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Analytic hierarchy process-based martial arts culture international communication innovation study

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ABSTRACT

Along with economic globalization, world culture presents diversity features. Martial arts as representative of Chinese traditional sports culture, it gradually goes out of the country to the world. In Chinese martial arts communication process, construction of martial arts culture international communication innovation presentation platform is very necessary. The paper utilizes analytic hierarchy process, takes universities martial arts educators and overseas students that just come to China as investigation objects, and establishes models according to investigation results. From the perspectives of communicators' satisfaction degree, communication contents rationality, audience' satisfaction degree and communication efficiency the four aspects, carry out comparative analysis of martial arts kinds of program, martial arts sports event, martial arts film and comprehensive martial arts forum the four creative demo platform, analysis result shows martial arts film is best martial arts culture international communication creative demo platform.

KEYWORDS

Martial arts culture; Creative demo platform; Martial arts film; Communication path; Analytic hierarchy process.

INTRODUCTION

With Chinese international position improvement, Chinese soft power is also required to be upgraded accordingly. As Chinese traditional sports culture representative-martial arts, its development in the world reflects Chinese culture soft power to a certain degree. Due to martial arts contents are complex, motions have varieties of types, its communication status is unsatisfactory.

In 2010, Zhu Kai in the article "Discuss Chinese martial arts international communication's martial arts cultural inheritance", he adopted multiple kinds of research methods to make basic defining on relative concepts from communication science perspective, and stated martial arts communication significances from culture, society and economy three aspects. Combine with present martial arts international communication existing aphasia, author clearly pointed out that Chinese martial arts international communication must insist on Chinese cultural basic spirits, on this basis, absorbed multiple excellent cultures, and carried forward martial arts national features. The author put forward to communicate martial arts cultural strategies, insist on martial arts communication cultural confidence, self-esteem; surpass tradition, let martial arts spirits to go to world; use martial arts fitness functions as martial arts communication best entry point.

In 2012, Liu Yong in the article "Chinese martial arts cultural international communication status and development strategic research", comprehensive applied multiple methods, studied on Chinese martial arts culture international communication status and development strategy, studying results indicated that Africa was fastest development zone of martial arts, secondly was European region. On a whole, martial arts global popularization degree was lower, main constraint factors were lacking of professional guidance group as well as Chinese martial arts publicity. The paper pointed out, by far, Chinese martial arts communication ways had four kinds, and it contained interpersonal communication, group communication, organizational communication and mass communication. In martial arts communication process, martial arts complex and diversity, professionals' shortage became obstructive main factors.

In 2012, Hu Yan-Li in the article "Chinese martial arts international communication mode research", according to Chinese martial arts international communication requests, relied on communication science knowledge, summarized four kinds of Chinese martial arts international communication modes; they were education communication mode, competitive communication mode, media communication mode and commercial communication mode. The article pointed out education communication was fundamental path, but it suffered objective factors effects. Competitive communication mode was faster communication path, but its "high, difficult, new and beauty" development orientation didn't conform to martial arts essence. Mass communication path was a way to propel to communication, commercial communication knowledge played auxiliary effects on Chinese martial arts international communication.

In 2011, Wang Li-Na in the article "Singapore middle and primary schools' martial arts development status investigation research", pointed out the purpose for Singapore students learning martial arts was to build body. Because Chinese martial arts possessed certain complex and particularity, strategy of value promotion martial arts was not strong, so Singapore students' cognitive level on Chinese martial arts was not high. For the phenomenon, author put forward correlated opinions and suggestions.

In order to let more foreign friends to understand Chinese martial arts so as to let martial arts to better communicate in international, the paper works on researching on martial arts culture international communication creative demo platform construction, the platform is used to arouse strong enthusiasm of numerous international friends on Chinese martial arts.

MODEL ESTABLISHMENT

Martial arts cultural communication needs to arouse numerous people enthusiasm on martial arts. Martial arts culture international communication creative demo platform construction is imperative. With science and technology advancement, network plays more and more important roles in people daily life. Nowadays, display platform has varieties of types, from which it contains martial arts program, martial arts sports event, martial arts film and comprehensive kinds of martial arts forum so on.

AHP can solve relative tedious and vague problems' decision-making problems. Use the method to construct model, it roughly needs four steps :

- Establish hierarchical structure scheme;
- Construct every layer that fully used in judgment matrix;
- Hierarchical single arrangement and consistency test;
- Hierarchical total arrangement and consistency test;
- Following contents respectively state each step detailed process.

Hierarchical structure

AHP solved problems are required to be hierarchic, orderly and logic. Only then it can construct hierarchical scheme. Let tedious problems' elements to form into multiple hierarchies according to its attributes, membership and its relations. Last hierarchical element plays a dominate role in next hierarchical relative elements. In general, these hierarchies can be divided into 3 types:

(1) Top layer: Only one element in this hierarchy, it normally is final target of analytic problems. The layer is also called target hierarchy.

(2) Middle layer: In this hierarchy, it includes intermediate links that get involved to fulfill targets, which can be composed of some hierarchies that include multiple and multilayer criterions that required to consider. It can also be called criterion hierarchy.

(3) The bottom layer: This hierarchy includes optional each method and way to fulfill targets. It can also be called measure hierarchy or scheme hierarchy.

Hierarchy numbers in hierarchical structure have something to do with problem's complicated degree as well as analysis detailed requirements, normally the hierarchy numbers are not limited, each element in every hierarchy governs less than 9 elements. Hierarchical structure is as Figure 1.
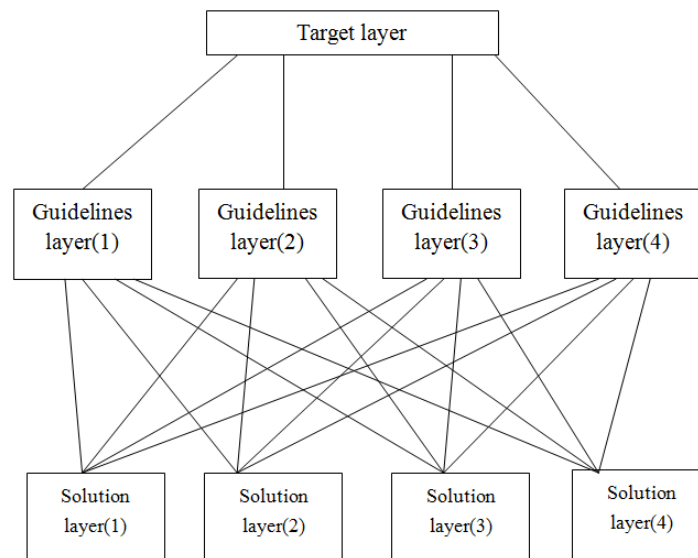

Figure 1 : Hierarchical structure chart

In Figure 1,layer 1 is target layer that is the purpose which is required to finally fulfill for researching problems, layer 2 is criterion layer that is the medium process that researching problems go

through,layer 3 is scheme layer that is each kind of referencing schemes. In general, layer one is one factor, layer two and layer three have multiple factors and quantity is not fixed.

Judgment matrix construction

Each layer structure can show factors relationships, but in middle layer, each factor occupied proportion in target evaluation basically will not be fully the same, in the heart of evaluators, each factor has certain proportions.

When define each factor proportion that is to compare n pieces of factors $X = \{x_1, \cdots, x_n\}$ to factor Z impacts. *Saaty* and others proposed to carry out paired comparison among factors, and constructed comparison matrix method. That is to say, it selects two factors x_i and x_j every time,uses a_{ij} to express x_i and x_j to Z impacts ratios, all comparison is using matrix $A = (a_{ij})_{n \times n}$ to express, A has become judgment matrix between $Z - X$. From matrix, it is clear that if x_i and x_j to Z impact ratio is a_{ij}, then x_j and x_i to Z impact ratio is $a_{ji} = \dfrac{1}{a_{ij}}$.

According to linear algebra theoretical knowledge, if matrix $A = (a_{ij})_{n \times n}$ meets $a_{ij} > 0$ and $a_{ji} = \dfrac{1}{a_{ij}} (i, j = 1,2,\cdots,n)$,then matrix A is positive reciprocal matrix.

a_{ij} Value determination can accord scale table, contents are as following TABLE 1:

TABLE 1: Scale table

Scale	Definition
1	Indicates two factors have equal importance by comparing
3	Indicates the former is slightly more important than the later by comparing two factors
5	Indicates the former is obviously more important than the later by comparing two factors
7	Indicates the former is intensely more important than the later by comparing two factors
9	Indicates the former is extremely more important than the later by comparing two factors
2,4,6,8	Indicates middle level of above judgment
Reciprocal	If importance ratio between i and j is a_{ij} ,then importance ratio between j and i is $a_{ji} = \dfrac{1}{a_{ij}}$.

Consistency test

Matrix A corresponding maximum feature value $\lambda_{\max}$ feature vector W, it is the priority weight of same hierarchy corresponding elements relative importance to last hierarchy some element through normalization, the process is called hierarchical single arrangement. Though the process can reduce other factors interference, it is hard to avoid appearing inconsistency to some extent when integrate all comparison results. If comparison results are consistent, then A factor should also meet:

$$a_{ij}a_{jk} = a_{ik}, \forall i, j, k = 1,2,\cdots,n \tag{1}$$

The positive reciprocal matrix that meets above formula is called consistent matrix. To easy define A can be accepted or not, it should test A inconsistency is very serious or not.
If A is consistent matrix, then
(1) A surely is positive reciprocal matrix.
(2) Transposed matrix A^T is consistent matrix.

(3) A matrix any two lines are in proportions, and factors are above 0, therefore $rank(A)=1$, so is the column.

(4) In A, $\lambda_{\max}=n$, n is A matrix order number. Other features roots of A is 0.

(5) $\lambda_{\max}$ corresponding feature vector $W=(w_1,\cdots,w_n)^T$, then $a_{ij}=\dfrac{w_i}{w_j}, \forall i,j=1,2,\cdots,n$, so:

$$A = \begin{bmatrix} \dfrac{w_1}{w_1} & \dfrac{w_1}{w_2} & \cdots & \dfrac{w_1}{w_n} \\ \dfrac{w_2}{w_1} & \dfrac{w_2}{w_2} & \cdots & \dfrac{w_2}{w_n} \\ \vdots & \vdots & \vdots & \vdots \\ \dfrac{w_n}{w_1} & \dfrac{w_n}{w_2} & \cdots & \dfrac{w_n}{w_n} \end{bmatrix} \qquad (2)$$

A is n order positive reciprocal matrix, when it is consistent matrix, when and only when $\lambda_{\max}=n$ as well as when A is inconsistent, it surely has $\lambda_{\max}>n$. Thereupon, use $\lambda_{\max}$ and n relationship to test whether A is consistent matrix or not.

A consistency test steps:
Calculate consistency indicator CI,

$$CI = \frac{\lambda_{\max}-n}{n-1} \qquad (3)$$

Consult corresponding average random consistency indicator RI. $Saaty$ researched RI value, RI value could refer to TABLE 2.

TABLE 2 : RI value

n	1	2	3	4	5	6	7	8	9
RI	0	0	0.58	0.90	1.12	1.24	1.32	1.41	1.45

RI Value is got in this way that randomly constructs 500 sample matrixes. Random select numbers from 1 to 9 as well as its reciprocals to construct positive reciprocal matrix, and determine average value of maximum feature root $\lambda'_{\max}$, and define:

$$RI = \frac{\lambda'_{\max}-n}{n-1} \qquad (4)$$

Solve consistency ratio CR

$$CR = \frac{CI}{RI} \qquad (5)$$

When $CR<0.10$, it is thought that A consistency is acceptable, otherwise it should make proper correction.

In the process, it also includes hierarchical total arrangement and consistency test, due to article lengths are limited, no theoretical statements here, directly apply it in the following.

CONSTRUCT BEST CREATIVE DEMO PLATFORM

The purpose of the model establishment is to look for best martial arts culture international communication creative demo platform. Therefore, target layer is best creative demo platform. Considering communication influential factors contain communicators' satisfaction, dissemination of the contents of rationality, audience satisfaction and effects spread, therefore criterion layer contains four elements. Martial arts program, martial arts sports events, martial arts film, and comprehensive martial arts forum four schemes. Hierarchical structure chart is as Figure 2.
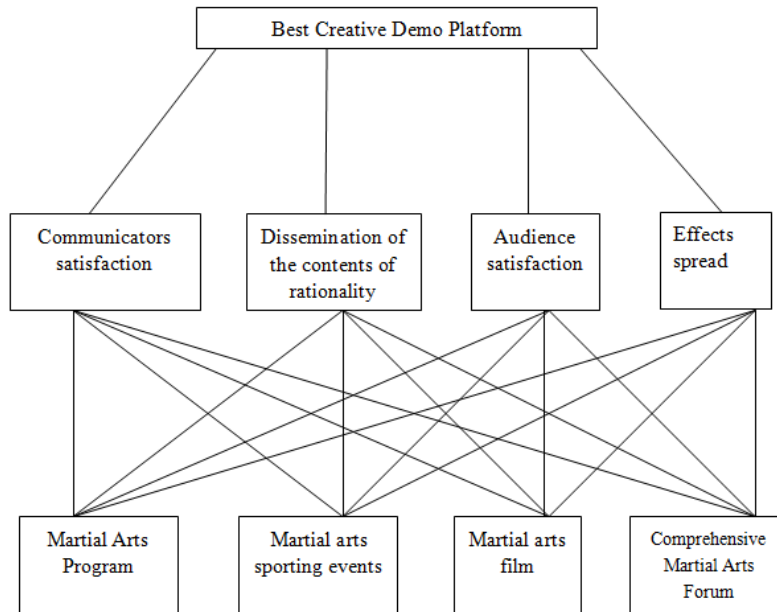

Figure 2 : Hierarchical structure of the best creative platform

Judgment matrix construction

Construct judgment matrix firstly needs to define criterion layer four factors' importance and makes comparison. Due to the paper researched martial arts culture communication among international, select investigation objects from all countries in the world is not realistic, so we select overseas students that just come to China as investigation objects, take investigation result as evidence to construct judgment matrix. Sample twenty overseas students that just come to China and twenty universities martial arts educators, ask them to estimate on communicators' satisfaction, dissemination of the contents of rationality, audience satisfaction and effects spread these four importance, result is as TABLE 3 shows.

TABLE 3: Four factors importance comparison

	Percentage (%)	Rank
Effects spread	49.2	1
Audience satisfaction	27.6	2
Dissemination of the contents of rationality	18.4	3
Communicators' satisfaction	6.2	4

According to TABLE 3 data, we establish target layer paired comparison matrix as TABLE 4 shows.

TABLE 4 : Target layer paired comparison matrix

A	B_1	B_2	B_3	B_4
B_1	1	1/2	1/3	1/4
B_2	2	1	1/2	1/3
B_3	3	2	1	1/2
B_4	4	3	2	1

And then, establish criterion layer paired matrix, contents are as TABLE 5-8.

TABLE 5: Criterion layer paired matrix one

B_1	P_1	P_2	P_3	P_4
P_1	1	1/5	1/3	1/2
P_2	5	1	3	4
P_3	3	1/3	1	2
P_4	2	1/4	1/2	1

TABLE 6: Criterion layer paired matrix two

B_2	P_1	P_2	P_3	P_4
P_1	1	1/2	1/3	2
P_2	2	1	1/3	3
P_3	3	2	1	4
P_4	1/2	1/3	1/4	1

TABLE 7: Criterion layer paired matrix three

B_3	P_1	P_2	P_3	P_4
P_1	1	4	1/2	2
P_2	1/4	1	1/5	1/3
P_3	2	5	1	3
P_4	1/2	3	1/3	1

TABLE 8: Criterion layer paired matrix four

B_4	P_1	P_2	P_3	P_4
P_1	1	4	1/3	1/2
P_2	1/4	1	1/6	1/5
P_3	3	6	1	2
P_4	2	5	1/2	1

Computed result

The model involved algorithm can be implemented by *Matlab* software program; therefore it can get computed result as TABLE 9.

TABLE 9 : Hierarchical total arrangement

	Criterion	Communicators' satisfaction	Dissemination of the contents of rationality	Audience satisfaction	Effects spread	Total arrangement weight
	Criterion weight	**0.0954**	**0.1601**	**0.2772**	**0.4673**	
Scheme layer single arrangement	Martial arts program	0.0838	0.1639	0.2844	0.1759	0.067543
	Martial arts sports events	0.5462	0.2631	0.0729	0.0591	0.150702
	Martial arts film	0.2323	0.4756	0.4729	0.4762	0.45932
	Comprehensive martial arts forum	0.1377	0.0975	0.1699	0.2888	0.324259

From TABLE 9, we can see that best creative platform is martial arts film. In order to more intuitional show computed result, we draw pie chart as Figure 3.
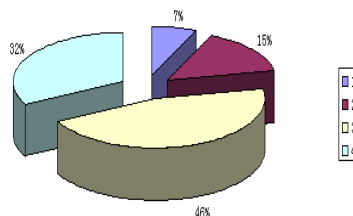

Figure 3 : Results of the analysis the best creative platform

CONCLUSION

The paper applies analytic hierarchy process into martial arts culture international communication best creative demo platform construction research problems, research result shows that martial arts film is best creative platform; the result conforms to practical situation. In international communication process, martial arts film suffers relative small obstacle degree of language; martial arts film contains many plots that are easier to arouse people enthusiasm on Chinese martial arts. In the aspect of martial arts film, China emerged more martial arts stars; they have certain popularity in international that plays positive roles in Chinese martial arts communication.

Analytic hierarchy process mainly contains two steps, firstly it needs to abstract practical problems that need to be solved into hierarchical structures with certain logic relations, then make qualitative comparison of problems so that define concrete parameters. When go ahead with step two, during process of converting from qualitative relation to quantitative relation, human interference components are bigger, mostly people will carry on estimation by experiences, so result accuracy will suffer certain impacts.

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