Study on Evaluation of Urban Industrial Parks in China

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Abstract: Nowadays the urban industrial park is not only the powerful platform of grasping the high ground of international economic and industrial development, but also the solid backing of improving independent innovation capability and international competitiveness, therefore, constructing the evaluation system of urban industrial park is important. This paper uses AHP to evaluation the urban industrial park in Wuhan from economic, management, environment, architecture, innovation, at last gets the evaluation result and some proposals
Key word: Urban industrial park, Evaluation system, AHP

1 Introduction

Urban industrial parks have a large influence on promoting the development of economic, society, science through their technology ability and policy[1]. In some region, urban industrial parks have formed economic of scale, so they strengthen the function of city service and optimization of industrial organization and accelerate transformation of the mode of economic development [2]. This paper constructs the evaluation system of urban industrial park and gets a evaluation on the whole by AHP and fuzzy evaluation in order to give some suggestions for urban industrial parks development. The evaluation of urban industrial parks is complex system engineering because it must reflect the comprehensive situation of parks, such as park economic, management, environment, architecture, innovation and so on [3]. This paper combines the practice and character of urban industrial parks in china, so that on a whole it can reflect the reality of urban industrial parks development.

Many scholars gain some results in the evaluation of urban industrial park: Emerson (2003) [4] thought that the evaluation of urban industrial park needed to concern employment, output value, investment and so on. Metzhr (2002)[5] summarized a industrial park have four important factors to evaluate: scale, benefit, economic contribution, society contribution. Domestic scholars also pointed some views. Wang (2001) [6] evaluated the development of some industrial park from investment, output, environment and so on. These scholars research findings put a great influence on the evaluation of urban industrial park.

2 Index System

2.1 Social and economic development

Social and economic development of parks is an important symbol of measuring the level of a park development which not only reflects the level of social and economic development but also reflect the potential of social and economic development. It is good to evaluate social and economic development for promoting the competiveness of enterprise in the park and ensuring the fast development of park. In this paper, we use total industrial output value, industrial added value growth rate, per-capital industrial added value and contribution rate of S&T progress to reflect the index of social and economic development.

2.2 System network structure

Park system network structure is the character index of urban industrial park which reflects the result of recycle and infrastructure construction. We use the integrated level of urban industrial park, resource optimize rate, and the share degree of information to reflect system network structure.

2.3 Innovation ability

Park innovation ability is a important measure of improving international competitiveness which need to develop the technology innovation, management innovation, system innovation of urban industrial parks. We use innovation technology input, the important technology organization, technology talents to reflect the park innovation ability, as table 1

2.4 Park management

Park management organization is the important part to ensure the normal operation and development of parks. The development of urban industrial park should get the supporting from the government in revenue , investment and talents, at the same time, we should pay a important attention to park organization, enterprise management and logistic management. We use the rationality of resource

planning development, the constructing level of information system, the infrastructure level, the implement of management system, the implement of law to reflect the park management activity.

2.5 Park environment

According to the policy of sustainable development, urban industrial parks should deal with the relation between economic and environment well in order to coordinate with urban planning and city development. We use Industrial waste comprehensive utilization rate, waste emissions rate, waste adolescent rate, the proportion of environment investment in GDP, the potential of environment improving, and percentage of greenery coverage to reflect park environment.

2.6 Park output

Urban industrial park need to make a large of output during its development which contain many aspects. In this paper, we use patent application quantity, patent granted quantity, revenue and export to reflect park output.

Table 1 The Evaluation System of Urban Industrial Park

Target Layer	Dimension Layer	Index layer
The evaluation system of urban industrial park	Social and economic development C1	Total industrial output value C11
		Industrial added value growth rate C12
		Per-capital industrial added value C13
		Contribution rate of S&T progress C14
	System network structure C2	The integrated level of urban industrial park C21
		Resource optimize rate C22
		The share degree of information C23
	Innovation ability C3	Innovation technology input C31
		The important technology organization C32
		Technology talents C33
	Park management C4	The rationality of resource planning development C41
		The constructing level of information system C42
		The infrastructure level C43
		The implement of management system C44
	Park environment C5	Industrial waste comprehensive utilization rate, waste emissions rate C51
		Waste adolescent rate C52
		The proportion of environment investment in GDP C53
		The potential of environment improving C54
	Park output C6	Patent application quantity C61
		Patent granted quantity C62
		Revenue C63
		Export C64

3 Evalution Method

3.1 Evaluation index

In table 1, C={C1, C2, C3, C4, C5, C6} stands for social and economic development, system network structure, innovation ability. Park management, park environment, park output C_{ij} stands for the direct evaluation index

3.2 Evaluation index weight

This paper determinates weights of factors evaluation index compared with upper layer index in importance. For the multiple comparison of index in the same layer, this paper adopts 1-9 scale method to reflect the relative importance between indexes. This paper obtains values by the Delphi consultation method

Table 2 Weight of the Dimension Layer

C	C1	C2	C3	C4	C5	C6	Wj
C1	1	2	2	1	2	2	0. 2469
C2	0.5	1	1	0.5	2	2	0. 1568
C3	0.5	I	1	2	2	2	0. 2022
C4	1	2	0.5	1	2	2	0. 2014
C5	0.5	0.5	0.5	0.5	1	1	0. 0964
C6	0.5	0.5	0.5	0.5	1	1	0. 0964

CI=0. 0441, CR=0. 0356<0.1, so the consistency of judgment matrix is acceptable.

Similarly, we can obtain respectively weights of behaviors layer: c_{ij}（0.2, 0.4,0.2, 0.2, 0.25, 0.5, 0.25, 0.2, 0.4, 0.4, 0.1667, 0.3333, 0.3333, 0.1667, 0.3917, 0.1646, 0.1646, 0.2792, 0.3333, 0.3333, 0.1667, 0.1667）. According to the test, the consistency of judgment matrix is acceptable. The total sorting weights: w_i (0.0494, 0.0987, 0.0494, 0.0494, 0.0392, 0.0784, 0.0392, 0.0404, 0.0809, 0.0809, 0.0336, 0.0671, 0.0671, 0.0336, 0.0377, 0.0159, 0.0159, 0.0269, 0.0321, 0.0321, 0.0161, 0. 0161); CR=0.0356<0.1, so the consistency of judgement matrix is acceptable. According to the values, this paper shows the descending order of behavior description weight: C12, C32, C33, C22, C42, C43, C11, C13, C14, C31, C21, C23, C51, C41, C44, C61, C62, C54, C63, C64, C52, C53.

4 Evaluation Application

4.1 Index layer's value

After determining the total weight, we need to obtain urban industrial park' evaluation information which calculate by the weighted average calculation method based on absolute evaluation values of index descriptions and corresponding weight of index descriptions.

As we known, getting score values of index are a complex work. Sometimes some index descriptions are easily get score values, but sometimes we can't directly obtain score values because these index don't have quantitative characteristics. In order to solve this problem, we can adopt Fuzzy Comprehensive Evaluation method to change them from qualitative index into quantitative index according to maximum membership degree law. Urban industrial park evaluation subjects include four participants: oneself, peers, higher authorities, subordinates. Evaluation of every index adopts the hundred point system, we can calculate the actual score of every index according to the formula 1. The weights of formula 1 are as table 3

$$Y_i = \sum_{i=1}^{4} S_i W_i^1 \qquad i=1,2,3,4 \tag{1}$$

Y_i= the actual score of every park

S_i =the respective score of four participants W_i^1= the respective weight of four participants

Table 3 Weight of Four Participants

Evaluation subjects	Oneself	Peers	Higher authorities	Subordinates	W_i^1
Oneself	1	1	1	5	0.322
Peers	1	1	2	4	0.362
Higher authorities	1	0.5	1	3	0.238
Subordinates	0.2	0.25	0.33	1	0.077

CI=0. 02, CR=0. 02<0.1, so the consistency of judgment matrix is acceptable.

$$Y_j = \sum_{j=1}^{22} Y_i W_j \qquad j=1,2,3\ldots..22 \tag{2}$$

Y_j= the total score of every park

Y_i= the actual score of index layer

W_j= the total weight of every park

4.2 Evaluation result

We choose seven urban industrial parks sample from Wuhan: Qiaokou urban industrial park, Jianghan urban industrial park, Hanjiang urban industrial park, Hanyang urban industrial park, Qingshan urban industrial park, Wuchang urban industrial park, Jiangan urban industrial park, Hongshan urban industrial park. After we figure out, the evaluation result is Y_i=（78.49, 61.44, 71.15, 63.99, 67,49, 72,31, 50.53）

5 Conclusion

This paper constructs the selection and evaluation system of urban industrial park, which adopts qualitative and quantitative analysis through AHP. In order to obtain accurately quantitative evaluation result, we should make good use of Delphi method to accurately mark for urban industrial park. In the process of urban industrial park evaluation, we find that technology innovation ability of urban industrial parks is not strong and need to construct information system better.

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