



Research Article

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## Study on TOPSIS-based evaluation of urban tourism competitiveness

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### ABSTRACT

Urban tourism competitiveness is divided into four factors by starting from the perspective of competitive factor based on the grasp of urban tourism competitiveness, including the tourism market competitiveness, tourism factor competitiveness, urban environment competitiveness and urban opening degree competitiveness. On that basis, urban competitiveness index system is established. It proposes to introduce TOPSIS model into the evaluation of urban tourism competitiveness, and to construct the evaluation model of urban tourism evaluation based on TOPSIS, which may provide good support for the effective launch of evaluation for urban tourism competitiveness.

**Key words:** urban tourism competitiveness, evaluation, TOPSIS model

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### INTRODUCTION

With the constant economic growth and improved living standard, tourism has already developed to be one of the significant recreational modes of people's daily lives. City is a carrier and engine of the development of modern tourism, and it has already developed to be the main body of contemporary tourism. Owing to the economic development, improved comprehensive environment and perfection of basic facilities, city develops the dual functions of tourist destination and tourist generating region<sup>[1]</sup>. The established tourists will select from numerous tourist destination, which results in the fierce competitions among cities. Consequently, studies shall be conducted for the urban tourist competitiveness, which may display the current situation and potential of urban tourist development, and be convenient for the comparison of tourist competitiveness, so as to make better competitive strategies. It may be of realistic guidance significance for the development of urban tourism.

In recent years, the competitive advantage theory proposed in the end of 1980s was proposed by M. Porter for studying the urban tourist competitiveness, and great achievements have been made<sup>[2]</sup>. It always had incisive opinions for making strategies and countermeasures of improving the urban tourist competitiveness. But generally speaking, the evaluation of urban tourist competitiveness is still dominated by qualitative index system, and the quantitative index system is still less perfect. Based on the previous studies, a set of urban tourist competitiveness evaluation index system is planned for evaluating the urban competitiveness with the improved TOPSIS method.

#### 1. Construction of urban tourist competitiveness index system

Before establishing the urban tourist competitiveness index, there should be a clear grasp of the connotation of urban tourist competitiveness. It is known that there should be at least three factors for establishing the competitive relation, namely the principal part with independent interest, rare competitive competitor and final competitive result<sup>[3]</sup>. Since urban tourist industry is an urban industry guided by consumption and happiness, as the flow of tourists caused by the 'attractions', rather than the flow of non-tourism product. Therefore, the core concept of urban tourist competitiveness can be expressed as: the sustainable ability of city in attracting tourists and providing tourism products for tourists within certain space-time range and achieving rewards when compared to another city. This ability is a complicated system, multi-dimensional and multi-level, and four aspects can be extended from its connotation, namely the competition structure, competition sequence, competition result and competitive factors<sup>[5]</sup>. In this paper, the index system is mainly established from the perspective of the competitive factors, and the urban

tourist competitiveness can be divided into four factors: tourism market competitiveness, tourism factor competitiveness, urban environment competitiveness, and urban opening degree competitiveness.

Urban tourism competitiveness (UTC) = tourism market competitiveness + tourism factor competitiveness + urban environment competitiveness + urban opening degree competitiveness

Tourist market competitiveness = F (tourism product competitiveness, tourist source competitiveness, tourist industry efficiency)

Tourism factor competitiveness = F (tourism landscape resource, tourism human resource, tourism infrastructure)

Urban environment competitiveness = F (natural ecological environment, economic situation, cultural environment, policy environment)

Urban opening competitiveness = F (urban reputation, friendly degree of residents)

Tourist market competitiveness is the most direct reflection of urban tourist competitiveness; tourism factor competitiveness mainly investigate according to each resource of the city, tourist environment competitiveness mainly reflects the influence of urban environment on the urban tourism development; while urban opening degree is one of the soft competitiveness.

**Table 1 Evaluation index system of urban tourist competitiveness**

Target	First class index	Secondary index
Urban tourism competitiveness (C)	Tourist market competitiveness (X <sub>1</sub> )	Tourism product competitiveness (X <sub>11</sub> )
		Tourist source competitiveness (X <sub>12</sub> )
		Tourist industry efficiency (X <sub>13</sub> )
	Tourism factor competitiveness (X <sub>2</sub> )	Tourism landscape resource (X <sub>21</sub> )
		Tourism human resource (X <sub>22</sub> )
		Tourism infrastructure (X <sub>23</sub> )
	Urban environment competitiveness (X <sub>3</sub> )	Natural ecological environment (X <sub>31</sub> )
		Economic situation (X <sub>32</sub> )
		Cultural environment (X <sub>33</sub> )
		Policy environment (X <sub>34</sub> )
	Urban opening competitiveness (X <sub>4</sub> )	Urban reputation (X <sub>41</sub> )
		Friendly degree of residents (X <sub>42</sub> )

## 2. Construction of TOPSIS-based urban tourist competitiveness evaluation model

After the evaluation index system of urban tourism competitiveness is constructed, the following problems confronted shall be the construction of the urban tourism competitiveness evaluation model. Based on the comparison of advantages, disadvantages and applicability of several evaluation models, it tries to introduce TOPSIS model into the evaluation of urban tourism competitiveness, and launch evaluation of urban tourism competitiveness scientifically.

Steps of constructing the TOPSIS-based evaluation model for urban tourism competitiveness are shown as follows:

STEP1: evaluation index system for constructing the urban tourism competitiveness

The evaluation index system of urban tourism competitiveness is shown in table 1.

STEP2: Determination of index weight in the evaluation index system for urban tourism competitiveness

As for the confirmation of index weight, GAHP is applied, and it mainly improves the AHP. It can integrate the opinions and suggestions of several experts, and launch the determination of index weight much more accurately. During the specific process of launching index weight, each expert mainly confirm the index weight according to the steps and requirements of AHP method respectively<sup>[6]</sup>. And then, the average value of the confirmed index weight shall be taken as the final weight of each index.

STEP3: Establishment of single-factor evaluation matrix

There should be three steps for establishing the single-factor evaluation matrix, namely:

(1). Determining single-index characteristic quantity matrix X

m evaluation indexes of urban tourism competitiveness form n evaluation value of cities waiting to be evaluated. Each urban tourism competitiveness evaluation index can be represented by the index characteristic value of n cities, namely

$$X = \begin{pmatrix} x_{11} & \dots & x_{1n} \\ \vdots & \ddots & \vdots \\ x_{m1} & \dots & x_{mn} \end{pmatrix} = (x_{ij})_{m \times n} \text{ Equation (1)}$$

In which,  $x_{ij}$  ( $i=1, 2, \dots, 12; j=1, 2, \dots, n$ ) is the index characteristic value of the  $i^{\text{th}}$  evaluation index of the  $j^{\text{th}}$  city.

In the evaluation index system of the urban tourism competitiveness, all indexes that cannot be represented by figures directly are called qualitative indexes. Aiming at such indexes, the characteristic determination method is shown as follows:

As for the qualitative index, the characteristic value is mainly determined with expert evaluation method. Since contents of different qualitative index evaluation are quite distinct, it is appointed according to different types of qualitative indexes, evaluation index sets and index evaluation values respectively.

It is considered in this research, among the twelve indexes in the index system, the evaluation result can be divided into five grades, namely very high ( $\tilde{V}_1$ ), relatively high ( $\tilde{V}_2$ ), ordinary ( $\tilde{V}_3$ ), low ( $\tilde{V}_4$ ), quite low ( $\tilde{V}_5$ ),  $V = \{ \tilde{V}_1, \tilde{V}_2, \dots, \tilde{V}_i, \dots, \tilde{V}_n \}$ . It is agreed that the grades respond to the 100, 80, 60, 40 and 20 in figure. Corresponding evaluation activities are carried out by aiming at the twelve indexes, which are mainly obtained from the investigations. Expert may carry out investigation activities, process and analyze the data independently, and then, the mean value of corresponding figure shall be taken as the evaluation result of urban tourism competitiveness.

(2) Determination the index membership matrix R

After the characteristic of each evaluation index is determined, the excellent membership of each index shall be calculated. In the index system established, all indexes are larger and superior.

For larger and superior index, the following equation can be applied for calculating the membership:

$$r_{ij} = \frac{x_{ij}}{x_{i \max} + x_{i \min}} \quad (j=1, 2, \dots, n) \quad \text{Equation (2)}$$

In the equation:  $r_{ij}$  is the excellent degree of  $i^{\text{th}}$  index of the  $j^{\text{th}}$  city that is about to be evaluated;

$$x_{i \max} = \max_j \{ x_{ij} \}, x_{i \min} = \min_j \{ x_{ij} \}.$$

According to equation (1) and (2), the index characteristic matrix can be transformed to be index membership matrix:

$$R = \begin{pmatrix} r_{11} & \dots & r_{1n} \\ \vdots & \ddots & \vdots \\ r_{m1} & \dots & r_{mn} \end{pmatrix} = (r_{ij})_{m \times n} \text{ equation (3)}$$

$i=1, 2, \dots, 12; j=1, 2, \dots, n$ .

(3). Determination of ideal city and negative ideal city for evaluation

Index membership of ideal city waiting to be evaluated shall be the maximum index membership.

Namely,  $R^* = (r_1^* \quad r_2^* \quad \dots \quad r_n^*)$  equation (4)

In this  $r_i^* = \max_j \{ x_{ij} \} \quad (i=1, 2, \dots, 12)$ .

The negative ideal index membership of city waiting to be evaluated shall be the minimum index membership.

Namely:  $R^- = (r_1^- \quad r_2^- \quad \dots \quad r_n^-)$  Equation (5)

In which,  $r_i^- = \min_j \{ x_{ij} \} \quad (i=1, 2, \dots, 12)$ .

## STEP 4: Final evaluation

(1). Working out the diversity factor of urban tourism competitiveness and ideal city and negative ideal city waiting to be evaluated

The diversity factors of urban tourism competitiveness and ideal city and negative ideal city waiting to be evaluated are  $d_j^*$  and  $d_j^-$  respectively, according to the measurement with weighted Euclidean distance, and then:

$$d_j^* = \sqrt{\sum_{i=1}^m W_i (r_{ij} - r_i^*)^2}, \quad j=1, 2, \dots, n \quad \text{equation (6)}$$

$$d_j^- = \sqrt{\sum_{i=1}^m W_i (r_{ij} - r_i^-)^2}, \quad j=1, 2, \dots, n \quad \text{equation (7)}$$

(2). Close degree of urban tourism competitiveness and ideal city waiting to be evaluated

The close degree of cities waiting to be evaluated and ideal cities waiting to be evaluated is  $C_j$ , and the express is:

$$C_j = d_j^- / (d_j^* + d_j^-) \quad \text{Equation (8)}$$

Generally  $0 \leq C_j \leq 1$ , the closer  $C_j$  is to 1, the more excellent membership of urban tourism competitiveness will be. According to  $C_j$ , cities waiting to be evaluated can be sorted.

### CONCLUSION

The launch of evaluation of urban tourism competitiveness is of great significance for comprehending the tourism competitiveness of each city. On that basis, the evaluation index system of urban tourism competitiveness is constructed from four aspects, including tourism market competitiveness, tourism factor competitiveness, urban environment competitiveness and urban opening degree competitiveness, which may provide god support for the effective launch of evaluation work for the urban tourism competitiveness.

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