

**Comprehensive Evaluation Model of Network Movie Hotness Based on Factor Analysis**

Xin-Xing ZHAO\*, Pei-Yi SONG, Jiang-Hua SUN

School of Economics and Management, Communication University of China, Beijing, China

\*Corresponding Author: xinxing871217@163.com

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**Abstract.** First of all, it constructs an index system for the comprehensive evaluation of network movie hotness from two dimensions. They are characteristics of commercial success and characteristics of the popularity. Then it uses factor analysis to establish the weight of two common factors and obtain the evaluation model of comprehensive factor scores. The conclusion of empirical analysis shows that 54.156% of network movie hotness comes from the factor of characteristics of commercial success and 33.057% comes from the factor of characteristics of the popularity. Finally, we compare the new ranking of network movie hotness with the original ranking based on Iqiyi hotness.

**1. Introduction**

At present, the whole process of films and TV series is almost market-oriented. Even if it is clear that the films and TV series are “the best-selling not good”, they will still do it because it is profitable. Many scholars have conducted researches on this issue. For example, box office is not the only measure of a movie's success because there are many factors worthy of expectation and judgment for a movie (Yang, 2014). Combined with the film *Us and Them* directed by Ruoying Liu, Xue (2018) compares and analyzes the influence of word-of-mouth and hotspots on China's box office. Lu (2017) studies the influence of public opinion of network movies on Chinese movie ecology through data mining.

In order to create a more benign industrial environment, break “the flow is greater than everything” and return to the content of the heart, Youku announced that it would shut down front-end view counts on January 18, 2019. As early as September 3, 2018, Iqiyi announced formal closure of front-end view counts. Then Iqiyi decided to build a hotness evaluation system with multiple evaluation systems and reasonable comprehensive weight to improve content quality and constantly optimize content selection. Gudu media and Entgroup also added the corresponding indexes to evaluate the hotness.

Whether from the theoretical research or the hotness index proposed by industry, we can see that the box office or view counts are one-sided. Therefore, this study puts forward a new definition of hotness value. It establishes a comprehensive evaluation model of network movie hotness. According to the hotness of network movie and related evaluation indicators, it makes a quantitative analysis through factor analysis, then makes a comparative analysis with Iqiyi hotness, and finally gets more reasonable evaluation results.

## **2. Establishment of Index System**

How to quantitatively evaluate the hotness of network movie and establish an objective evaluation model? Currently, there is no standardized method in academic circles. As an independent third-party data service provider of film and television entertainment industry, Entgroup launches screening index, which mainly reflects the comprehensive evaluation of the content value after a film or TV content is showed. It is composed of media-hotness, user-hotness, praise-degree and view-degree. According to Baidu's "Media Index", we find that the media-hotness of network movies is relatively low, so this paper does not consider the media-hotness when constructing the comprehensive evaluation index system of network movie hotness. The box office cannot measure the quality of a film, but it represents the global hotness of a film. Therefore, the comprehensive evaluation index system increases the payment-hotness, which is expressed by the profit allocation of box office. Based on this, the paper takes payment-hotness, view-degree, user-hotness and praise-degree as secondary indicators, and further refines them into the tertiary index. It also defines characteristics of commercial success and characteristics of the popularity as the primary index of the comprehensive evaluation of network movie hotness.

(1) Characteristics of commercial success. The following indicators are selected as the secondary indicators to reflect the characteristics of commercial success:①payment-hotness,②view-degree,③user-hotness. Then these secondary indicators are further processed, and the following indicators are selected as the third-level indicators: ①profit allocation of box office, ②Effective viewed times, ③number of Douban valuers, ④peak of Baidu index. The corresponding relationship between third-level indicators and second-level indicators is presented in Table 1.

(2) Characteristics of the popularity. The praise-degree indicator is selected as the secondary indicators to reflect the characteristics of the popularity. Then the secondary indicator is further processed, and the following indicators are selected as the tertiary indicators:①score on the Douban,②score on the video platform. The results are presented in Table 1.

### **3. Selection of Research Objects and Evaluation Indicators**

In 2018, there were 25 network movies in Iqiyi whose profit allocation of box office broke through tens of millions of dollars. Demon Catcher and Immortal & Demons have been offline. The data of River's lake college, The Bravest Escort Group and other four network movies are missing. Therefore, these eight network movies are eliminated. Finally, there are 17 network movies that participate in the estimation.

Profit allocation of box office and Effective viewed times come from Iqiyi's box office list of network movies in 2018; number of Douban valuator and score on the Douban come from website Douban; peak of Baidu index comes from website Baidu index; score on the video platform comes from website Iqiyi. The 17 network movies are extracted according to the comprehensive evaluation index system of network movie hotness. Thus, a 17\*6 original data matrix, namely  $X_{ij}$ , is obtained, in which  $i$  represents a network movie and  $j$  represents a third-level indicator.

### **4. Model Establishment Based on Factor Analysis of Hotness Index**

This paper uses factor analysis to quantitatively study the hotness of network movie. All the data are collected and analyzed with software SPSS. The process is as follows:

(1) Suitability test. Collected data are tested by KMO and Bartlett's test. The results are shown in Table 1.

**Table 1. Comprehensive Evaluation Index System of Network movie Hotness**

First-level indicators	Second-level indicators	Third-level indicators	Description
Characteristics of commercial success	Payment-hotness	Profit allocation of box office	The box office of a film is divided into three parts: the exhibitor, the distributor and the producer
	View-degree	Effective viewed times	How many people have really viewed a network movie
	User-hotness	Number of Douban valuator	Number of people who score a network movie on Douban
Peak of Baidu index		Expressing netizens' active search for a network movie in Baidu	
Characteristics of the popularity	Praise-degree	Score on the Douban	Score of a network movie on the Douban
		Score on the video platform	Score of a network movie on the video website

**Table 2. KMO and Bartlett's Test**

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.769
Bartlett's Test of Sphericity	Approx. Chi-Square	115.533
	df	15
	Sig.	.000

In table 2,  $KMO=0.769>0.7$ , which indicates that factor analysis is suitable. The Sig value of Bartlett's test is  $0.000<0.05$ , so the null hypothesis is rejected. The variables are not independent, and there is correlation between variables. This ensures that the indicators are suitable for factor analysis.

(2) Communality test. The communalities of variables reflect the degree to which all common factors explain the variance (variation) of original variables. The results are shown in Table 3.

Communalities of all the variables are higher than 0.8, so extracted common factors have basically reflected more than 80% of original variables. The effect of factor analysis is good.

(3) Selection and interpretation of common factors. The total variance table is calculated by principal component analysis. The results are shown in Table 4.

Two common factors are extracted, which conform to two dimensions of the index system proposed above. Further analysis shows that the two common factors can explain 54.156% and 33.057% of hotness-related information respectively. Finally, the cumulative amount explains 87.213% of the overall information. The results show that two common factors can reflect well the overall information of network movie hotness.

**Table 3. Communalities**

	Initial	Extraction
Profit allocation of box office	1.000	.896
Effective viewed times	1.000	.893
Number of Douban valuers	1.000	.906
Peak of Baidu index	1.000	.814
Score on the Douban	1.000	.803
Score on the video platform	1.000	.921

**Table 4. Total Variance Explained**

Component	Initial Eigenvalues			Rotation Sums of Squared Loadings			
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	
dimension0	1	4.480	74.670	74.670	3.249	54.156	54.156
	2	.753	12.543	87.213	1.983	33.057	87.213
	3	.380	6.332	93.546			
	4	.252	4.202	97.747			
	5	.132	2.192	99.939			
	6	.004	.061	100.000			

Then it uses variance maximum method to calculate the factor load matrix after rotation. The results are shown in Table 5.

**Table 5. Rotated Component Matrix**

	Component	
	1	2
Profit allocation of box office	.777	.541
Effective viewed times	.796	.510
Number of Douban valuator	.910	.279
Peak of Baidu index	.893	.129
Score on the Douban	.599	.666
Score on the video platform	.168	.945

The following information can be found from Table 5: the first common factor has high correlation with profit allocation of box office, effective viewed times, number of Douban valuator and peak of Baidu index; the second common factor has strong correlation with score on the Douban and score on the video platform.

The results exactly correspond with the previous hotness index system. It takes profit allocation of box office, effective viewed times, number of Douban valuator and peak of Baidu index as a common factor  $F_1$ .  $F_1$  represents characteristics of commercial success of network movies and explains 54.156% of the information. It takes score on the Douban and score on the video platform as a common factor  $F_2$ .  $F_2$  represents characteristics of the popularity and explains 33.057% of the information.

(4) Comprehensive evaluation model. As can be seen from the Table 6, score functions of each common factor can be obtained. According to  $F_1$  and  $F_2$ , we calculate scores of each common factor for network movies.

**Table 6. Component Score Coefficient Matrix**

	Component	
	1	2
Profit allocation of box office	.175	.118
Effective viewed times	.203	.077
Number of Douban valuator	.390	-.204
Peak of Baidu index	.458	-.340
Score on the Douban	.006	.330
Score on the video platform	-.392	.823

$$F_1=0.175X_1+0.203X_2+0.390X_3+0.458X_4+0.006X_5-0.392X_6 \quad (1)$$

$$F_2=0.118X_1+0.077X_2-0.204X_3-0.340X_4+0.330X_5+0.823X_6 \quad (2)$$

Then we weight the influence of variance contribution rate of each common factor on network movie hotness.

The model of comprehensive factor F is described as follows:

$$F=(0.54156*F_1+0.33057*F_2)/0.87213$$

According to the model, we get the top 10 of network movies in 2018. The results are shown in Table 7.

**Table 7. Top 10 of Comprehensive Scores**

Comprehensive new ranking of F	Name	F	F <sub>1</sub>	Ranking of F <sub>1</sub>	F <sub>2</sub>	Ranking of F <sub>2</sub>	Peak of Iqiyi hotness	Ranked by Iqiyi hotness
1	<i>Soul Ferry:</i> <i>Netherworld</i>	2.47	3.48	1	0.80	4	6875	1
2	<i>Chen Xiang Half</i> <i>Past Six:</i> <i>Invincible Iron</i> <i>Head</i>	0.93	0.43	3	1.75	1	6427	4
3	<i>The Unity of</i> <i>Heroes</i>	0.24	-0.10	9	0.80	5	6037	8
4	<i>The Incredible</i> <i>Monk-Dragon</i> <i>Return</i>	0.13	-0.35	12	0.92	3	6485	3
5	<i>SiPing Youth:</i> <i>Bloody Bangkok</i>	-0.07	-0.75	14	1.05	2	5699	12
6	<i>The Mad Monk:</i> <i>Heroic Homing</i>	-0.12	-0.08	8	-0.19	10	6536	2
7	<i>Dream Journey 4</i>	-0.13	-0.69	13	0.79	6	6000	9
8	<i>Meet Mr.</i> <i>Vampire</i>	-0.17	0.04	5	-0.50	13	6267	5

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9	<i>Detective Dee:</i> <i>ChiYou and</i> <i>BloodVine</i>	-0.18	-0.05	7	-0.38	12	6081	7
10	<i>Detective Dee</i> <i>and Nether Road</i>	-0.18	-0.32	11	0.05	9	5878	10

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## 5. Conclusion

First of all, this study constructs an index evaluation system for network movie hotness. Then it collects the data of 25 network movies in 2018. Finally, it conducts an empirical research with factor analysis. From the results, we find that the factor analysis method has its unique advantage.

We get not only the score and ranking of comprehensive factor of each network movie, but also the score and ranking on each common factor. Through observing scores of two common factors  $F_1$  and  $F_2$ , we find that *Soul Ferry: Netherworld* is much better than other network movies in terms of characteristics of commercial success, while *Chen Xiang Half Past Six: Invincible Iron Head* has best word-of-mouth in terms of characteristics of the popularity. Comprehensive factor  $F$  of *Soul Ferry: Netherworld* reaches the highest score of 2.47, *Chen Xiang Half Past Six: Invincible Iron Head* comes second and scores 0.93, while comprehensive scores of other network movies are not very different. Under the annual report of Iqiyi's network movies in 2018, *Soul Ferry: Netherworld* and *Chen Xiang Half Past Six: Invincible Iron Head* have taken the top two spots in the Annual box office list and annual comprehensive word-of-mouth list. It shows that our method is feasible and the estimated results are believable. In addition, the new ranking of network movie hotness has made some modifications to the original ranking based on Iqiyi hotness. For example, *SiPing Youth: Bloody Bangkok* has shot up the new ranking significantly compared with the original ranking. Observing the ranking of the common factor  $F_2$ , *SiPing Youth: Bloody Bangkok* gains a strong reputation in terms of characteristics of the popularity. Therefore, the model of this paper is able to improve the ranking of network movies which have excellent characteristics of the popularity. It can find network movies of high quality more objectively and scientifically. The amount of data used in this model is relatively limited, and more data of network movies are needed to verify and revise the model in the future. There is still room to improve the research.

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## **7. References**

- [1]Lu, Y. 2017. Will bad reviews ruin films? -- The Influence of Public Opinion of Network Movies on Chinese Movie Ecology. *Journal of News Research*, 14:122-123.
- [2]Xue, Y. J. 2018. Is word-of-mouth or hotness affecting the box office of Chinese movies? *Research on Transmission Competence*, 15:76.
- [3]Yang, Q. 2014. July 24. Box office is not the only measure of the success of a movie. *SHENZHEN ECONOMIC DAILY*. p. 4.