Research on the Development of Forest Recreation Industry Based on SWOT and AHP Model--Take the Forest Recreation Industry of Xiying Street in Jinan City as an Example

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Abstract. In the context of rapid socio-economic development, forest recreation industry has gradually emerged. This paper uses SWOT and AHP analysis to evaluate the development of forest recreation industry in Xiying Street, Jinan City, and analyzes the strengths and weaknesses of the forest recreation industry. It also provides data support and reference for the development of forest recreation industry in similar areas, so as to promote the development of forest recreation industry in the future.

1. Foreword

The forest recreation industry originally originated from the "Forest Bathing" in Germany, and since then, it has been developed as an industry in Korea and Japan[1]. Relying on the high-quality environmental resources and abundant forest resources, it has been developed for medical rehabilitation, health food, tourism landscape, health and leisure, etc[2]. At the same time, the development of forest recreation industry can promote the transformation and reform of state-owned forest farms, drive the economic development of forest farms, and effectively promote the paid use of state-owned forest resources[3].

Although China's forest recreation industry started relatively late, it is expected to have a huge development potential in China based on the abundant forest resources and the huge population size[4]. In recent years, China has been learning from foreign countries and developing it as a new industry[5]. Therefore, it is of great importance to study and discuss it.

Based on the survey results, this paper uses SWOT and AHP analysis to study and analyze the development status of forest recreation industry in Xiying Street, Jinan, point out its strengths, weaknesses, opportunities and threats, evaluate its development and propose reasonable countermeasures, provide reference for the development of forest recreation industry in other regions, and promote the healthy and standardized development of forest recreation industry in the future.

2. Introduction of Xiying Street

2.1. Regional overview

Xiying Street is located at latitude N36°30′16.23″ longitude E117°13′23.03″. It is located in the southern mountainous area of Jinan City, the birthplace of Jinan City springs, the region is rich in water resources, numerous mountain springs, sufficient light, four seasons, 260-976 meters above sea level. Rich in forest resources, it is the "green lung" and "natural oxygen bar" of Jinan City.
2.2. Data sources
The data in this paper come from field research and relevant statistics. The statistics are from Jinan Statistical Yearbook 2021 and Jinan Statistical Yearbook 2020.

3. SWOT model construction

3.1. Construction of the index system of forest recreation industry development factors in Xiyiing Street
Based on the results of the field survey in Xiyiing Street, combined with relevant information and literature, the four aspects of Strengths (S), Weaknesses (W), Opportunities (O) and Threats (T) were used as the basis for classification, and the following index system (Table 1, Table 2) was summarized as the main content options of the questionnaire survey.

Table 1 Indicator system of the strengths and weaknesses of the forest recreation industry in Xiyiing Street

| Number | Strength factors(S) | Number | Weakness factors(W) |
|--------|---------------------|--------|---------------------|
| S1     | Rich natural resources | W1     | Lack of recreational facilities |
| S2     | Excellent air environment | W2     | Shortage of professionals |
| S3     | Local government support | W3     | Scenic area project is not perfect |
| S4     | Diverse local specialties | W4     | Lack of visibility |
| S5     | Unique folk culture | W5     | Inadequate management mechanism |

Table 2 Indicator system of opportunities and threat factors of forest recreation industry in Xiyiing Street

| Number | Opportunity(O) | Number | Threat(T) |
|--------|----------------|--------|-----------|
| O1     | National policy support | T1     | High competitive pressure in the industry |
| O2     | People’s consumption concept change | T2     | Diversified market needs |
| O3     | State-owned forest reform policy | T3     | Ecological protection work is difficult |
| O4     | Broad market prospect | T4     | Advanced technology is difficult to introduce |
| O5     | Increased awareness of wellness among residents | T5     | Limited financial investment |

3.2. Questionnaire research results
In the questionnaire, the influence degree of each index was assigned a value, and a certain strength factor, for example, was divided into five degrees: no advantage, small advantage, average advantage, large advantage and great advantage, with corresponding scores of 1, 3, 5, 7 and 9. According to the results, the average score of each index was calculated, and the main indexes were selected according to the average score, and the results are shown in Table 3.

3.3. SWOT analysis

3.3.1. Strengths analysis. Jinan Xiyiing Street has dense forests and various tree species, and the scenery is pleasant all year round. The vegetation coverage rate is 98%, and the concentration of negative oxygenions is 50,000 to 70,000/cm$^3$, making the air environment good. Xiyiing Street has a variety of local specialties, such as the famous chestnuts and walnuts, etc. In this way, Xiyiing Street also carries out a series of local specialties promotion activities, which not only improves the interest of tourists, but also improves the economic benefits.

3.3.2. Weaknesses analysis. As the forest recreation industry is in the initial rising stage, the arrangement of facilities for recreation and convalescence in Xiyiing Street is not yet perfect, and there is a lack of corresponding professional talents. Moreover, Xiyiing Street is not well known in the country, and most of them are local visitors, and the volume of visitors is small.
3.3.3. **Opportunity analysis.** With the growth of China's economic level, the development of forest recreation industry is in a rising stage, with a broad market prospect. At the same time, China is also vigorously promoting the development of forest recreation industry. Good policy support brings great opportunities for the development of forest recreation industry in Xiying Street. The upgrading of the consumption structure of residents and their desire for natural environment also bring great opportunities for the development of forest recreation industry.

3.3.4. **Threat analysis.** With the rapid economic growth and increased competitive pressure in the industry, how to attract and keep tourists is also a very difficult problem. And while developing the forest recreation industry, it will certainly cause a certain degree of damage to the ecological environment, therefore, how to protect the ecological environment and maintain the balance between the ecological environment is also a daunting task.

3.4. **SWOT analysis model**

According to the research results and analysis, the SWOT analysis model of Xiying Street development is constructed (Table 4).

### Table 4 SWOT analysis model of forest recreation industry in Xiying Street

| Strength($) | Weakness(W) |
|-------------|-------------|
| S1 Rich natural resources | W1 Lack of recreational facilities |
| S2 Excellent air environment | W2 Shortage of professionals |
| S4 Diverse local specialties | W4 Lack of visibility |
| Opportunity(O) | Threat(T) |
| O1 National policy support | T1 High competitive pressure in the industry |
| O2 People's consumption concept change | T2 Diversified market needs |
| O4 Broad market prospect | T3 Ecological protection work is difficult |

4. **AHP analysis of SWOT**

4.1. **Construction of hierarchical analysis recursive hierarchical model**

The hierarchical model is constructed for the development of forest recreation industry in Xiying Street, with S, W, O and T in the criterion layer and each indicator in the SWOT model in the indicator layer.
Figure 1 Hierarchical Model of Forest Recreation Industry Development in Xiyining Street, Jinan City

4.2. Calculation of matrix indicator values

The indicator of the construction matrix is set as $b_{ij}$, and its value can be obtained by the mean ratio with the following formula:

$$b_{ij} = \frac{\sum_{i=1}^{n} X_i}{\sum_{j=1}^{n} X_j}$$

Where: $n$ is the number of samples, $b_{ij}$ is the weight value of indicator $i$ for indicator $j$ in the judgment matrix, $X_i$ is the average value of survey data of indicator $i$, and $X_j$ is the average value of survey data of indicator $j$.

4.3. Construction of judgment matrix

Based on the calculated values of each indicator, the judgment matrix $A$ of the corresponding influence factors at the same level is constructed, and the equation is as follows:

$$A = \begin{bmatrix} 1 & a_{12} & \ldots & a_{1n} \\ a_{21} & 1 & \ldots & a_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ a_{n1} & a_{n2} & \ldots & 1 \end{bmatrix}$$

(1) Construct the judgment matrix of strengths $S$, weaknesses $W$, opportunities $O$, and threats $T$ for the total objective:

$$P = \begin{bmatrix} 1.0000 & 1.3350 & 1.0039 & 1.3271 \\ 0.7483 & 1.0000 & 0.7511 & 0.9932 \\ 0.9961 & 1.3315 & 1.0000 & 1.3221 \\ 0.7535 & 1.0070 & 0.7565 & 1.0000 \end{bmatrix}$$

(2) Construct the judgment matrix of strength indicators S1, S2, S4 for dominance $S$:

$$S = \begin{bmatrix} 1.0000 & 1.0281 & 1.0211 \\ 0.9726 & 1.0000 & 0.9931 \\ 0.9795 & 1.0072 & 1.0000 \end{bmatrix}$$

(3) Construct the judgment matrix of weakness indicators W1, W2, W4 on the disadvantage $W$:

$$W = \begin{bmatrix} 1.0000 & 1.0171 & 1.0101 \\ 0.9832 & 1.0000 & 0.9931 \\ 0.9903 & 1.0072 & 1.0000 \end{bmatrix}$$

(4) Construct the judgment matrix of opportunity indicators O1, O2, and O4 for opportunity $O$:
Construction of threat indicators T1, T2, T3 for the judgment of threat T:

\[
O = \begin{pmatrix}
  1.0000 & 1.0472 & 1.0131 \\
  0.9953 & 1.0000 & 0.9681 \\
  0.9871 & 1.0332 & 1.0000
\end{pmatrix}
\]

\[
T = \begin{pmatrix}
  1.0000 & 1.0000 & 1.0241 \\
  1.0000 & 1.0000 & 1.0245 \\
  0.9765 & 0.9762 & 1.0000
\end{pmatrix}
\]

4.4. Calculation of index value weights

The calculation of indicator value weights was performed using yaahp software, and the consistency test was performed; if the consistency ratio CR < 0.1 was satisfied, the degree of disagreement of the matrix was considered to be within the error range. The results are shown in Table 5.

Table 5 Ranking of the weight of each indicator.

| Guideline layer | Weights | Indicator layer | Weights | Combined weights | Consistency check |
|-----------------|---------|----------------|---------|------------------|------------------|
| Strength factors(S) | 0.2156  | S4 | 0.2596 | 0.0740 | CR=0<0.1 |
|                 |         | S1 | 0.2507 | 0.0951 | CR=0<0.1 |
|                 |         | S2 | 0.2426 | 0.0904 | CR=0<0.1 |
| Opportunity(O)  | 0.2845  | O1 | 0.3307 | 0.0696 | CR=0<0.1 |
|                 |         | O2 | 0.3240 | 0.0924 | CR=0<0.1 |
| Threat(T)       | 0.2155  | T1 | 0.3282 | 0.0729 | CR=0<0.1 |
|                 |         | T2 | 0.3282 | 0.0729 | CR=0<0.1 |
|                 |         | T3 | 0.3279 | 0.0708 | CR=0<0.1 |
| Weakness factors(W) | 0.2137 | W1 | 0.2543 | 0.0546 | CR=0<0.1 |
|                 |         | W4 | 0.2514 | 0.0538 | CR=0<0.1 |
|                 |         | W2 | 0.2441 | 0.0521 | CR=0<0.1 |

4.5. AHP results for the development of forest recreation industry in Xiying Street

In the criterion layer, the development of forest recreation industry in Xiying Street has the largest strength weight value, followed by the opportunity weight value, and the difference between the threat weight value and weakness weight value is not significant. According to the index layer, the biggest strength factor of forest recreation industry in Xiying Street is the diversity of local specialties, the biggest opportunity factor is the support of policies, the biggest threat factor is the competitive pressure in the industry and the diversification of market demand, and the biggest weakness factor is the lack of recreation facilities.

5. Industry development evaluation and recommendations

Based on the above results, it can be concluded that the threats from outside and our own weaknesses are factors that cannot be ignored in the process of developing forest recreation industry in Xiying Street. Only by playing to our own strengths and grasping the opportunities, we can achieve great strengths in the process of developing forest recreation industry. Under the background of national policies, we rely on the support of local government, introduce relevant professional talents and strengthen the construction of recreation facilities. Strengthen the protection of ecological environment and minimize the damage to the natural environment. Strengthen the publicity to the outside world, improve the popularity of the region, and attract foreign tourists.

6. Conclusion

In the development process of forest recreation industry in Xiying Street, strengths and opportunities dominate. The biggest strength is the diverse local specialties, the biggest weakness is the lack of
recreation facilities, and the huge competitive pressure within the industry is the biggest threat to the development of the industry at present. As the forest recreation industry is in the initial development stage in China, the relevant national policies provide a great opportunity for the development of forest recreation industry.

Xiyiing Street should fully develop local specialties, expand the brand effect and increase its popularity, which in turn will improve economic income and enhance the competitiveness of the industry. At the same time, rely on the support of national policies, attract relevant professionals, gradually improve forest recreation facilities, and drive the benign and rapid development of the industry.

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