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Research on the Selection of Sponsors of Winter Olympics Based on Factor Analysis

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Abstract: *As the world's top sports event, the Winter Olympics has great commercial value. How to select sponsors is a topic worthy of study. Firstly, this paper uses questionnaires and other tools to select nine important factors that affect the selection of sponsors. Next, this paper uses SPSS software to extract three common factors from nine initial factors by factor analysis, in which "matching degree and external image factor" reflect the indexes of "product quality", "reputation degree" and "match degree" of the sponsoring enterprises; "Sponsorship history and popularity factor" reflects the sponsor's "sponsorship experience", "sponsored teams and athletes" and "popularity" indicators; "Economic factor" reflects the index of "annual profit growth rate" and "geometric average growth rate of 3-year cycle profit" of sponsoring enterprises. Through the results of factor analysis, we can get the bidding index system of sponsorship for the Winter Olympics. When selecting sponsors, Winter Olympics Organizing Committee can analyze and judge the matching degree and external image of sponsors, sponsorship history and popularity, and economic strength, and finally determine the sponsors of the Winter Olympics.*

Keywords: *Winter Olympics, Factor analysis, Sponsor evaluation*

1. Introduction

As the world's top sports event, the Winter Olympics has attracted great attention all over the world. According to the current revenue status of the Beijing Winter Olympics Organizing Committee and sponsorship revenue of previous Olympic Games, it is estimated that the total revenue of the Beijing Winter Olympics Organizing Committee from market development is not less than 1.1 billion US dollars, of which the estimated revenue of sponsorship plan is about 870 million US dollars, and different levels of sponsors need to pay different amounts. [1]

While sponsoring the Winter Olympics, enterprises can also make use of the tremendous influence brought by the Winter Olympics to promote their own brands and enhance the visibility of enterprises. Sponsors of the Winter Olympics can obtain the rights of marketing, reception, products and services, priority negotiation and so on.

2. Selection of Sponsor Influence Factors

This paper selects six sponsors from the last five Winter Olympics to collect basic data. Get the basic data of the financial dimension by questioning the multi-year financial statements and annual statements of enterprises. Secondly, this paper searches and collects the basic data of the sponsorship history dimension of the sponsoring enterprises, and uses the network and sports-related software to inquire about the history of sports-related matters of six enterprises in the past.

Next, a questionnaire survey was conducted among six sponsoring enterprises in order to obtain the match index. The survey objects are divided into two parts: the general population and experts in related fields such as sports event sponsorship. According to the suggestion of Liu Ying (2014) [2], the questionnaire was compiled in the form of "7-point Likert Scale", that is, each question was set with seven options of "very different opinions, comparative disagreement, disagreement, uncertainty, agreement, comparative agreement and very agreement". At the same time, in compiling the title, this paper refers to 12 measurement indexes of Liu Ying and makes reasonable deletion, sets up 6 questions related to sponsorship matching degree, [3] and names them as product suitability matching degree, product use matching degree, position matching degree, audience matching degree, image matching

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degree and influence area matching degree respectively, thus completing the design of the questionnaire. [4] Finally, this paper deals with the comprehensive matching index obtained from the general population questionnaire and the expert questionnaire, setting the weight of the general population comprehensive index to 30% and the weight of the expert comprehensive index to 70%, and finally getting the final index data of "match degree" after summation, as shown in the following table:

Table 1: Match Degree of Sponsors of the Winter Olympics

Sponsor	SAMSUNG	Nike	Coca-Cola	P&G	Alibaba	Intel
Match Degree	667.8	816.9	934.8	801.0	867.2	852.3

Using the same method, the dimension index of sponsor brand image can be obtained.

Table 2: Brand Image Indicators of Sponsors of the Winter Olympics

	Reputation	Popularity	Science and Technology	Uniqueness	Product Quality
SAMSUNG	3.15	4.18	3.85	3.43	3.33
Nike	3.24	4.49	3.34	3.46	3.63
Coca-Cola	4.1	4.65	3.06	3.84	3.94
P&G	3.94	4.11	3.43	3.51	3.92
Alibaba	3.72	4.39	4.19	3.99	3.7
Intel	four	4.34	4.29	3.82	3.9

This paper inquiries into the multi-year financial statements and annual statements, finds out the profit amount of each year as the basic data and calculates the function. Finally, the data of two indicators of "annual profit growth rate" and "geometric average growth rate of 3-year cycle profit" are as follows:

Table 3: Enterprise operation

	Annual Profit Growth Rate	Geometric Average Growth Rate of 3-year Cycle Profit
Coca-Cola	-11.48%	9.21%
P&G	8.46%	-0.94%
Alibaba	72.43%	46.97%
Intel	6.95%	14.24%
SAMSUNG	21.48%	-18.14%
Nike	-4.38%	-5.80%

Use the network and sports-related software to inquire about the history of sports-related matters sponsored by six enterprises in the past, score and summarize each index, and make a table. [5] Finally, the two original data indicators of "sponsorship experience" and "sponsored teams and athletes" are as follows:

Table 4: Sponsorship history

	International Level	National Level	Provincial Level	Teams and Athletes
SAMSUNG	15	8	3	10
Nike	15	8	3	10
Coca-Cola	15	8	3	10
P&G	15	0	0	0
Alibaba	15	8	3	5
Intel	15	8	3	8

Finally, this paper determines nine original variables, which are annual profit growth rate, a geometric average growth rate of 3-year cycle profit, reputation, popularity, uniqueness, product quality, match degree, sponsorship experience, sponsored teams and athletes.

3. Comprehensive Evaluation Model of Sponsors Based on Factor Analysis

Import the data of the original variable summary table into the SPSS work column, find out the correlation matrix, and analyze the correlation among the variables. The calculation shows that most of the correlation coefficients are greater than 0.3, which verifies the rationality and scientificity of factor analysis.

A scree plot is used to show the importance of each factor, and its abscissa is the factor serial number, and the ordinate indicates the magnitude of characteristic value.

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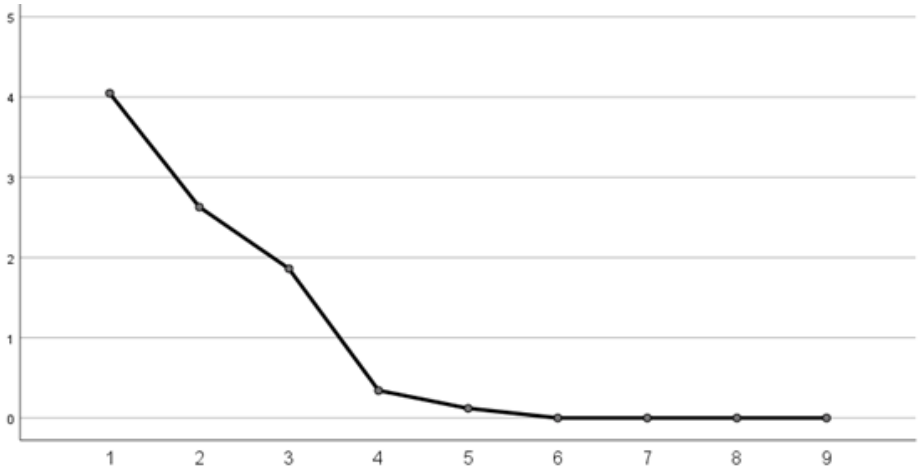

Figure 1: Scree plot

It can be seen from the figure that the scatter points of the first three factors are located on the steep slope, while the scatter points of the last six factors form a platform, and the characteristic value is less than 1, so only the first three factors can be considered.

Using SPSS to calculate the initial factor load and analyze the component matrix, the variables "match degree", "uniqueness", "geometric average growth rate of 3-year cycle profit", "reputation" and "product quality" are obviously related to factor 1. The variables "sponsorship experience" and "sponsored teams and athletes" are obviously related to factor 2; The variable "annual profit growth rate" is obviously related to factor 3.

Table 5: Component matrix

	Factor 1	Factor 2	Factor 3
Match Degree	.919	.079	-.099
Uniqueness	.890	.312	.241
Geometric Average Growth Rate of 3-year Cycle Profit	.856	.150	.491
Reputation	.831	-.281	-.347
Product Quality	.801	-.319	-.505
Sponsorship Experience	-.016	.976	.126
Sponsored Teams and Athletes	-.326	.901	-.255
Popularity	.425	.747	-.400
Annual Profit Growth Rate	.245	.007	.967

After the maximum variance rotation, the analysis of the rotated component matrix shows that the first common factor has a great load on "product quality", "reputation" and "match degree", so it is named as "match degree and external image factor". The second common factor has a great load on "sponsorship experience", "sponsored teams and athletes" and "popularity", so it is named "sponsored history and popularity factor"; The third common factor has a great load on "annual profit growth rate" and "geometric average growth rate of 3-year cycle profit", so it is named "economic factor".

Table 6: Composition matrix after rotation

	Factor 1	Factor 2	Factor 3
Product Quality	.978	-.177	-.098
Reputation	.926	-.170	.059
Match Degree	.839	.137	.371
Sponsorship Experience	-.203	.930	.252
Sponsored Teams and Athletes	-.287	.919	-.237
Popularity	.459	.830	-.024
Annual Profit Growth Rate	-.238	-.177	.953
Geometric Average Growth Rate of 3-Year Cycle Profit	.499	.085	.860
Uniqueness	.624	.295	.686

According to the factor analysis method, the following three factors are obtained-matching degree and external image factor, sponsorship and popularity factor and economic factor. The scores of each factor of different enterprises are as follows:

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Table 7: Different enterprise ratings

	Matching Degree and External Image Factor	Sponsorship History and Popularity Factors	Economic Factor
SAMSUNG	-1.7708	0.0430	-0.2418
Nike	-0.4060	0.6749	-0.6518
Coca-Cola	1.0488	0.9433	-0.5861
P&G	0.4145	-1.8979	-0.5150
Alibaba	0.0626	0.0110	1.9768
Intel	0.6509	0.2257	0.0179

According to the above-mentioned matching degree of each enterprise and the total variance explanation of external image factor, sponsorship history and popularity factor and economic factor, the proportion of each factor score in the comprehensive score is determined. Finally, the following comprehensive scores are obtained by weighted average:

Table 8: Enterprise comprehensive score

	Matching Degree and External Image Factor	Sponsorship History and Popularity Factors	Economic Factor	Comprehensive Score
SAMSUNG	-1.7708	0.0430	-0.2418	-0.7903
Nike	-0.4060	0.6749	-0.6518	-0.1455
Coca-Cola	1.0488	0.9433	-0.5861	0.5590
P&G	0.4145	-1.8979	-0.5150	-0.5501
Alibaba	0.0626	0.0110	1.9768	0.5827
Intel	0.6509	0.2257	0.0179	0.3442

4. Conclusion

In this paper, SPSS software is used to extract three common factors from nine initial factors by factor analysis, among which "matching degree and external image factor" reflect the indexes of "product quality", "reputation degree" and "match degree" of the sponsoring enterprises; "Sponsorship history and popularity factor" reflects the sponsor's "sponsorship experience", "sponsored teams and athletes" and "popularity" indicators; "Economic factor" reflects the index of "annual profit growth rate" and "geometric average growth rate of 3-year cycle profit" of sponsoring enterprises.

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