Research on Evaluation Model of Market Potential based on Cultural Tourism Resources

Xin Wei*
Xi’an Eurasia University, Xi’an shanshi,710065,China
*Corresponding author (E-mail: xinw2017@126.com)

Abstract
In this paper, the author research on evaluation model of market potential based on cultural tourism resources. By analyzing cultural tourism resources endowment resources and market potential index problems, we put forward a kind of market potential evaluation model. Through the statistical estimation of cultural tourism market potential index, we introduce a new matrix evaluation mathematical model. The empirical analysis shows the evaluation model can effectively solve the problem of resources endowment and market potential index statistics, also can be effective for analysis and calculation. Meanwhile, the model has passed the effectiveness experiment, and can effectively reflect the market situation.

Key words: Cultural tourism resources, Market potential, Resources endowment, Indicator

1. INTRODUCTION

With the development of tourism in recent years, the direction of tourism development has gradually turned to cultural tourism from landscape tour, and now tourists pay more and more attention to richen and enjoy spiritual civilization, therefore, cultural tourism has become a potential tourism market development direction, and has great potential for development. Culture and tourism are mutually reinforcing relationship. Cultural resources can effectively promote the development of tourism and has a higher role in the tourism industry. Moreover, cultural resources can provide visitors with better travel experience, and dig deeper travelling feeling. And the development of tourism can fully display the characteristics of regional culture, effectively realizing the protection of cultural resources and full use.

Cultural tourism facilities are the basis of cultural tourism, and it is an inevitable choice to explore its potential. It has become a hot topic of academic to correctly assess the potential value of tourism market, and then to achieve the effective development of tourism resources. Although the existing methods can perform some assess and identification, there are many problems, such as the inability to accurately validate the resource endowments and market potential indicators. The conventional evaluation method is mainly focused on the protection of culture, but from the tourism industry aspect, it is rarely able to carry out effective evaluation. Although the individual assessment methods will exist the development of tourism potential value assessment, but the excavation of cultural tourism resources is not very one-sided, and the indicators can be calculated are not very comprehensive.

At present, the assessment of tourism industry mainly uses the analytic hierarchy process. The main factors for evaluation are the development of resources. However, the special market for cultural tourism cannot be calculated and the factors affecting the tourism market are not directly evaluated. In view of the above problems, this paper designs a system for evaluating the market potential of cultural tourism resources, and can use the designed system to evaluate effectively.

2. RESOURCE ENDOWMENTS AND MARKET POTENTIAL INDICATOR PROBLEMS

Cultural tourism resource is a very special tourism resource, so the evaluation and assessment for cultural tourism resource is very necessary. Firstly, the cultural tourism resource is a kind of tourism resource, with all the attributes of tourism resource. The standard for evaluating tourism resource is also suitable for cultural tourism resource, such as the value assessment for the elements of resource, the assessment for the impact of resources; however, due to cultural tourism resources have some special nature, so the development and protection need to take into account the issue of carrying capacity of resources.

This is the unique property of cultural tourism resource, and it’s referred to as “resource endowment” attribute. Moreover, cultural tourism is an industry, so its development depends on the market support. For cultural tourism resources, market factor is an important factor, so we have to take into account the market potential indicators. In this paper, we study the two problems, and introduce a new mathematical model to design the cultural tourism resources market potential evaluation system.
3. OPTIMIZATION SCHEME OF MARKET POTENTIAL EVALUATION SYSTEM FOR CULTURAL TOURISM RESOURCES

As the cultural tourism resource has very unique characteristics, so that scholars need to build multiple measures and indicators to evaluate the cultural resources value. Among them, the two most important conditions are resource condition and market condition. However, resource conditions include five major factors. Culture can be used as a tourism resource, and also can act as a factor in tourism resources. Its existence will affect some assessments of tourism resources and development protection of resources. The primary consideration in cultural tourism resource development is to protect, inherit and promote the resource. Cultural tourism resources carrying capacity indicators are also within the scope of evaluation. Resource development requires a comprehensive consideration of the local natural resources, environmental capacity and economic capacity and other objective conditions, of which the effective use of convenient transportation can provide a huge feasibility. Tourism resources development also need to consider the supporting services of tourism. These basic facilities need to be learned before developing the tourism to acquire appropriate information. Therefore, the resource conditions are summarized as follows: environmental carrying capacity, development conditions, the best development time, popularity and ornamental value.

Figure 2 is the structure of cultural tourism resources market potential evaluation system constructed in this paper.

3.1. Evaluation of resource endowment

Cultural tourism resources market potential evaluation criteria as shown in Table 1 below:

<table>
<thead>
<tr>
<th>Indicators</th>
<th>10 scores</th>
<th>5 scores</th>
<th>Less than 3 scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>Popularity</td>
<td>World-known</td>
<td>Nationally known</td>
<td>Regionally known</td>
</tr>
<tr>
<td>Scale</td>
<td>Very big</td>
<td>Big</td>
<td>Ordinary</td>
</tr>
<tr>
<td>Carrying capacity</td>
<td>Very strong</td>
<td>Strong</td>
<td>Ordinary</td>
</tr>
<tr>
<td>Integrity</td>
<td>Very complete</td>
<td>Complete</td>
<td>Partially damaged</td>
</tr>
</tbody>
</table>
Resource endowment evaluation is the valuation for the resource itself, which is done after comprehensive examination and elegant assessment. The main elements of evaluation include ornamental value, historical and cultural science and artistic value, rarity, scale of tour, enrichment, ornamental integrity and other factors; but also its influence and visibility, suitable period for the tour are also need to be measured. These are the key points to be evaluated.

3.2. Introduction of matrix evaluation model

This paper introduces a matrix evaluation model to confirm the vertical relationship between resources and market. The development trend of cultural tourism resources is studied from the perspective of market potential to determine the latest status of resource development, quantify the resource parameters and determine the market potential and advantages and disadvantages. The matrix model is simple and easy to operate, and its accuracy is high. Compared with the traditional analytic hierarchy process (AHP), the matrix evaluation model constructed in this paper can analyze the factors that restrict the development of the market directly, combine the resource development to subdivide the market ways, which then reacts to the resource development, providing effective basis for resources development. The matrix evaluation model is not only applicable to the resources - the market. Because of its strong relevance, after the evaluation indicators being effectively changed, the model can be applied to other related areas, or applied to different types of resource development evaluation systems, to choose a different indicator parameters program.

Firstly, the construction cost of cultural tourism resources is effectively assessed. Appropriate conditions should be excluded for the assessment, the formula is:

$$P_a = \sum_{i=1}^{k} P_i \cdot \frac{Q_i}{Q_t}$$

(1)

In the formula: $P_a$ is the construction cost under the unit; $P_i$ is the variable cost of stochastic condition; $Q_i$ is the construction cost under the actual condition; $Q_t$ is the construction cost under the expected condition.

In order to effectively avoid the effect of development on the inheritance of cultural tourism resources, so the expected long promotion calculation should be protected. The formula is as follows.

$$HHI = \sum_{i=1}^{n} (X_i / X)^2 = \sum_{i=1}^{n} S_i^2$$

(2)

In the formula: $X$ represents the long promotion value of an inheritance protection; $X_i$ represents the influence value under the development case; $HHI$ represents the square root of the actual market share.

The rarity of cultural tourism resources is accessed with the formula as follows.

$$W = \sum_{i=1}^{k} p_i y_i$$

(3)

In the formula: $p_i$ is the coefficient of rarity, $y_i$ is the actual existence time and quantity.
In the cultural tourism resources assessment, certain assessment calculation is carried out for the best time
to tour, the formula is as follows:

$$EAF = \frac{\text{Available time-stop time}}{\text{Statistic time}} \times 100\%$$

(4)

The popularity of cultural tourism resources is accessed with the formula as follows:

$$Q = \frac{Q}{Q_1} = \frac{TSP}{Q_1}$$

(5)

In the formula: Q represents the degree of understanding within unit time range; Q1 represents the degree of understanding within the actual area, TSP is estimated by a certain amount of data. It is important to
determine the above evaluation, so it is necessary to make multiple measurements to find the average.

After the above calculation, several elements in the cultural tourism resources can be clear. After these
elements being quantified, and then the primary matrix arrangement is practiced. A primary assessment
screening can be conducted to evaluate the most influential factor in cultural tourisms.

$$W_{ij} = \begin{bmatrix} w_{i1} & w_{i2} & \cdots & w_{in} \\ w_{i1} & w_{i2} & \cdots & w_{in} \\ \vdots & \vdots & \ddots & \vdots \\ w_{i1} & w_{i2} & \cdots & w_{in} \end{bmatrix}$$

(6)

Through this matrix model, the comparison between elements can be evaluated, so it’s easy to conduct the
coordination between the elements. The coordinated matrix consists of all evaluated elements. The matrix is:

$$W_s = \begin{bmatrix} w_{11} & w_{12} & \cdots & w_{1n} \\ w_{21} & w_{22} & \cdots & w_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ w_{n1} & w_{n2} & \cdots & w_{nn} \end{bmatrix}$$

(7)

Each element in the matrix is a matrix, but W itself is not a matrix but value representing the element. In
order to achieve more accurately calculation, normalizing matrix needs to be conducted, in fact, each element is
weighted, so that the super matrix after being weighted can be achieved.

The normalized weighting matrix is:

$$H = \begin{bmatrix} h_{11} & \cdots & h_{in} \\ \vdots & \ddots & \vdots \\ h_{n1} & \cdots & h_{mn} \end{bmatrix}$$

(8)

The weighted super-matrix $W^*$ can be obtained by multiplying H with W. The resulting weighted
super-matrix requires the relative ranking vector calculation:

$$w^* = \lim_{n \to \infty} \left( \frac{1}{N} \sum_{k=1}^{n} w \right)$$

(9)

The corresponding value of each element of the original matrix is the same. The calculated values need
positive and inverse indicators calculation, the formula is:

$$S_i = \frac{x_i - \min x_i}{\max x_i - \min x_i}$$

(10)
\[
S_i = \frac{\max x_i - x_i}{\max x_i - \min x_i}
\]
(11)

In the formula: \(a\) is the moderate coefficient. After the positive index and inverse index calculation, the appropriate value is a normal value. Comprehensive evaluation points can be achieved after selecting linear model for summary.

\[
Y = \sum_{i=1}^{n} W_i S_i
\]
(13)

\[
\sum_{i=1}^{n} W_i = 1.0 \leq W_i \leq 1, \quad i=1, 2, \ldots, n
\]
(14)

In the formula: \(Y\) is the overall evaluation value; \(S_i\) is the index value of the element; \(W_i\) is the circle coefficient.

Through the calculation of some columns, the purpose is to select the representative elements for evaluation, so that the resource endowments and market potential indicators of cultural tourism resources can be effective solved.

### 3.3. Integration of assessed data

The 2.2 part collects the market potential evaluation data of cultural tourism resources for fusion treatment, so as to ensure the anti-jamming performance of redundant data \(^6\). The market potential assessment data fusion is maximized as a constraint condition of the integration process, and formula is expressed as:

\[
\max \sum_{x, a, b, c, d, p} \sum_{x} x
\]
(15)

In order to minimize the error rate of evaluation data going down, the genetic algorithm is used to discriminate the evaluation data. In the process of completing the whole genetic evolution, the calculated variables \(X_a\) in the algorithm and the maximum and minimum values of the matrix control function value \(f_m\) are necessary to create an initial population firstly and then design a sorting fitness function for the corresponding population of the created population to get the prior probability density \(p(x_\theta)\) controlled by the market potential evaluation matrix. The genetic algorithm should satisfy the formula as shown below:

\[
P_{\theta} (k) = \frac{\sum_{j \in N_i(k)} (l_j(k) - f_i(k))} {\sum_{j \in N_i(k)} (l_j(k) - f_i(k))}
\]
(16)

In the whole genetic evolution process, \(X_i = (x_{i1}, x_{i2}, \ldots, x_{iD})\) represents the fitness function of the individual \(i\) in D-dimensional space, which represents the potential evaluation function of the corresponding matrix. The fitness of all the individuals included in the population through calculation, thus \(P_i = (p_{i1}, p_{i2}, \ldots, p_{iD})\) can be derived. \(P_i = (p_{i1}, p_{i2}, \ldots, p_{iD})\) represents the final set of solutions of the \(i\) corresponding genetic population in market potential evaluation matrix, the expression is:

\[
j \in N_i(k), N_i(k) = \{k \mid \|x_i(k) - x_i(k)\| < r_j(k)\}
\]
(17)

In the formula, \(\eta_{\theta}(k)\) is the crossover probability of evaluation data in the matrix. The algorithm can finally deduce the recommended value of the algorithm degree of reliability after the whole process of genetic evolution control. The iterative representation of the recommended value is expressed as:

\[
x_j(k+1) = x_j(k) + s(\frac{x_j(k) - x_j(k)}{\|x_j(k) - x_j(k)\|})
\]
(18)

In the formula: \(\|\|\) is the length of \(\bar{x}\), \(P^ {best}_{\theta}(k)\) refers to the optimal solution of evolution probability in the evolutionary process, \(S\) refers to the step length to complete the iterative process.

After completing the above market potential evaluation data collection and getting the whole extraction step of the recommended characteristic parameters by the reliability, the cultural tourism resources market potential evaluation model design is optimized. The proposed cultural tourism resources market potential evaluation model will finally perform information fusion and treatment \(^7\) for the extracted and proposed
parameters of this algorithm reliability. The characteristic value of the error of market potential evaluation data is obtained by genetic algorithm. The expression is:

\[
E = \sum_{j=1}^{q} \frac{E_j}{(q+k)} \text{ where } E_j = \sum_{k} \left( d_k - c_k \right)^2
\]

(19)

In the formula: q denotes the error proportion element set, \( E_k \) indicates the sensitivity factor of this algorithm in the process of genetic evolution, \( d_k \) represents the extreme value of the kth node in all search spaces, and \( E_k \) refers to the corresponding individual value.

Therefore, a fitness function which has been determined is selected and greedy search method is used to find the optimal solution for the fitness function, and for the individual with higher fitness in the population, its cost value is calculated to satisfy:

\[
\hat{w}_i^j = \frac{p(z_i^j / x_i^j) p(x_i^j / x_{i+1}^j)}{q(x_i^j / x_{i+1}^j)}
\]

(20)

In the evolutionary game, the cloud evaluation subject often maintains a fixed steady state. When the local search is carried out for optional solution individual obtained in the population to finish the optimal quantitative evaluation of the market potential evaluation data, and the linear weighting evaluation method is used to get the fusion weight of the reliability of genetic algorithm. The iteration expression is:

\[
\hat{w}_i^j = \hat{w}_i^j / \sum_{i=1}^{N} w_i^j
\]

(21)

In this paper, the subordinating degree function of this combined weight is initialized. In the market potential evaluation for the newly improved population, the improved genetic algorithm is used to reach the evaluation purpose in order to finally determine the optimal solution in the global population, the expression is:

\[
N_{eff} \approx 1 / \sum_{i=1}^{N} (\hat{w}_i^j)^2
\]

(22)

In the formula: \( N_{ih} \) refers to a pre-set threshold, when \( N_{eff} < N_{ih} \), the market potential reliability evaluation meet the design requirements of market potential evaluation model.

From the above analysis, it can be seen that the design of this model can analyze the relationship between resources and market potential effectively. The specific analysis is as follows:

First of all, if the market potential of cultural tourism resources and their resource endowments are relatively high, then the tourism development in the region has begun to form a certain scale, and has good prospects for development. Thus, the tourism resources in this region can be expanded for development, maintaining the development state, while increasing investment and developing new cultural tourism projects and tourism products, to maintain the original market competitiveness, expand its market size, in order to provide an effective basis to improve market position.

Secondly, if the cultural tourism resources and anti-damage ability are poor, but its market potential is higher and has more opportunities for development, its cultural tourism development will still be limited, and tourism will bring lower profits. At this point, protective strategy can be chose. In the conditions of higher market potential, people's awareness of cultural resources protection is enhanced to protect cultural tourism resources perfectly, to increase efforts to protect resources, limit too much tourism activities as well as ensure that smooth development of cultural tourism industry.

Again, when the cultural tourism resources have certain advantages, larger attractiveness and stronger carrying capacity, the market potential is not good enough. Then the cultural tourism resources at this time should become the main force in the development of tourism, promoting the development of tourism enterprises, to provide broad prospects for development. But at the same time, the selection strategy should also be emphasized. The use of selective strategies can further develop resources, effectively reflect the market and increase the utilization of cultural tourism resources.

Finally, if the ability of market potential and cultural tourism resources is low, then the tourism business market development is bumpier, and their development path is limited with small space of development. In particular, tourists are unable to be attracted, and tourism market is in downturn. Then, contraction strategy can be selected at this time to reduce the size of tourism industry market, while avoiding risk and reducing investment. And in focusing on the development and research of tourism resources with more potential, making full use of limited resources in the hands, the resources with more potential should be developed and found.

4. EFFECTIVENESS OF CULTURAL TOURISM RESOURCES MARKET POTENTIAL EVALUATION
The cultural tourism resources market potential evaluation system designed in this paper is to evaluate the system in terms of cultural tourism resources. When we evaluate the cultural tourism resources for a certain region, conventional methods are used to evaluate firstly. And then use the evaluation system of cultural tourism resources market potential designed in this paper to evaluate. The evaluation results are shown in the table.

Table 2 Evaluation results of cultural tourism resources market potential evaluation system

<table>
<thead>
<tr>
<th>Evaluation</th>
<th>Resource endowment</th>
<th>Market potential index</th>
<th>Comprehensive score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cultural value</td>
<td>2813</td>
<td>4978</td>
<td>I</td>
</tr>
<tr>
<td>Ornamental value</td>
<td>2414</td>
<td>4689</td>
<td>II</td>
</tr>
<tr>
<td>Development potential</td>
<td>2634</td>
<td>4167</td>
<td>II</td>
</tr>
<tr>
<td>Popularity</td>
<td>2732</td>
<td>4098</td>
<td>III</td>
</tr>
</tbody>
</table>

Table 3 Evaluation results with conventional means

<table>
<thead>
<tr>
<th>Evaluation</th>
<th>Resource endowment</th>
<th>Market potential index</th>
<th>Comprehensive score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cultural value</td>
<td>2978</td>
<td>4098</td>
<td>Unable to evaluate</td>
</tr>
<tr>
<td>Ornamental value</td>
<td>2098</td>
<td>Unable to evaluate</td>
<td>Unable to evaluate</td>
</tr>
<tr>
<td>Development potential</td>
<td>Unable to evaluate</td>
<td>Unable to evaluate</td>
<td>Unable to evaluate</td>
</tr>
<tr>
<td>Popularity</td>
<td>Unable to evaluate</td>
<td>Unable to evaluate</td>
<td>Unable to evaluate</td>
</tr>
</tbody>
</table>

Figure 4. Evaluation for the cultural tourism in this region

It can be clearly seen from Figure 3 that the market potential evaluation system of cultural tourism resources designed in this paper can calculate the carrying capacity of this region continuously and effectively. But with the traditional means, and the dotted portion in the middle part is the undetectable result. As a result of discontinuous evaluation, calculation accuracy and precision are not very accurate. This may be because in the matrix models adopted in this paper, the relevance and universality of cultural tourism resources are considered, and at the same time, the demand influencing factors of tourism market development are examined. The combination of two factors, the tourism carrying capacity of the model is improved. Therefore, when the model in this paper is compared with the traditional model, the model of this paper directly divides the evaluation index of tourism market. The development strategy and way of the market under different modes are considered. And the model in this paper is more applicable, which is mainly because it has a certain relevance and higher reliability, it’s obvious due to the traditional method. Another advantage is that the model proposed in this paper has the advantage of quantitative evaluation of indicators, for example, the quantitative analysis of various parameters take use of a variety of indicators for integrated processing to obtain the final quantitative model, conducting accurate and complete analysis for the model, to make the model evaluation designed in this paper have more scientific and more accurate results.

Through the detailed data in the table, it can be seen that the cultural tourism resources market potential evaluation system designed in this paper can perform more comprehensive assessment, and the evaluation results are reflected in the specific value, which can be observed directly. Conventional evaluation means are limited, and the items that can be evaluated are not comprehensive enough to be observed directly.

In summary, the cultural tourism resources market potential evaluation system designed in this paper can effectively carry out rapid assessment and evaluation for cultural tourism resources.

5. CONCLUSION

This paper mainly focuses on the market potential evaluation system of cultural tourism resources.
Through the research of this paper, the problem of resource endowment and market potential index of cultural tourism resources are effectively solved. It is hoped that the research in this paper can provide good solution for the evaluation of cultural tourism resources.

REFERENCES


