovation system of a city is a system in which the main elements of innovation such as enterprises, scientific research institutions, universities, governments, and related intermediary services and financial institutions interact with the innovation environment. The urban innovation environment is an important part of the urban science and technology innovation system. We define the urban innovation environment as the sum of various innovation main elements (various institutions and organizations) and non-subject elements (material and non-material conditions) in the urban area, as well as the systems and policies that coordinate the relationship between the elements. When the innovation environment is in a good state, it promotes the urban innovation system and enables scientific and technological innovation to achieve better results; on the contrary, it acts as a restriction and hindrance and affects the implementation of scientific and technological innovation. The AHP-fuzzy comprehensive evaluation model is mainly composed of two blocks: the first block is the analytic hierarchy process; the second block is the fuzzy comprehensive evaluation. Among them, the fuzzy comprehensive evaluation is carried out on the basis of the analytic hierarchy process, and the two complement each other, and jointly improve the validity and reliability of the evaluation [15-21].

The AHP-fuzzy comprehensive evaluation method combines the fuzzy comprehensive evaluation method and the analytic hierarchy process to evaluate the actual effects of the independent innovation environment of the high-tech industry in Heilongjiang Province. Fuzzy comprehensive evaluation for comprehensive evaluation. At present, innovative industries have begun to take shape in developed cities such as Beijing,

Shanghai, and Shenzhen, with good development prospects. However, innovation industries in different regions within the same city are uneven. The reason may be related to internal factors such as the innovation industry's industry, investment and financing system, and human resource structure. At the same time, it is also closely related to external factors such as its geographic location, surrounding resource supply, and service supporting layout [22-24].

II. THE PROPOSED METHODOLOGY

A. Environmental Effects Of Innovative Industries

There are many factors that affect a city's scientific and technological innovation activities. Only by analyzing and constructing an evaluation system from all levels can the conditions of the city's scientific and technological innovation environment be accurately reflected. Drawing lessons from domestic and foreign research on innovation environment, this article summarizes various types of influencing factors and designs a set of urban innovation environment evaluation system. The system divides the basic components of the urban innovation environment into four aspects: policy and legal environment, innovation basic environment, humanistic environment and innovative service environment. Establish a judgment set and determine the fuzzy judgment matrix.

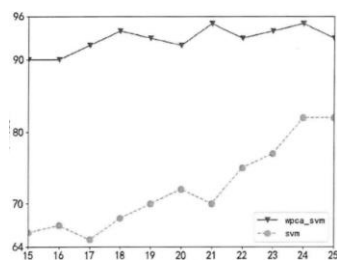


Fig. 1. Environmental effects

The evaluation scale is the set of evaluations given by the reviewers to each factor, and it is a linguistic description of the evaluation factors at each level. The evaluation scale of this model is the ratio of A, B, C, D, E, F, G; that is: very high, high, high, average, low, low, and very low ratios. These ratios are used to judge vector. The basic environment of innovation is the carrier for the flow of various elements in a regional innovation activity, including various transportation and communication infrastructures (such as railways, highways, telephones, Internet, etc.), knowledge and information infrastructures such as databases, scientific and technological information retrieval systems, etc., and The degree of integration of various basic institutions engaged in research and development (such as key laboratories, engineering centers, universities and scientific research institutes) with local industries, and the construction of basic innovation platforms. There are more qualitative evaluations and less quantitative evaluations, it is difficult to make an objective and effective evaluation, and the evaluation results are not comparable.

Based on the goals and guidance of environmental performance auditing, this paper constructs a comprehensive evaluation index system for environmental performance auditing from the perspectives of ecological environmental quality, pollution control, environmental construction and resource utilization, and audits and evaluates the environmental performance of Lishui City's eco-environmental protection funds. Identify the negative factors affecting environmental

performance and put forward constructive audit opinions to promote efficient environmental management.

B. AHP Evaluation and Intelligent Analysis

The Analytic Hierarchy Process (AHP) model usually contains three levels: the target layer is the description of the evaluation object or target problem; the criterion layer is the specific description and expansion of the target layer; the index layer is the refinement of the criterion layer. According to the target to the index, the direct influence relationship between various factors is listed at different levels from top to bottom, forming a hierarchical structure. We divide the evaluation index system of the urban innovation environment into 3 levels, with the urban innovation environment as the first level of target level; the second level of criterion level has 4 secondary indicators: policy and legal environment U1, basic environment U2, humanistic environment U3, Innovative service environment U4; 20 three-level indicators (u11~u44) have been established at the third level index level below the criterion level.

$$f(x) = w^T x + b \quad (1)$$

$$f(x) = \sum_{i=1}^n a_i y_i x a \quad (2)$$

This constructs a hierarchical structure of urban innovation environment evaluation. The standardization of raw data refers to the standard quantification of index values. According to the manifestation of different index data at the element level, the evaluation results, evaluation standards and evaluation requirements are comprehensively considered, and the index method (such as Eco-environmental status index), linear interpolation method (such as urban environmental air quality status) and grade division method (cross-border water quality status of administrative areas) are standardized, and finally the score range of each index is between 0-100. According to the analysis results of the AHP fuzzy comprehensive evaluation method, it can be seen that the level of the effect of the independent innovation environment of Heilongjiang Province on the independent innovation of high-tech industries in the province is: the proportion that thinks "very low" is 0.011; the proportion that thinks "low" is 0.015; The ratio of "low" is 0.045; the ratio of "very high" is 0.315; the ratio of "high" is 0.365; the ratio of "high" is 0.161; the ratio of "average" is 0.089.

According to the principle of maximum degree of membership, among the seven levels of degree of membership, "high" has the largest value. Therefore, the degree of impact of the independent innovation environment of high-tech enterprises in Heilongjiang Province on the enterprise is evaluated as "high". From the AHP-FCE model The calculated weight value can be seen that the weights corresponding to the 11 indicators of technology companies, universities, scientific research funds, scientific research institutions, Chinese restaurants, fast food restaurants, residential quarters, subway stations, bus stations, shopping malls, and supermarkets, are respectively These are 0.1754, 0.0594, 0.0596, 0.0883, 0.0704, 0.1459, 0.0905, 0.1061, 0.0483, 0.0682 and 0.0879. Taken together, the three individual indicators of technology companies.

C. Analysis of Environmental Effects Based on Big Data POI Indicators

As well as learning from the existing research on innovative industries using big data methods, this article, as the first article of the author's series of research on innovative industries, intends to start with the most basic carrier of physical space, and conduct research on the development status and environment of innovative industries. Analysis in order to gradually deepen the research cognition and discovery of innovative industries. Here, with the help of POI big data, take Beijing as an example to analyze and evaluate the development environment of its innovative industries.

$$\min_{w,b} \frac{1}{2} \|w\|^2 \tag{3}$$

$$L(w,b,a) = \frac{1}{2} \|w\|^2 - \sum_{i=1}^n a_y \tag{4}$$

First, grab the Baidu POI data of Beijing University campus, technology companies, residential areas, post offices, public bicycles, and newsstands. Secondly, address the data to get its geographic coordinates. Finally, after coordinate correction, it is imported into ArcGIS and converted into GIS data. The data is visualized through GIS software and the GEOHEY website and converted into spatial data that can be analyzed. The construction of innovative industries in Beijing is facing some problems and challenges in the rapid development. For example, Zhongguancun and Chaoyang CBD are currently clusters of innovative industries. However, the fierce competition environment has resulted in higher land rental prices, which has increased the operating costs of innovative industries and increased Difficulty of survival. The incompatibility between the functional types of the innovative industries and the location characteristics, the mismatch between the services of the innovation industry and the demand of the innovation industry, and the inconsistency between the supporting facilities and the growth needs of the innovation industry have become very urgent practical problems. The subject of this research is closely related.

By decomposing the regional innovation environment into each indicator in the indicator system, the innovation strengths and weaknesses of each region can be obtained separately. Judging from the scores of each indicator, there are big differences between different administrative regions. Almost all indicators in Haidian District have exceeded the average value and are in the forefront. Only the number of bus stops within 1 kilometer around the innovative industry has "pulled back". This shows that Haidian District needs to work hard on public transportation facilities to make up for the shortest shortcoming of the overall innovation environment.

III. EXPERIMENT

The environmental effects of innovative industries are shown in the figure.

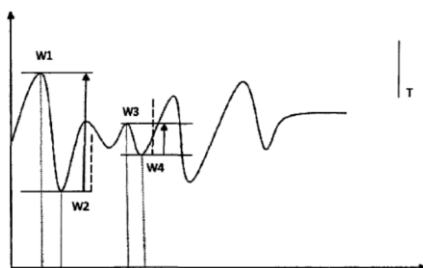


Fig.2. Environmental effects of innovative industries

The AHP evaluation system for the environmental effects of innovative industries is shown in the figure.



Fig. 3. AHP evaluation system

The environmental AHP evaluation based on big data POI is shown in the figure.

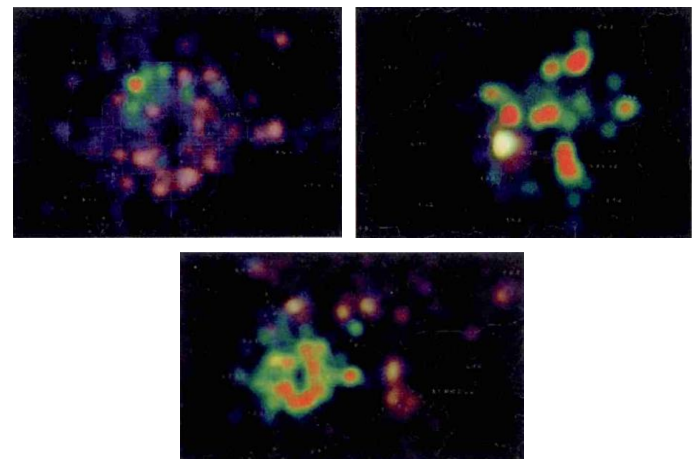


Fig. 4. Environmental AHP evaluation based on big data POI

CONCLUSION

This paper constructs a multi-level evaluation system of urban innovation environment, based on this, gives a comprehensive evaluation model of urban innovation environment based on analytic hierarchy process, and studies how to apply this model to evaluate. The analytic hierarchy process quantifies the indicators that are difficult to quantify, and scientifically processes the subjective judgments made by experts, eliminates the purely subjective evaluation in the indicator weighting, and makes the weights of the indicators tend to be rationalized. The method given in this paper is feasible and practical for the evaluation of urban innovation.

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