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## Game analysis and research on school education wushu inheritance system under cultural power target

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### ABSTRACT

Since China has entered into modernization construction, due to emphasis has been put on developing economy, it caused Chinese traditional Wushu culture to being ignored, in order to protect Chinese cultural property, the paper firstly finds out main inheritance system of each kind of factors when considering during inheriting traditional Wushu culture by establishing analytic hierarchy process model. Then according to game analysis and evolved game analysis, it solves government, school, folk and media companies' best strategy in traditional Wushu cultural inheritance problem should be government positive supports school and gym inheritance on Wushu, speed up folk inheritance normalization, and control media companies to let them to make contributions to inherit traditional Wushu culture.

### KEYWORDS

AHP; Game theory; School sports; Cultural power; Inheritance system; Judgment matrix.



## INTRODUCTION

China is a country of abundant cultural background, Wushu as China’s quintessence; it even gets highest attentions and affections of whole world. Chinese and foreign countries personnel such crazy love in Chinese Wushu culture is originated from its colorful and mysterious feelings. But since China has entered into modernization construction, due to emphasis has been put on developing economy, it caused Chinese traditional Wushu culture to being ignored, groups that loved Wushu in domestics are decreasing, which lets lots of secret Wushu skills that brought down from families to be gradually lost, cultural treasure to be rapidly run off. Therefore, the paper targeted at this phenomenon, it carries on analysis and researches on cultural power target’s Chinese school Wushu inheritance system.

## MODEL ESTABLISHMENTS

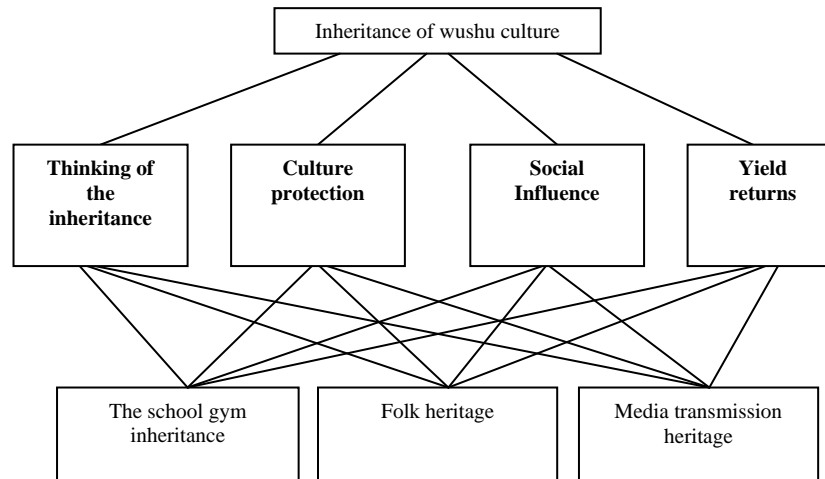
### Establish hierarchical structure

In order to analyze China’s traditional Wushu cultural inheritance pattern, firstly it should find out traditional Wushu cultural inheritance main paths, and look for most influential unit, therefore the paper firstly makes quantization on traditional Wushu cultural inheritance based on analytic hierarchy process. Establish target layer, criterion layer and scheme layer relations.

Target layer: Inheritance of Wushu culture.

Criterion layer: Scheme layer influence factors,  $a_1$  is thinking of the inheritance,  $a_2$  is culture protection,  $a_3$  is social influence,  $a_4$  is yield returns.

Scheme layer:  $b_1$  is the school gym inheritance,  $b_2$  is folk heritage,  $b_3$  is media transmission heritage, and get hierarchical structure as Figure 1 shows.



**Figure 1 : Hierarchical structure**

### Construct judgment matrix

**TABLE 1 : Comparison matrix G**

G	$a_1$	$a_2$	$a_3$	$a_4$
$a_1$	1	1/4	4	5
$a_2$	4	1	7	4

$a_3$	1/4	1/7	1	1
$a_4$	1/5	1/4	1	1

**TABLE 2 : Comparison matrix  $a_1$**

$a_1$	$b_1$	$b_2$	$b_3$
$b_1$	1	1	1/3
$b_2$	1	1	1/4
$b_3$	3	4	1

**TABLE 3 : Comparison matrix  $a_2$**

$a_2$	$b_1$	$b_2$	$b_3$
$b_1$	1	4	4
$b_2$	1/4	1	3
$b_3$	1/4	1/3	1

**TABLE 4 : Comparison matrix  $a_3$**

$a_3$	$b_1$	$b_2$	$b_3$
$b_1$	1	5	6
$b_2$	1/5	1	5
$b_3$	1/6	1/5	1

**TABLE 5 : Comparison matrix  $a_4$**

$a_4$	$b_1$	$b_2$	$b_3$
$b_1$	1	4	5
$b_2$	1/4	1	3
$b_3$	1/5	1/3	1

According to lots of experts experiences and referencing lots of documents as well as 1~9 scale setting, it gets paired comparison matrix that is judgment matrix as TABLE 1-5.

**Consistency test**

Use consistency indicator test formula as:  $CI = \frac{\lambda_{\max} - n}{n - 1}$ . From which  $\lambda_{\max}$  is maximum feature root value of comparison matrix,  $n$  is comparison matrix order. It is clear that judgment matrix and  $CI$  value are in inverse proportion.

$$C = \begin{Bmatrix} 1 & 1/4 & 4 & 5 \\ 4 & 1 & 7 & 4 \\ 1/4 & 1/7 & 1 & 1 \\ 1/5 & 1/4 & 1 & 1 \end{Bmatrix} \xrightarrow{\text{normalization}} \begin{Bmatrix} 0.3628 \\ 0.3002 \\ 0.2045 \\ 0.1325 \end{Bmatrix} = Y^{(0)}$$

$$\lambda_{\max}^{(0)} = \frac{1}{4} \left( \frac{3.744}{0.3628} + \frac{2.656}{0.3002} + \frac{1.463}{0.2045} + \frac{1.338}{0.1325} \right) = 5.10, \quad u^{(0)} = \begin{pmatrix} 0.407 \\ 0.289 \\ 0.159 \\ 0.145 \end{pmatrix}$$

$$CY^{(0)} = \begin{Bmatrix} 1 & 1/4 & 4 & 5 \\ 4 & 1 & 7 & 4 \\ 1/4 & 1/7 & 1 & 1 \\ 1/5 & 1/4 & 1 & 1 \end{Bmatrix} \begin{Bmatrix} 0.3628 \\ 0.3002 \\ 0.2045 \\ 0.1325 \end{Bmatrix} = \begin{Bmatrix} 3.744 \\ 2.656 \\ 1.463 \\ 1.338 \end{Bmatrix}$$

Judgment matrix is:

$$C_1 = \begin{Bmatrix} 1 & 1 & 1/3 \\ 1 & 1 & 1/4 \\ 3 & 4 & 1 \end{Bmatrix}, C_2 = \begin{Bmatrix} 1 & 4 & 4 \\ 1/4 & 1 & 3 \\ 1/4 & 1/3 & 1 \end{Bmatrix}, C_3 = \begin{Bmatrix} 1 & 5 & 6 \\ 1/5 & 1 & 5 \\ 1/6 & 1/5 & 1 \end{Bmatrix}, C_4 = \begin{Bmatrix} 1 & 4 & 5 \\ 1/4 & 1 & 3 \\ 1/5 & 1/3 & 1 \end{Bmatrix}$$

Corresponding maximum feature value and feature vector are in order as:

$$\lambda_{\max}^{(1)} = 4.49, y^{(1)}_1 = \begin{Bmatrix} 0.257 \\ 0.257 \\ 0.514 \end{Bmatrix}, \lambda_{\max}^{(2)} = 3.51, y^{(1)}_2 = \begin{Bmatrix} 0.650 \\ 0.286 \\ 0.056 \end{Bmatrix}$$

$$\lambda_{\max}^{(3)} = 3.22, y^{(1)}_3 = \begin{Bmatrix} 0.637 \\ 0.221 \\ 0.138 \end{Bmatrix}, \lambda_{\max}^{(4)} = 3.62, y^{(1)}_4 = \begin{Bmatrix} 0.642 \\ 0.254 \\ 0.154 \end{Bmatrix}$$

According to  $CI = \frac{\lambda_{\max} - n}{n - 1}$ , it gets  $RI$  value that can refer to TABLE 6.

TABLE 6 : RI value

n	1	2	3	4	5	6	7	8	9	10	11
RI	0	0	0.58	0.90	1.12	1.24	1.32	1.41	1.45	1.49	1.51

For judgment matrix  $C$ ,  $\lambda_{\max}^{(0)} = 4.49, RI = 1.02$

$$RI = \frac{4.49 - 4}{4 - 1} = 0.016, CR = \frac{CI}{RI} = \frac{0.016}{1.12} = 0.014 < 0.1$$

It represents  $C$  inconsistency extent is within permissible range, now it can use  $C$  feature vector to replace weight vector.

Similarly, to judgment matrix  $C_1, C_2, C_3, C_4$ , utilize above principle, all pass consistency test. Therefore target layer to scheme layer computational result can refer to Figure 2. Calculation structure is as following:

$$y^{(1)} = (y_1^{(1)}, y_2^{(1)}, y_3^{(1)}, y_4^{(1)}) = \begin{Bmatrix} 0.257 & 0.650 & 0.637 & 0.642 \\ 0.257 & 0.286 & 0.221 & 0.254 \\ 0.514 & 0.056 & 0.138 & 0.154 \end{Bmatrix}$$

$$y = y^{(1)}y^{(0)}$$

$$= \begin{Bmatrix} 0.257 & 0.650 & 0.637 & 0.642 \\ 0.257 & 0.286 & 0.221 & 0.254 \\ 0.514 & 0.056 & 0.138 & 0.154 \end{Bmatrix} \begin{Bmatrix} 0.407 \\ 0.289 \\ 0.159 \\ 0.145 \end{Bmatrix} = \begin{Bmatrix} 0.362 \\ 0.422 \\ 0.216 \end{Bmatrix}$$

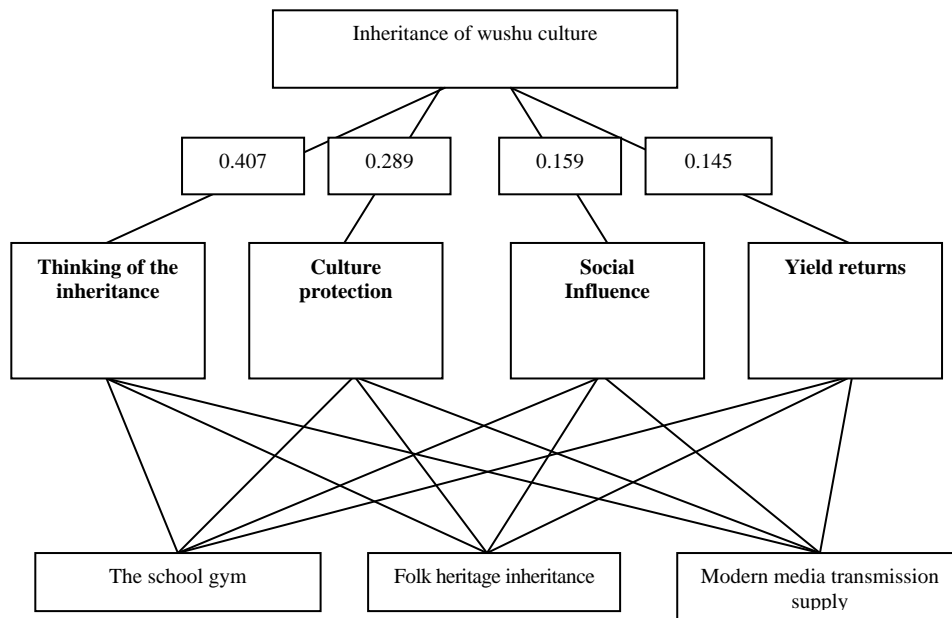


Figure 2 : Target layer to Scheme layer calculation result

**Traditional Wushu culture inheritance system game analysis**

By above analytic hierarchy process, it is clear that in the aspect of traditional Wushu inheritance, it should take the school gym inheritance and folk heritage as subjects. And media companies' transmission is mostly with purposes of profit-making. So in order to improve such kind of inheritance system, it needs government support and monitoring. In the following, according to game analysis, it can roughly regard government and media companies as game main parts, its implemented strategies are two types, government strategy is regulate and control as well as don't regulate and control. Set that in case government regulates and controls inheritance and mass media do not inherit, government profit is  $d_1$ , media companies' profit is 0 ;on the contrary media makes transmission while government don't regulate and control, enterprises profit is  $d_1'$ , government profit is  $d_2$ , causes is though government don't play regulating and controlling role, media companies transmission is beneficial to

traditional Wushu protection. When both government and media companies are with positive attitudes, government earnings is  $d$ , media companies' earnings is  $d'$ ; If both government and media companies are not positive, then the two earnings are 0. TABLE 7 is government and modern media companies' transmission earnings matrix.

**TABLE 7: Government and modern media companies' transmission earnings matrix**

		Modern media companies	
		Inherit	Don't inherit
Government	Regulate and control	$d, d'$	$d_1, 0$
	Don't regulate and control	$d_2, d'_1$	$0, 0$

Among them,  $d > d_1 > d_2$ , but size of  $d', d'_1$  cannot define, therefore the paper will adopt evolution game analysis to analyze government and modern media companies practical status of traditional Wushu cultural inheritance, and make respectively strategies adjustment.

**Traditional Wushu cultural inheritance evolution game analysis**

Set  $t$  instant sum total of number of members that select  $S_i$  should equal to probability product when group members sum total and members select strategy  $S_i$ , that:

$$v_i(t) = v(t)x_i(t)$$

Set group's members only survive a while, and then every member's remained descendants amount is up to respective adaptability. Then, select  $S_i$  strategy members sum total in the instant of  $t + 1$  is:

$$v_i(t + 1) = v_i(t) \left[ \sum_{j=1}^n a_{ij} x_j(t) \right]_{(i=1,2,\dots,n)}$$

$$x_i(t + 1) = \frac{v_i(t + 1)}{v(t + 1)} = \frac{x_i(t)v(t) \left[ \sum_{j=1}^n a_{ij} x_j(t) \right]}{\sum_{u=1}^n x_u(t)v(t) \left[ \sum_{j=1}^n a_{uj} x_j(t) \right]}$$

It can get:

$$\frac{\Delta x_i(t)}{x_i(t)} = \frac{x_i(t + 1) - x_i(t)}{x_i(t)} = \frac{\sum_{j=1}^n a_{ij} x_j(t) - x(t)Ax(t)}{x(t)Ax(t)}$$

By above formula, it is clear that random strategy  $S_i$  probability changing rate is equal to  $S_i$  fitness  $\sum_{j=1}^n a_{ij} x_j(t)$  and whole strategies fitness  $x(t)Ax(t)$  differences, from which

$$x(t)Ax(t) = \sum_{u=1}^n x_u(t)v(t) \left[ \sum_{j=1}^n a_{uj}x_j(t) \right].$$

If set  $t$  as continuous time parameters, let  $\theta \in (0, 1]$  represents  $t$  every time phase duration, then:

$$\begin{aligned} \frac{\dot{x}_i(t)}{x_i(t)} &= \frac{1}{x_i(t)} \lim_{\theta \rightarrow 0} \frac{x_i(t+\theta) - x_i(t)}{\theta} \\ &= \sum_{j=1}^n a_{ij}x_j(t) - x(t)Ax(t), \quad t \geq 0, \quad (i = 1, 2, \dots, n) \end{aligned}$$

In above formula, when  $x_i(t) \neq 0$ ,  $x_i(t) = 0$ , it represents group members select  $S_i$  strategy probability is 0, therefore write above formula into:

$$\dot{x}_i(t) = x_i(t) \left[ \sum_{j=1}^n a_{ij}x_j(t) - x(t)Ax(t) \right], \quad t \geq 0, \quad (i = 1, 2, \dots, n)$$

Due to government and modern media companies' strategies positive and non-positive selection in traditional Wushu cultural inheritance is independent and random, and can carry on repeated games. Therefore, set government regulating and controlling media transmission probability as  $F$ , non-regulating and controlling probability as  $1 - F$ ; media inheritance probability is  $Q$ , probability that don't inherit is  $1 - Q$ . According to Malthusian theorem, it is clear that government strategies regulating

and controlling times selection growth rate should be differences between  $\frac{\dot{F}}{F}$  fitness  $E_w P \{f, 1 - Q\}^T$  and average fitness  $\{F, 1 - F\} P \{Q, 1 - Q\}^T \cdot E_w = [1, 0]$ , when government supporting probability is 1, its earnings matrix is

$$P = \begin{bmatrix} d & d_1 \\ d_2 & 0 \end{bmatrix}$$

Simplify  $\dot{F} = F(1 - F) \{1, -1\} P \{Q, 1 - Q\}^T$  and get:

$$\dot{F} = F(1 - F) [(d - d_1 - d_2)Q + d_1]$$

Similarly, media strategies inheritance times' selection growth rate should be differences between  $\frac{\dot{Q}}{Q}$  fitness  $E_j q \{Q, 1 - Q\}^T$  and average fitness  $\{Q, 1 - Q\} q \{F, 1 - F\}^T \cdot E_j = [0, 1]$ , When media inheritance probability is 1, its earnings matrix is:

$$q = \begin{bmatrix} d' & 0 \\ d_1' & 0 \end{bmatrix}$$

Simplify  $\dot{Q} = Q(1 - Q) \{-1, 1\} q \{t, 1 - Q\}^T$  and get:

$$\dot{Q} = Q(1 - Q)[d_1' + (d' - d_1')F]$$

Therefore when  $\dot{F} = 0, \dot{Q} = 0$ , (0,0), (0,1), (1,0), (1,1) are balance points of traditional Wushu cultural inheritance. According to matrix stability, analyze these balance points partial stability, solve partial derivatives of  $\dot{F}$  to  $F$ , and partial derivatives of  $\dot{Q}$  to  $Q$ , matrix is Among them:

$$A = \begin{bmatrix} \partial \dot{F} / \partial F & \partial \dot{F} / \partial Q \\ \partial \dot{Q} / \partial F & \partial \dot{Q} / \partial Q \end{bmatrix} = \begin{bmatrix} (1 - 2F)[(d - d_1 - d_2)Q + d_1] & F(1 - F)(d - d_1 - d_2) \\ Q(1 - Q)(d' - d_1') & (1 - 2Q)F \end{bmatrix}$$

$$trA = (1 - 2F)[(d - d_1 - d_2)Q + d_1] + (1 - 2Q)[d_1' + (d' - d_1')F]$$

$$\det A = (1 - 2F)(1 - 2Q)[(d - d_1 - d_2)Q + d_1][d_1' + (d' - d_1')F] - FQ(1 - F)(1 - Q)(d - d_1 - d_2)(d' - d_1')$$

TABLE 8 is balance point partial stability.

**TABLE 8 : Balance point partial stability**

Balance point (F, Q)	det A		trA		Stability
(0,0)	$d_1 \cdot d_1'$	+	$d_1 + d_1'$	+	unstable point
(0,1)	$-(d - d_2) \cdot d_1'$	-	$d - d_2 - d_1'$	Unknown	Saddle point
(1,0)	$-d_1 \cdot d'$	-	$d' - d_1$	Unknown	Saddle point
(1,1)	$(d - d_2) \cdot d'$	+	$-(d - d_2 + d')$	-	Stable point

By above TABLE 8, it is clear (0,0) point is unstable point, (0,1) and (1,0) is saddle points, evolution stable point is(1,1). Therefore traditional Wushu cultural inheritance best strategy should be government positive supports school and gym inheritance on Wushu, speed up folk inheritance normalization, and control media companies to let them to make contributions to inherit traditional Wushu culture.

### CONCLUSION

By establishing analytic hierarchy process, the paper solves traditional Wushu cultural inheritance folk, school gym and media companies respective occupied proportions are 0.362、0.422 and 0.216 when consider thinking inheritance, cultural protection, social influences and yield returns and other influence factors during inheriting traditional Wushu culture. Then according to game analysis and evolved game analysis, it solves government, school, folk and media companies' best strategy in traditional Wushu cultural inheritance problem should be government positive supports school and gym inheritance on Wushu, speed up folk inheritance normalization, and control media companies to let them to make contributions to inherit traditional Wushu culture.

### REFERENCES



- [1] Lu Xu-tao, Hong Hao; Survival and Development of National Traditional Sports Major under the Background of Globalization. *Journal of Chengdu Physical Education Institute*, **37(9)**, (2011).
- [2] Zhao Jin; On the Modernization Dispute of National Traditional Sports. *Sports Sciences Researches*, **15(3)**, 14-17 (2011).
- [3] Ye Xiang-wen; The Cultural Ecological Perspective of Heritage of National Traditional Sports. *Bulletin of Sport Science & Technology*, **19(1)**, 112-113, 125 (2011).
- [4] Zhao Jin, Wang Jian; Exploration of the way to the inheritance and development of traditional national sports. *Journal of Physical Education*, **16(8)**, (2009).
- [5] Li Rongzhi, Yu Chonggan; Sports Globalization and Descent of China Traditional Sports. *Sports Culture Guide*, **4**, 84-86 (2007).
- [6] Chen Lixin; The Research Status and Prospects of Sport Globalization at Home and Abroad. *Sports & Science*, **30(4)**, (2009).
- [7] Guo Li; Studies of the Ways of Inheriting and Passing on of the Ethnic Traditional Sports in China. *Journal of Southwest China Normal University (Natural Science)*, **33(6)**, (2008).
- [8] Hu Yonggang; Cultural Confusion and Coping Mechanism of Martial Arts in Context of Globalization. *Journal of Shenyang Sport University*, **28(4)**, 110-113, 128 (2009).
- [9] Wang Gang; Concerns of National Traditional Sports: Current Status, Problems and Reflections. *Journal of Capital College of Physical Education*, **20(2)**, 1-4 (2008).