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Based on the bird's nest, cloud patterns method after the operation benefit evaluation system of research

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ABSTRACT

After the Olympic Games, built a big stadiums have utilization rate is low. Build the stadium after the operation efficiency evaluation system, and study how to increase the operating efficiency of the venue is very important. This article in the bird's nest, for instance, by Vivian method established the bird's nest operating efficiency rating system, and puts forward the corresponding set up. Firstly, Vivian, affecting the bird's nest after the operation benefit level evaluation index are discussed. Influence of social benefit index sex is the largest. Using analytic hierarchy process (ahp) to the test results, the findings have reliability. Then, using the method of CAM, combined with the level of index weight, the bird's nest after the camp cloud benefits of secondary evaluation index for the determination of the total weight, the results met the TABLE 9. For quality of employees is the most important, environmental quality and management system, weight value of 0.0826, respectively, 0.0817, 0.0817. In conclusion is put forward for the bird's nest management, enhance the bird's nest brand, improve the quality of employees.

KEYWORDS

Operating efficiency; Evaluation system; Delphi method; Analytic hierarchy process; Indicator weight.

INTRODUCTION

In 2008 the world in the Olympic Games held in Beijing, China. The implementation of China's one hundred Olympic dream, not only the event held in such aspects as economy and culture of our country has a great influence. In order to meet the arrival of the Beijing Olympic Games, China built and change a lot of sports venues. These stadiums during the game not only send out a dazzling light, after the game also brought great benefits to our country.

The bird's nest is 2001 by herzog and DE meuron and Li Xinggang Chinese architects in collaboration with the giant stadium. The bird's nest belong to super sports building, use fixed number of year 100, the main structure design fire resistance rating for level 1, seismic fortification intensity of 8 degrees, the waterproofing of underground engineering grade 1, steel structure total amount is 42000 tons. The bird's nest, formally began on December 24, 2003, is expected to be completed in March 2008, the project total cost 2.267 billion yuan.

The bird's nest construction engineering, investment is huge. This makes the bird's nest at the beginning of construction becomes the streets the focus of debate. After the completion of the bird's nest is known as "the fourth generation of stadium" the great architectural works of witness is not only the human in the 21st century, the relentless pursuit in the field of architecture and environment, also witness to China's the history of this Oriental ancient civilization continuously towards opening process. The bird's nest in 2009 included in the "ten building" in the world.

The bird's nest in the initial set up, the Chinese government will give a high degree of attention. Before and after the review of previous Olympic Games, countries in the Olympic Games there were rapid economic rise and then fall phenomenon. Olympic venues have appeared in the different situation of idle, low utilization rate. Make construction and huge investment in reconstructing the stadiums, get the corresponding returns, the cause of the government and investors economic losses.

The specification of the bird's nest in the construction scale, high to all professionals in favour. In order to make the bird's nest in conformity with the investment gain after the game, how to under the environment of rapid economic development, the sustainable development of the play to its own force, improve the management mode, optimize operating level, becoming the key of the bird's nest after the operation. The problem is the key to measure the bird's nest "development degree", judging it and external factors of "coordination". Find the nest through regulating economic evaluation system, optimizing the corresponding aspects of the operational level, in order to improve the operating level of the bird's nest.

OPERATING EFFICIENCY EVALUATION INDICATOR SYSTEM ESTABLISHMENT

According to nest operational features, it is known that nest operating efficiency is related to multiple aspects factors. To establish nest operating efficiency evaluation indicator system, it needs to find out different factors impacts degrees on operating efficiency. It is similar to Delphi method. Delphi method is using experienced experts opinions by widely consulting to predict one subject or one project future development method. The method is relative simple, and saves expense.

Delphi method

Firstly, it should find out research objects evaluation indicators. Then define every expert evaluation on different indicators, according to expert evaluation, it gets every indicator weight. Assume

it totally has n pieces of factors, m experts to participate in scoring, and then expert scores on every kind of indicators are as TABLE 1 shows.

TABLE 1 : Different indicator relative importance scores

Indicator	1	2	3	...	j	...	n
1	C_{11}	C_{12}	C_{13}	...	C_{1j}	...	C_{1n}
2	C_{21}	C_{22}	C_{23}	...	C_{2j}	...	C_{2n}
3	C_{31}	C_{32}	C_{33}	...	C_{3j}	...	C_{3n}
...	...	...	...	...	...	...	...
i	C_{i1}	C_{i2}	C_{i3}	...	C_{ij}	...	C_{in}
...	...	...	...	...	...	...	...
m	C_{m1}	C_{m2}	C_{m3}	...	C_{mj}	...	C_{mn}

According to above TABLE 1, it can get experts' different indicators scores arithmetic average value is:

$$M_j = \frac{1}{m_j} \sum_{i=1}^{m_i} C_{ij} \qquad (1)$$

Then every indicator full score limit is:

$$K_j^1 = \frac{m_j^1}{m_j} \qquad (2)$$

First grade evaluation indicator weight defining

As far as we know, nest now is not only used in tour and sightseeing, sports, cultural performances and other intuitive increasing nest economic earnings aspects. Nest is architecture of higher popularity in the world; it improves urban social impacts to a certain degree. It increases social efficiency. Nest management and external services improve urban environment, and meanwhile enhance staff comprehensive quality and idea. According to above analysis, and search relative information, it can define nest operating efficiency is related to following some first grade factors, it can refer to Figure 1.
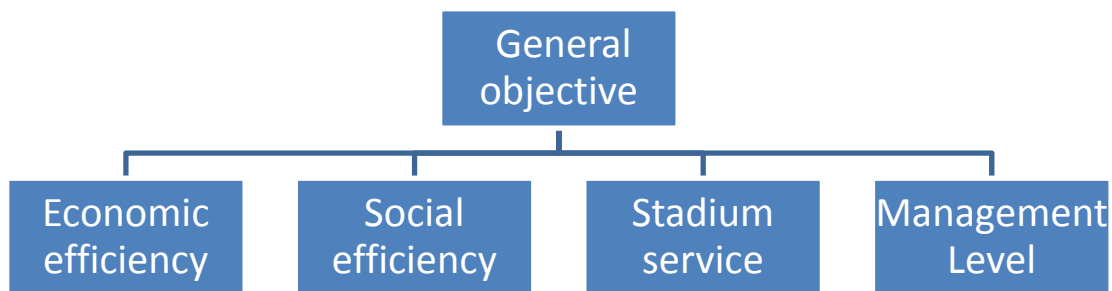

Figure 1 : First grade classification

Make classification of every kind of indicators factors according to operating efficiency impact degree size. Every indicator can divide into five grades according to emphasis from big to small: very important, important, normal, less important, much less important. To every grade emphasis to score that are respectively: 5, 4, 3, 2, 1. Expert scoring status on every kind and indicators are as TABLE 2 shows.

TABLE 2 : First grade indicator importance experts' scores

First grade indicator	Very important (5)	Important (4)	Normal (3)	Less important (2)	Much less important (1)
Economic efficiency	11	9			
Social efficiency	14	5	1		
Stadium service	9	9	1	1	
Management level	8	10	1	1	

Utilize Delphi method to score above each indicator importance degree. Input above TABLE 2 data into formula (1) and formula (2), respectively can get each indicator score average value, and full score limit. Therefore it can get each indicator importance. Each first grade indicator importance score is as TABLE 3 shows:

TABLE 3 : First grade indicator importance score

First grade indicator	Average value	Full score limit
Economic efficiency	4.55	0.55
Social efficiency	4.65	0.70
Stadium service	4.30	0.45
Management level	4.25	0.40

According to above TABLE 3, it is not hard to analyze that nest social efficiency indicator occupies most important proportions in operating efficiency evaluation system, and economic efficiency is the secondary one. Delphi method accords to experts' scores, it has certain subjectivity. For above results, we utilize analytic hierarchy process to test the model. By testing whether the two results are consistent or not and further define whether it can utilize Delphi method to judge indicator importance. At first construct judgment matrix:

Hierarchical structure reflects relations among each element, but criterion layer's each criterion weight covers the targets measurement is not always the same. The paper adopts establishing paired comparison matrix method on factor B to carry out paired comparison. Which is taking two factors B_i and B_j every time, with m_{ij} representing B_i and B_j affect A ratios, whole comparison result use matrix $C = (m_{ij})_{n \times n}$ to express, it called C as $A - B$ paired comparison judgment matrix, it is called judgment matrix for short. According to experts' paired score comparison among B_1, B_2, B_3, B_4, it can get judgment matrix C:

$$C = \begin{bmatrix} \frac{3}{7} & 3 & \frac{3}{2} & 1 \\ 1 & 7 & \frac{7}{2} & \frac{7}{3} \\ \frac{2}{7} & 2 & 1 & \frac{2}{3} \\ \frac{1}{7} & 1 & \frac{1}{2} & \frac{1}{3} \end{bmatrix} \tag{3}$$

With the help of *Matlab* calculation, it can get:
$$v = \begin{pmatrix} 0.23 \\ 0.54 \\ 0.15 \\ 0.08 \end{pmatrix}$$

Hierarchical single arrangement and consistency test:

Judgment matrix C corresponds to maximum feature value λ_{max} feature vector v, it is the priority weight of same hierarchy corresponding elements that is relative important to last hierarchy some element after normalization, and the process is called hierarchical single arrangement.

Consistency indicator:

$$CI = \frac{\lambda - n}{n - 1} \tag{4}$$

When $CI = 0$, C is consistency matrix, the larger CI is, the more seriously inconsistency extent C would be.

Random consistency indicator RI values as TABLE 4 shows:

TABLE 4 : Random consistency indicator RI

n	1	2	3	4	5	6	7	8	9	10	11
RI	0	0	0.58	0.90	1.12	1.24	1.32	1.41	1.45	1.49	1.51

For $n \geq 3$ paired comparison matrix C, it is called its consistency indicator and same order (refers to n is the same) random consistency indicator RI ratio as consistency ratio CR, when:

$$CR = \frac{CI}{RI} < 0.1 \tag{5}$$

It is thought that C inconsistency extent is within permissible range, it can use its feature vector as weight vector.

Use *Matlab* calculating each matrix maximum feature value as $\lambda_{max} = 4 = n$, therefore CR is surely less than 0.1, therefore comparison matrix C meet consistency test. So v can be taken as weight vector. That is $a_i = 0.23$, $b_i = 0.54$, $c_i = 0.15$, $d_i = 0.08$. That according to each indicator important from big to small, they are successive: social efficiency, economic efficiency, stadium service, management level. It is consistent to Delphi method result. So it can use Delphi method to solve the problem.

Second grade evaluation indicator weight defining

Search relative information, it can get nest postgame operating efficiency relative evaluation indicators are as Figure 2 shows:

Similar to above, it continues to use Delphi method to make importance judgment on second and third grade indicators. Investigation experts score second grade indicators under social efficiency, as TABLE 5 shows:

According to above TABLE 5, input above data into formula (1) and formula (2), respectively can get under social efficiency each kind of second layer indicator importance, as TABLE 6 shows:

According to above TABLE 6 each indicator importance data result, it can get each second grade indicator to first grade indicator importance degree. Single layer grade weight calculation:
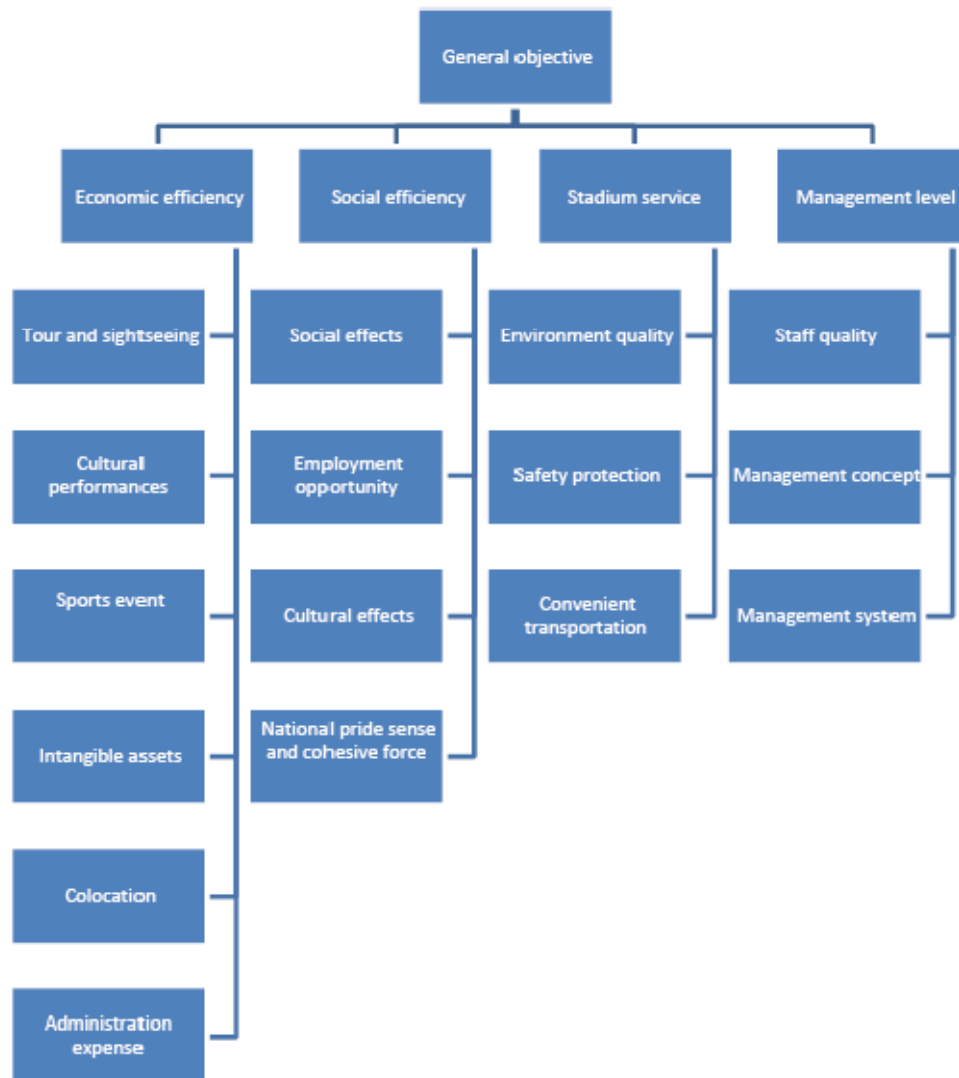
$$w_i = f_i / \sum_{i=1}^{n} f_i \qquad\qquad\qquad (6)$$

Figure 2 : Nest postgame operating efficiency relative evaluation indicators

TABLE 5 : Under social efficiency second grade indicators' scores

Second grade indicator	Very important (5)	Important (4)	Normal (3)	Less important (2)	Much less important (1)
Social effects	13	6	1		
Employment opportunity	4	11	5		
Cultural effects	8	10	2		
National pride sense and cohesive force	6	10	4		

TABLE 6 : Under social efficiency second layer indicator importance scores

Second grade indicator	Average value	Full score limit
Social effects	4.60	0.01
Employment opportunity	3.95	0.20
Cultural effects	4.30	0.40
National pride sense and cohesive force	4.10	0.30

Among them, f_i represents all experts to indicators scores average value, n represents number of experts.

According to TABLE 3, input experts scores into formula (6), then it can get under general objective every kind of first grade indicators single layer weight, as TABLE 7 shows:

TABLE 7 : Under general indicator first grade indicator single layer weight

Indicator	Economic efficiency	Social efficiency	Stadium service	Management level
Weight	0.2563	0.2614	0.2422	0.2394

Second grade indicator total weight value is:

$$w_{Bj} = w_i \cdot w_{ij} \tag{7}$$

Among them, w_i represents first grade the i indicator weight, w_{ij} represents under first grade the i indicator, the j second grade indicator weight. According to TABLE 6 and TABLE 7 data, it can get under social efficiency second grade indicator single layer weight, and total weight as TABLE 8 shows:

TABLE 8 : Under social efficiency second grade indicator single layer weight and total weight

Second grade indicator	Single layer weight	Total weight
Social effects	0.2714	0.0709
Employment opportunity	0.2330	0.0609
Cultural effects	0.2537	0.0663
National pride sense and cohesive force	0.2419	0.0632

According to TABLE 8, then it can define second grade indicator importance. When single layer weight is important, it shows the factor has larger importance to first grade indicators, when weight is small, it shows the indicator has relative weaker importance to first grade indicators. When total weight is important, it shows the factor in nest operating efficiency evaluation is relative more important. When total weight is smaller, it shows the indicator relative importance in nest operating efficiency evaluation is smaller.

In this way, then it gets other second grade evaluation indicators weights so that can get all evaluation indicators importance sizes to nest postgame operating efficiency. Similar to under social efficiency second grade evaluation indicators defining, it gets other each item evaluation indicator weights, all evaluation indicator weights are as TABLE 9 shows:

TABLE 9 : All evaluation indicator weights

First grade indicator	Total weight	Second grade indicator	Single layer weight	Total weight	Second grade indicator	Single layer weight	Total weight
		Tour and sightseeing	0.1650	0.0423	Intangible assets	0.1750	0.0449
Economic efficiency	0.2563	Cultural performances	0.1571	0.0403	Colocation	0.1610	0.0413
		Sports event	0.1889	0.0484	Administration expense	0.1531	0.0392
Social efficiency	0.2614	Social effects	0.2714	0.0709	Cultural effects	0.2537	0.0663

					National pride sense and cohesive force	0.2419	0.0632
		Employment opportunity	0.2330	0.0609			
Stadium efficiency	0.2422	Environment quality	0.3372	0.0817	Convenient transportation	0.3142	0.0761
		Safety protection	0.3487	0.0845			
Management level	0.2394	Staff quality	0.3452	0.0826	Management system	0.3413	0.0817
		Management concept	0.3135	0.0751			

By consulting relative information, it is clear that above each indicator weight has no big difference with information, so research result has certain reliability. According to above table each grade evaluation indicator weight, it can get different evaluation indicators importance to nest operating efficiency. According to importance and weights, the solved weighting sum is nest postgame operating efficiency score.

CONCLUSION

According to experts scores status, it is not difficult to see that all experts think social efficiency such indicator is more important. According to TABLE 9 result, social efficiency total weight is 0.2614. And economic efficiency weight is 0.2563, it is slightly lower than social efficiency. Other stadium efficiency weight is 0.2422, importance is lower than economic efficiency. And management level weight is the lowest as 0.2394, importance is also the lowest.

According to TABLE 9 each layer indicator factor weight, by comparing, it is clear that nest safety protection work is most important for nest operating efficiency grading, others contain overall management, environment quality, traffic management and others, all are very important. And under economic efficiency second grade evaluation indicator weight is not big; its importance to nest postgame operating efficiency evaluation is lower. Therefore, when people utilize nest to carry out effective operating, compare to its profits status, they more focus on nest social efficiency, management level and other aspects.

In order to increase nest profits status, we put forward following suggestions: increase nest postgame advertisement, as cultural advertisement, advertising and so on. Try to build nest into communicative carrier to upgrade city publicity and abstract foreign investments. Put emphasis on nest self quality cultivation. Organize relative famous events or cultural transmission events. Not only build nest into high level stadium, but also build it into international cultural exchanging high class platform. So as to improve nest attendance, bring pressure to foreign organizers, and meanwhile improve nest brand. Enhance nest internal staff quality; staff quality is best reflection of brand. In addition, better staff quality is easily to leave deeper impression to investors. It is beneficial to nest permanent development.

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