

## REASONABLY SELECTING THE WILL FOR ENTERING UNIVERSITY

Guoliang Zhao, Nan Tan  
Tianjin Normal College  
Tianjin, The People's Republic of China

### ABSTRACT

How to choose the colleges reasonably is a question worthy of discussion. In this article, using Analytic Hierarchy Process, developed by Professor T. L. Saaty, we try to combine the scaling method with the scoring method to present a table of marking for choosing colleges will give marks, so that, they can get a total marks,  $S$ , of each college (dep.). In order of  $S$ , marks can rate the colleges for which the examinees want to enter.

#### 1. AHP MODEL AND ITS DESCRIPTION

A rational choice of colleges concerns many factors, for which the following three specific aims can be drawn,

A. Levels of colleges, universities, departments, and majors.

B. Examinees' aspiration and interest.

C. Possibility to be accepted

The aims are divided into 9 rules, and the latter are again subdivided into 18 targets. The meanings of these targets are as follows,

- (1). Prestige and international and domestic exchange of colleges or departments -- denoting their effects, numbers and forms of various scholastic exchange at home and abroad.
- (2). Geographic location denoting the place and environment of a college or university.
- (3). Developing trend denoting the developing prospect of colleges, universities or majors.
- (4). Examinees' psychological factor denoting examinees' impressions, feelings and other subjective judgements on the colleges and the majors which they will select.

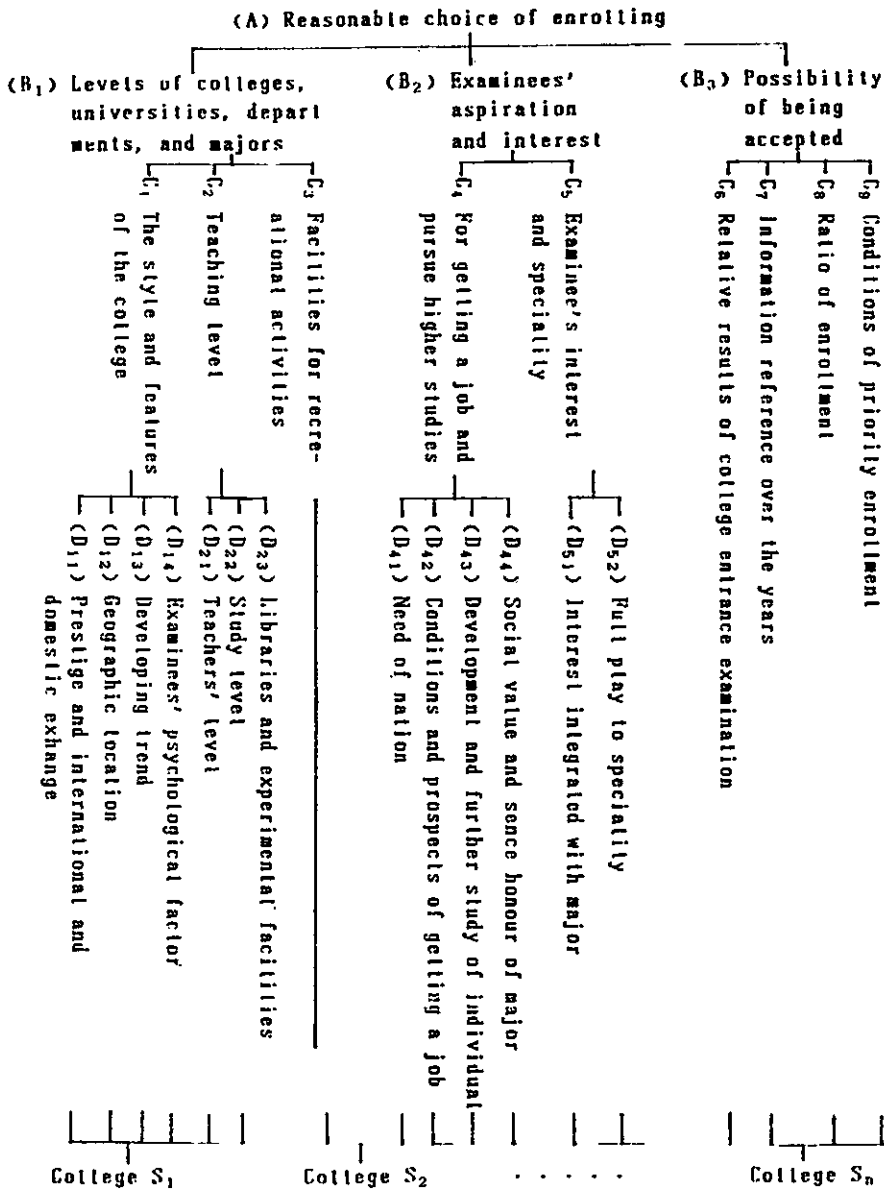


Figure 1. The model of choice of entering one's name for colleges by AHP

- (5) Teachers' level denoting the numbers of prominent professors and scholars as well as the professors, lecturers and assistants of colleges or departments and their capabilities
- (6). Study level denoting the level of college, the research institutions, the quality and quantity of achievements in scientific research, and the research levels of teachers and students.
- (7). Libraries and experimental facilities denoting the volume of books, the reading conditions of libraries and the experimental conditions and levels of laboratories, affiliated factories and farms.
- (8). Facilities for recreational activities - denoting the conditions of developing recreational activities and their relative levels of colleges and universities.
- (9). National needs - denoting the quantities and the degree of requirement of the majoring students in recent years and for a long time.
- (10) Conditions and prospects for getting a job - denoting the direction and condition for getting a job after graduation.
- (11) Development and further training for oneself - whether the selected majors providing oneself with favourable conditions for further development and study or not.
- (12) Sense of honour and social value of a major - denoting the social value, created by the major and its respectability by the society.
- (13) Integration of interest and major - denoting examinees' feelings and the degree of interest in the major they chose.
- (14) Giving full play to the speciality - denoting whether colleges or major is favourable or not to giving full play to examinees' special skill.
- (15) Relative results of college entrance examination denoting estimating lowest enrollment mark of a level to which examinees' results can reach, and comparing the results with the averaged marks enrolled by colleges or departments they chose.
- (16) Information reference over the year denoting according to examinees' position in the simulation examination before college entrance examination and the information of the analogues examinees' in the Alma Mater over recent two years, deciding the competition ability of their own.
- (17) Rate of enrollment denoting the proportion of the numbers of the students

planned to enroll colleges and majors to the numbers of students estimated to take the entrance examination.

- (18) Conditions of priority enrollment denoting the conditions which govern stipulates for reducing enrollment marks during that and the priority care conditions which colleges (depts) decided and control by themselves (within the limits permitted by nation policy).

## 2. PAIRWISE COMPARISON AND CALCULATIONS OF NUMERICAL VALUE

By analysing a large number of examples and summarizing the opinions of many experienced directors in choosing colleges, we use Scattling method 1-9 to give the judging matrices which Class A, B and C are corresponding to certain element in the previous class respectively. Among those ones, Matrix A-B can become another three matrices A-B', A-B'' and A-B''' to fit all kinds of examinees according to three examinees' ability strong, medium or weak. Then we count the important numerical value of every element to the element in preceding class, and check its consistency. In details, see the following diagrams.

Table 1. judgement matrix A-B'

A	B <sub>1</sub>	B <sub>2</sub>	B <sub>3</sub>	W(A, B <sub>i</sub> )
B <sub>1</sub>	1	3	1/3	0.2583
B <sub>2</sub>	1/3	1	1/5	0.1074
B <sub>3</sub>	3	5	1	0.6370

$$\lambda_{\max}=3.040 \quad CI=0.0193$$

$$RI=0.58 \quad CR=0.0332$$

Table 2. judgement matrix A-B''

A	B <sub>1</sub>	B <sub>2</sub>	B <sub>3</sub>	W(A, B <sub>i</sub> )
B <sub>1</sub>	1	3	1/3	0.2426
B <sub>2</sub>	1/3	1	1/7	0.0879
B <sub>3</sub>	3	7	1	0.6695

$$\lambda_{\max}=3.0070 \quad CI=0.0035$$

$$RI=0.58 \quad CR=0.0060$$

Table 3. judgement matrix A-B'''

A	B <sub>1</sub>	B <sub>2</sub>	B <sub>3</sub>	W(A, B <sub>i</sub> )
B <sub>1</sub>	1	3	7	0.6695
B <sub>2</sub>	1/3	1	3	0.2426
B <sub>3</sub>	1/7	1/3	1	0.0879

$$\lambda_{\max}=3.0070 \quad CI=0.0035$$

$$RI=0.58 \quad CR=0.0060$$

Table 4. judgement matrix B<sub>1</sub>-C

B <sub>1</sub>	C <sub>1</sub>	C <sub>2</sub>	C <sub>3</sub>	C <sub>4</sub>	W(B <sub>1</sub> , C <sub>i</sub> )
C <sub>1</sub>	1	1/2	3	1/3	0.1618
C <sub>2</sub>	2	1	7	1	0.3715
C <sub>3</sub>	1/3	1/7	1	1/7	0.0550
C <sub>4</sub>	3	1	7	1	0.4118

$$\lambda_{\max}=4.0145 \quad CI=0.0052$$

$$RI=0.90 \quad CR=0.0058$$

Table 5. judgement matrix B<sub>2</sub>-C

B <sub>2</sub>	C <sub>4</sub>	C <sub>5</sub>	W(B <sub>2</sub> , C <sub>i</sub> )
C <sub>4</sub>	1	1/3	0.2500
C <sub>5</sub>	3	1	0.7500

Table 6. judgement matrix B<sub>3</sub>-C

B <sub>3</sub>	C <sub>6</sub>	C <sub>7</sub>	C <sub>8</sub>	C <sub>9</sub>	W(B <sub>3</sub> , C <sub>i</sub> )
C <sub>6</sub>	1	7	2	3	0.5089
C <sub>7</sub>	1/7	1	1/3	1/3	0.0706
C <sub>8</sub>	1/2	3	1	1	0.2208
C <sub>9</sub>	1/3	3	1	1	0.1997

$\lambda_{max}$  4.0157      CI 0.0052  
RI 0.90              CR 0.0058

Table 7. judgement matrix C<sub>1</sub>-D

C <sub>1</sub>	D <sub>11</sub>	D <sub>12</sub>	D <sub>13</sub>	D <sub>14</sub>	W(C <sub>1</sub> , D <sub>i,j</sub> )	W(B <sub>1</sub> , D <sub>i,j</sub> )	
D <sub>11</sub>	1	1/2	2	3	0.2696	0.0436	$\lambda_{max}$ -4.0593
D <sub>12</sub>	2	1	3	5	0.4768	0.0771	CI - 0.0198
D <sub>13</sub>	1/2	1/3	1	3	0.1740	0.0282	RI - 0.90
D <sub>14</sub>	1/3	1/5	1/3	1	0.0795	0.0129	CR - 0.0220

Table 8. judgement matrix C<sub>2</sub>-D

C <sub>2</sub>	D <sub>21</sub>	D <sub>22</sub>	D <sub>23</sub>	W(C <sub>2</sub> , D <sub>i,j</sub> )	W(B <sub>1</sub> , D <sub>i,j</sub> )	$\lambda_{max}$ -3.0054
D <sub>21</sub>	1	2	5	0.5700	0.2118	CI 0.0027
D <sub>22</sub>	1/2	1	3	0.3207	0.1191	RI 0.58
D <sub>23</sub>	1/5	1/3	1	0.1093	0.0406	CR - 0.0047

Table 9. judgement matrix C<sub>4</sub>-D

C <sub>4</sub>	D <sub>41</sub>	D <sub>42</sub>	D <sub>43</sub>	W(C <sub>4</sub> , D <sub>i,j</sub> )	W(B <sub>1</sub> , D <sub>i,j</sub> )	W(B <sub>2</sub> , D <sub>i,j</sub> )	$\lambda_{max}$ 4.0040
D <sub>41</sub>	1	1/2	1	0.2346	0.0966	0.0587	CI = 0.0014
D <sub>42</sub>	2	1	2	0.4408	0.1848	0.1122	RI 0.90
D <sub>43</sub>	1	1/2	1	0.2346	0.0966	0.0587	CR 0.0015
D <sub>44</sub>	1/3	1/5	1/3	0.0819	0.0337	0.0204	

Table 10. judgement matrix C<sub>5</sub>-D

C <sub>5</sub>	D <sub>51</sub>	D <sub>52</sub>	D <sub>53</sub>	W(C <sub>5</sub> , D <sub>i,j</sub> )	W(B <sub>2</sub> , D <sub>i,j</sub> )	$\lambda_{max}$ 3.0649
D <sub>51</sub>	1	1/7	1/5	0.0719	0.0539	CI 0.0324
D <sub>52</sub>	7	1	3	0.6491	0.4863	RI 0.58
D <sub>53</sub>	5	1/3	1	0.2790	0.2093	CR 0.0559

### 3. SETTING UP A SCORING TABLE AND ITS APPLICATION EXAMPLE

Since the number of the colleges (depts) which examinees want to enter is different. Even if to the same examinee when comparing the number of some colleges, we need to present a large number of judging matrices and need a great amount of calculations. Therefore, by means of integrating with scoring method, we decide the order of entering oneself for colleges. Concrete steps as follows,

- (1). Making the important significance numerical value,  $W(B-D_{i,j})$  of each index in Class D corresponding to each element in Class B enlarge 100 times.
- (2). In accordance with five circumstances, Bad, not bad, Good, Better and Best, every index in Class D,  $D_{i,j}$ , is designated as A, B, C, D, E, five grades. According to the ratio of 1:3:5:7:9, the mark values are granted respectively. Grade A has the mark value  $100w(B_{i,j}, D_{i,j})$ .
- (3). Examinees can score the mark values of colleges (depts) they want to enter and assign each index the value in the right place according to the conditions and environment of colleges (depts) and examinees.
- (4). Sum up the marks of the three diagrams separately and acquire the corresponding total marks of each college L, M, N.
- (5). Using the formula,  $V=LW_1 + MW_2 + NW_3$ , examinees can calculate the total marks values V of each college. Among others,  $W_1, W_2, W_3$  are the relative numerical values of  $B_1, B_2, B_3$  corresponding to the top Class A.
- (6). In order of V-values of each college (dep.), the highest value of V is the most ideal choice of entering oneself for college.

Table 11. Mark values for aspiration in connection with major

Index of each item	Degree and mark value					Marks, $W(D_{i,j})$ of colleges (Depts) intending to enter oneself for			
	A	B	C	D	E	$S_1$	$S_2$	...	$S_n$
$D_{4,1}$ , Need of nation	5.87	4.57	3.26	1.96	0.65				
$D_{4,2}$ , Conditions and prospects of getting a job	11.22	8.73	6.23	3.74	1.25				
$D_{4,3}$ , Development and further study of individual	5.87	4.57	3.26	1.96	0.65				
$D_{4,4}$ , social value and sense honour of major	7.43	5.78	4.13	2.48	0.83				
$D_{5,1}$ , Interest integrated with major	48.68	37.86	27.04	16.23	5.41				
$D_{5,2}$ , Full play to speciality	20.93	16.28	11.63	6.98	2.33				
Total marks N									

Table 12. Mark values for enrollment possibility

Index of each item	Degree and mark value					Marks, $W(D_{ij})$ of colleges (Depts) intending to enter oneself for			
	A	B	C	D	E	$S_1$	$S_2$	...	$S_n$
$D_{61}$ , Relative results of ( $C_6$ ) college entrance examination	50.89	39.58	28.27	16.96	5.65				
$D_{71}$ , Information reference over the years ( $C_7$ )	7.06	5.49	3.92	2.35	0.78				
$D_{81}$ , ( $C_8$ ) Ratio of enrollment	22.08	17.17	12.27	7.36	2.45				
$D_{91}$ , Condition for ( $C_9$ ) priority enrollment	19.97	15.53	11.09	6.66	2.22				
Total marks N									

Table 13. Mark value for colleges or departments (major) levels

Index of each item	Degree and mark value					Marks, $W(D_{ij})$ of colleges (Depts) intending to enter oneself for			
	A	B	C	D	E	$S_1$	$S_2$	...	$S_n$
$D_{11}$ , Prestige and international and domestic exchange	4.36	3.39	2.42	1.45	0.48				
$D_{12}$ , Geographic location	7.71	6.00	4.28	2.57	0.86				
$D_{13}$ , Developing trend	2.82	2.19	1.57	0.94	0.31				
$D_{14}$ , Examinees' psychological factor	1.29	1.00	0.72	0.43	0.14				
$D_{21}$ , Teachers' level	21.18	16.47	11.77	7.06	2.35				
$D_{22}$ , Study level	11.91	9.26	6.62	3.97	1.32				
$D_{23}$ , Libraries and experimental facilities	4.06	3.16	2.36	1.35	0.45				
$D_{31}$ , Facilities for ( $C_3$ ) recreational and sports activities	5.50	4.28	3.06	1.83	0.61				
$D_{41}$ , Needs of nation	9.66	7.51	5.37	3.22	1.07				
$D_{42}$ , Conditions and prospects for getting a job	18.48	14.37	10.27	6.16	2.05				
$D_{43}$ , Individual's development and further training	9.66	7.51	5.37	3.22	1.07				
$D_{44}$ , Sense of honour and social value of major	3.37	2.62	1.87	1.12	0.37				
Total marks L									

Example, So and so examinee estimates that his result of the entrance college examination is 40 marks higher than the lowest enrollment mark line of local key colleges, belonging to the medium level of that grade. He has 6 colleges (depts),  $E_1, E_2, E_3, E_4, E_5$  and  $E_6$ . Each item is scored as follows, (Cf. Table 14, Table 15, and Table 16. The examinee's important significance numerical value of  $B_1, B_2, B_3$  corresponding to A is  $W_1=0.2583, W_2=0.1047, W_3=0.6370$ . According to the formula  $V=L_1W_1+MW_2+NW_3$ , the  $V_s$  values every colleges have been calculated as follows,

$$V_1=91.85 \times 0.2583 + 74.44 \times 0.1047 + 24.88 \times 0.6370 = 47.37,$$

$$V_2=58.75, V_3=69.37, V_4=58.96, V_5=61.87, V_6=67.37$$

In order of the value  $V_s$ , we know that  $E_3$  is the most ideal college to enter and  $E_6$  is the second best. So  $E_3$  is the college that the examinee will choose.

Table 14.

	$D_{11}$	$D_{12}$	$D_{13}$	$D_{14}$	$D_{21}$	$D_{22}$	$D_{23}$	$D_{31}$	$D_{41}$	$D_{42}$	$D_{43}$	$D_{44}$	$L_i$
$E_1$	4.36	6.00	2.82	1.29	21.18	11.91	4.06	5.50	7.51	18.48	5.37	3.37	91.85
$E_2$	4.36	7.71	2.82	1.00	21.18	11.91	4.06	5.50	7.51	14.37	5.37	3.37	89.16
$E_3$	4.36	7.71	2.19	1.00	16.47	9.26	4.06	5.50	7.51	14.37	7.51	2.62	82.56
$E_4$	4.36	4.28	2.19	0.72	16.47	9.26	4.06	5.50	7.51	14.37	5.37	2.62	76.71
$E_5$	4.36	2.57	2.19	0.72	16.47	9.26	4.06	5.50	7.51	10.27	7.51	2.62	73.04
$E_6$	2.42	4.28	2.19	0.43	7.06	3.97	2.26	3.06	7.51	10.27	3.22	1.87	48.54

Table 15

	$D_{41}$	$D_{42}$	$D_{43}$	$D_{44}$	$D_{51}$	$D_{52}$	$M_i$
$E_1$	4.57	8.73	5.87	5.78	37.86	11.63	74.44
$E_2$	4.57	11.22	5.87	5.78	37.86	16.28	81.58
$E_3$	4.57	11.22	5.87	5.78	37.86	16.28	81.58
$E_4$	4.57	6.23	4.57	5.78	37.86	16.28	75.29
$E_5$	4.57	3.74	4.57	5.78	37.86	16.28	72.80
$E_6$	4.57	6.23	1.96	5.78	37.86	11.63	68.03

Table 16

	$D_{61}$	$D_{71}$	$D_{81}$	$D_{91}$	$N_i$
$E_1$	5.65	0.78	7.36	11.09	24.88
$E_2$	16.96	2.35	12.27	11.09	42.67
$E_3$	28.27	5.49	17.17	11.09	62.02
$E_4$	28.27	2.35	7.36	11.09	49.08
$E_5$	28.27	3.92	12.27	11.09	55.55
$E_6$	39.58	7.06	17.17	11.09	74.90

#### REFERENCE

- 1 Saaty, T.L. (1980) The Analytic Hierarchy Process, McGraw-Hill, Inc.
- 2 Xu, S.B. (1986) The Principle of Analytic Hierarchy Process, the Institute of Systems Engineering of Tianjin University.