



# Research on Tourism Economic value of Chinese Noodle Culture based on data Modeling

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**Abstract.** Noodles are one of the most popular snacks in many snack bar in the tourism service center. Select nine kinds of noodles which are the most important representative in China, construct 12 evaluation systems from the three dimensions of originality, influence and sustainability, and use principal component analysis to comprehensively evaluate the six factors that affect the nine kinds of noodles. The results showed that the comprehensive indexes were as follows: taste (0.984) > popularity (0.955) > skill inheritance (0.908) > performance-to-price ratio (0.882) > health value (0.823). It also makes a comprehensive comment on the correlation between the comprehensive attributes of nine kinds of noodles and the development of tourism economy, among which the comprehensive evaluation of 5 kinds of noodles is higher than the average value, and 4 kinds of noodles are lower than the average value. With scientific analysis as the purpose and tourism catering development as the goal, it has strong theoretical and practical significance to promote the integration of tourism and gourmet culture and the transformation and upgrading of the catering industry.

**Keywords:** Digital Economy; Chinese Noodle Culture; Smart Tourism

## 1 Introduction

Gourmet is the priority of the people, and gourmet is the priority of travel; "Gourmet, housing, transportation, travel, shopping, entertainment" constitute a consumption-oriented industrial chain. Tourists enjoy the beautiful scenery of rivers and mountains at the same time taste the local gourmet and experience the happiness. Through tourists, food cultural exchange between different countries and regions have been enhanced, and the entertainment, cultural and social benefits of tourism projects have been improved. <sup>[1]</sup> Moreover, tourism motivation is generated because of the famous local gourmet, which makes the special gourmet based on different geographical locations, exquisite production techniques <sup>[2]</sup>. Today, China has formed a wide variety of noodles with different flavors. Noodles with low price and good quality, full and quench thirst, is one of the fast food welcomed by the public. <sup>[3]</sup>. According to historical records, noodles were first called "soup cakes" and have a history of more than 4,000 years. <sup>[4]</sup>.

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Throughout China, there are at least hundreds of various noodles, for example Hand rolled noodles, Daoxiao Noodles, Qishan minced noodles, Stewed noodles, Noodles with bean paste and so forth, which are popular among the general public. With the improvement of economic level, the nutritious and healthy pasta industry has promoted the development of tourism. In recent years, domestic scholars attach importance to the study of "gourmet food" in tourism development, which has expanded the market scale of gourmet food. [5], However, there is a lack of quantitative analysis from the perspective of brand culture and tourist experience perception. Therefore, the prosperity and innovation of noodle marketing mechanism is of great significance to China's tourism industry.

To sum up, this paper selects nine kinds of important Chinese traditional noodles as the research object, and analyzes the relevant literature data. Based on the data matrix of perceived experience and food cost-benefit, the resource value and tourism industry competitiveness of 9 kinds of noodles were qualitatively and quantitatively analyzed by principal component analysis. And through related analysis, to explore the consumer market and demand characteristics of nine kinds of pasta, in order to promote the integrated development of tourism and catering culture, and to understand customer demand and consumption trend, as well as the transformation, upgrading and sustainable development of the catering industry to provide scientific theoretical and practical significance. [6].

## 2 Materials and research methods

### 2.1 Establishment of index system

In this paper, the relevant literature, selected the most important representative nine kinds of noodles: Dandan noodles, Daoxiao Noodles, Beef noodles, Stewed noodles, Cold noodle, Qishan minced noodles, Pian Er Chuan, Hot and dry noodles and Noodles with bean paste. Meanwhile, 12 evaluation indexes are constructed from the three dimensions of originality, influence and sustainability. combined with the natural attributes of noodles, such as the age of origin, market recognition, taste and flavor, health value (calories), service level, performance-to-price ratio, geographical location (convenient transportation), many independent factors are summarized into 6 comprehensive indicators. On this basis, the hierarchical structure model and function evaluation system of noodles were established in Figure 1.

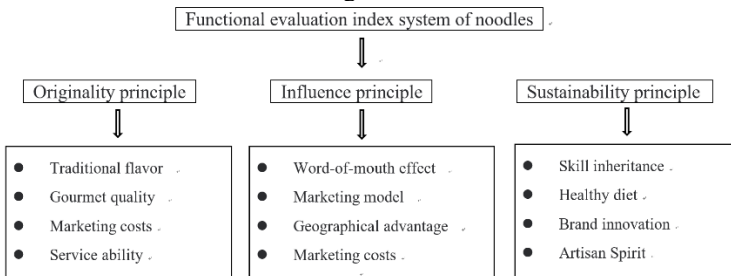


Fig. 1. Functional evaluation system of noodles

## 2.2 Composition of original data

On the basis of the scientific principle, regional principle and comparability principle, the 12 indicators are integrated into 6 dependent variables. Among the factors of skill inheritance, the difficulty of noodle making technology is analyzed comprehensively. Trace back to the origin of the time in order: Qishan minced noodles 1000 BC, Daoxiao Noodles 1300, Pian Er Chuan 1645, Stewed noodles 1650, Beef noodles 1799, Dandan noodles 1841, Cold noodle 1890, Noodles with soybean paste 1900, Hot and dry noodles with sesame paste 1930. The cost factor analysis method is the ratio of production cost and price, for example: the average price of a bowl of noodles of about 500g is about 10 yuan, of which the highest price is 35 yuan for Noodles with soybean paste, and the lowest is 7 yuan for Hot and dry noodles with sesame paste. The health value factors are comprehensively evaluated from the perspective of the calorie, protein, cellulose and other contents of a bowl of noodles, the average calories of a 500g bowl of noodles is about 450 calories, in contrast, the calorie of Noodles with soybean paste is the highest, and the calorie of Cold noodle is relatively low. The popularity factor is considered from the regional culture and the convenience of transportation. For instance, Beef noodles and Qishan minced noodles are mainly distributed in the northwest region, Dandan noodles are located in the southwest, Stewed noodles rise in the central region, Cold noodle are in the northeast region, Noodles with soybean paste are in the Beijing-Tianjin-Hebei region, Hot and dry noodles with sesame paste are mainly in the east region of the central region, and Pian Er Chuan is located in Jiangsu and Zhejiang regions. The quality factors of the ingredients mainly consider the collocation, taste, texture and other characteristics of the noodles. The determination of index weights should strive to cover many factors affecting the subject of the study<sup>[7]</sup> and reflect the attributes and popularity of noodles. After scientific scoring and ranking, the standardized data are shown in Table 1, and the original data are omitted due to space limitations.

**Table 1.** Standardized data matrix

Noodles	Skill inheritance	Cost performance	Health index	Popularity	Flavour and taste	Ingredient quality
<b>Dandan noodles</b>	-0.58779	0.46832	0.6576	0.425 54	0.60807	-0.57097
<b>Daoxiao Noodles</b>	0.67724	0.65157	0.0010	0.828 69	1.01561	1.35606
<b>Stewed noodles</b>	0.21723	-0.90609	- 1.31519	0.022 4	-0.73098	0.71372
<b>Cold noodle</b>	-0.76029	-1.08934	0.0009	- 1.187 05	-0.43988	0.07137
<b>Beef noodles</b>	-0.01278	1.84272	1.31519	1.231 84	1.3067	0.71372

<b>Pian Er Chuan</b>	0.33223	-1.36423	- 0.98639	- 1.590 19	-1.60427	-1.21332
<b>Hot and dry noodles</b>	-0.8753	0.10181	- 1.31519	- 0.783 9	-1.02208	-0.89215
<b>Qishan minced noodles</b>	2.11477	0.01018	0.6576	0.022 4	0.14231	-1.21332
<b>Noodles with bean paste</b>	-1.1053	0.28506	0.98639	1.030 27	0.72451	1.03489

### 2.3 Research methods

Principal component analysis (PCA) was used to study the value weights of nine kinds of noodles, which simplified several variables with a certain correlation into six related comprehensive indexes by linear combination. The basic steps of principal component analysis are as follows: (1) Establish the original data for standardization processing to eliminate the influence of different dimensions; (2) Calculate the correlation coefficient matrix R of the sample matrix; (3) Find the eigenvalue, eigenvector and contribution rate of R; (4) Determine the number of principal components; (5) Take the cumulative contribution rate of principal component > 80% as the criterion to determine the quantity of principal component, and explain the economic significance of principal component factor; (6) The value evaluation ranking of 9 kinds of noodles was obtained by using the principal component comprehensive evaluation function, and the future industrial development was predicted. The whole process is done with SPSS20.0.

## 3 Analysis results

### 3.1 Correlation analysis between indicators

The correlation matrix calculated through SPSS analysis (Table 2) shows that the correlation coefficients between the popularity, flavor and taste, cost performance, ingredient quality, and health value of the nine types of noodles all exceed 0.8, indicating a strong correlation between various indicators, making it suitable to use principal component analysis.

**Table 2.** Correlation analysis among indicators

	Skill inheritance	Cost performance	Health index	Popularity	Flavour and taste	Ingredient quality
Skill inheritance	1.000	-0.008	0.054	0.034	0.044	-0.248
Cost performance	-0.008	1.000	0.678	0.833	0.849	0.382
Health index	0.054	0.678	1.000	0.688	0.852	0.277
Popularity	0.034	0.833	0.688	1.000	0.915	0.670
Flavour and taste	0.044	0.849	0.852	0.915	1.000	0.606
Ingredient quality	-0.248	0.382	0.277	0.067	0.606	1.000

### 3.2 Principal component analysis of indicators

Table 3 Principal component analysis shows that the characteristic root  $\lambda_1=3.763$ , characteristic root  $\lambda_2=1.156$ ,  $\lambda_3=0.649$  of the first three factors, the cumulative variance contribution rate of these three common factors is 92.79%, that is, they cover most of the information and can express 92.79% of the information of the six analysis items. The principal component analysis has a good effect.

**Table 3.** Principal component eigenvalue, variance contribution rate and cumulative contribution rate

Initial eigenvalue extraction square sum load						
Ingredient	Total	Variance %	Cumulant %	Total	Variance %	Cumulant %
1	3.763	62.710	62.710	3.763	62.710	62.710
2	1.156	19.272	81.982	1.156	19.272	81.982
3	0.649	10.809	92.791			
4	0.329	5.477	98.268			
5	0.078	1.294	99.562			
6	0.026	0.438	100.000			

Among them, the first two principal components contain 80% of the information of all indicators, and the initial eigenvalue is greater than 1, which has good representation and meets the extraction standard of principal components. Therefore, the first two indicators extracted are recorded as the principal components F1 and F2 respectively (Table 4), and the six indicators can be integrated into two principal factors. Among the six indexes, flavor and taste (0.984) > popularity (0.955) > Cost performance (0.882) > Health index (0.823) had a higher load on the first principal component, and the corre-

lation was strong. The information carried by the first principal component F1 concentrated reflected that the flavor and taste factor was 0.984, and the second principal component F2 had a higher load value (0.908) and a strong correlation.

**Table 4.** Principal component score coefficient matrix

	Ingredient	
	1	2
<b>Skill inheritance</b>	-0.018	0.908
<b>Cost performance</b>	0.882	0.101
<b>Health index</b>	0.823	0.233
<b>Popularity</b>	0.955	-0.003
<b>Flavour and taste</b>	0.984	0.074
<b>Ingredient quality</b>	0.653	-0.511

The first two principal component expressions are as follows:

$$F1 = -0.018Z1 + 0.882Z2 + 0.823Z3 + 0.955Z4 + 0.984Z5 + 0.653Z6$$

$$F2 = 0.908Z1 + 0.101Z2 + 0.233Z3 - 0.003Z4 + 0.074Z5 - 0.511Z6$$

Where: Z1, Z2, Z3, Z4, Z5, Z6 represent variables that are standardized to the original data.

### 3.3 Comprehensive evaluation of principal component analysis

SPSS statistical software was used to calculate the score of each factor by using the respective variance contribution of the two principal components as the weight comprehensive score function:

$$F = 62.71\% \times F1 + 19.27\% \times F2$$

The comprehensive evaluation ranking and score calculated in light of this model are shown in Table 5.

**Table 5.** Principal component scores and composite scores

Noodles	F1	F2	F (Weighted sum)	Ranking
<b>Dandan noodles</b>	0.42426	0.00172	0.27	5
<b>Daoxiao Noodles</b>	0.86096	0.05149	0.55	2
<b>Stewed noodles</b>	-0.56265	-0.53561	-0.46	6
<b>Cold noodle</b>	-0.65578	-0.74848	-0.56	7
<b>Beef noodles</b>	1.49806	0.1799	0.97	1
<b>Pian Er Chuan</b>	-1.57095	0.3819	-0.91	9
<b>Hot and dry noodles</b>	-0.88071	-0.61237	-0.67	8
<b>Qishan minced noodles</b>	-0.03157	2.34013	0.43	3
<b>Noodles with bean paste</b>	0.91838	-1.05868	0.37	4

## 4 Conclusion and Enlightenment

As indicated by Table 5, the ranking results are Beef noodles, Daoxiao Noodles, Qishan minced noodles, Noodles with bean paste, Dandan noodles, Stewed noodles, cold noodles, Hot and dry noodles and Pian Er Chuan. Among them, the factor scores of Beef noodles, Daoxiao Noodles, Qishan minced noodles, Noodles with bean paste and Dandan noodles are positive, but the factor scores of Stewed noodles, Cold noodle, Hot and dry noodles and Pian Er Chuan were negative, indicating that among which the comprehensive evaluation of 5 kinds of noodles is higher than the average value, and 4 kinds of noodles are lower than the average value. The results are consistent with the share of nine kinds of noodles in the catering industry. The Beef noodle with the first comprehensive score has a stable industry standard of " firstly clear (The soup is clear without turbidity), second white (Turnip), thirdly green (Coriander green), fourthly red (Spicy Oil Red) and fifth yellow (Noodles are yellow and shiny)". The Daoxiao Noodles and the Qishan minced noodles win in the inheritance of the process. The Noodles with bean paste and Dandan noodles have unique advantages in taste, passenger flow and geographical location. Stewed noodles, Cold noodle, Hot and dry noodles and Pian Er Chuan are not perfect in marketing promotion and creating a tourism environment, tourism income and scale are low, and promotion needs to be strengthened to attract more tourists.

Various types of noodles should actively learn from six indicators, break through the bottleneck that restricts the development of tourism sales, leverage their brand advantages, and promote the development of the industry in a targeted manner<sup>[8]</sup>. The purpose of factor analysis is to reveal the gaps and constraints between the noodle gourmet industry. The noodle gourmet industry can understand the advantages and disadvantages of each type of noodle, formulate more targeted development strategies and marketing plans, thereby improving the comprehensive competitive strength of tourist destinations and promoting the sustainable development of gastronomy culture tourism. To make noodles more responsive to market demand and vitality, and further prosper the Chinese noodle industry and the rapidly changing tourism industry.

In accordance with the results of the multivariate analysis of 6 factors of 9 kinds of noodles, the following enlightenment can be obtained on how to strengthen the integration and development of gourmet and tourism:

(1) Food culture can invigorate the development of local tourism economy, making use of historical origins, folklore, as well as local conditions and customs<sup>[9]</sup>, from the aspects of food customs, cooking process and meal rituals, let food culture become a new growth point in the efficiency of tourism management.

(2) By holding characteristic cultural festivals and establishing iconic gourmet buildings<sup>[10]</sup>, we can increase the economy of tourism and promote the competitiveness of local tourism through scientific marketing.

(3) Enhance the economic added value of pasta tourism commodities, develop and produce pasta as an important local specialty and tourism commodities, make a series of easy-to-carry commodities, and stimulate tourists' desire to buy<sup>[11]</sup>. It can not only greatly increase economic benefits, but also accelerate the spread of tourism culture.

In short, by understanding the advantages and disadvantages of each type of pasta, and formulating more targeted development strategies and marketing plans, the branding development of Chinese noodle food culture will become an important part of Chinese catering culture in the future.

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## References

1. ZHOU L F. A preliminary study on the Tourism Model of Gourmet Culture. *Manager' Journal*,2019, (2)8:88-89.
2. GUO A X, GUO Y Z, LI H.J. Empirical Research on Tourists Perceived Value Influence to Revisit Intention: The Role of Tourists Satisfaction and Risk Probability, *Tourism Tribune*, 2018,5(1): 63-73.
3. HUANG L. The Excavation of Local Gourmet Culture and Tourism Development Research, *Modern Gourmet*, 2019,4(2):8-10.
4. ZHAO R G. *History of Chinese Dietetic Culture*, Shanghai people's Publishing House, 2006.
5. ZHONG Z J, ZHOU M Q, LIN J P. Research Progress of "Gourmet" Tourism at Home and abroad. *Yunnan Geographic Environment Research*, 2021, 8(2): 69-78.
6. ZHANG W, ZHANG J X, HE L C. Research on the Model of Intangible Cultural Heritage Tourism Development System. *China Journal of Commerce* ,2020, 4(7): 86-90.
7. YANG J, HOU Z Y, YANG C P. Influencing factors of dietetic culture tourism based on DEMATEL Model-Taking the development project experiencing Chengdu gourmet making as an example. *Journal of Researches on Dietetic Science and Culture* ,2019, 36(2): 53-59.
8. XU Y K, YU F L, PAN W. Research progress and its enlightenment of gourmet tourism, *Journal of Researches on Dietetic Science and Culture*,2021, 38(1): 24-32.
9. Coskun, G., & Norman, W. The influence of impulsiveness on local food purchase behavior in a tourism context. *Tourism: An International Interdisciplinary Journal*, 2021,69(1):7-18.
10. LI J Y. The influence of Chinese traditional Dietetic Culture on the Image Construction of Chinese Tourism destination China Market ,2019,30(2):62-63.
11. Ellis, A., Park, E., Kim, S. and Yeoman, I. "What is food tourism?". *Tourism Management*, 2018, Vol. 68, pp. 250-263.



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