



The Optimal Strategy of College Admissions Officers Admitting Students Based on TOPSIS

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Abstract

Based on TOPSIS method, this paper constructs a multi-index decision model to assist college admissions officers to evaluate applicants comprehensively, aiming to provide scientific and objective admission evaluation tools for overseas college admissions officers. By collecting quantitative data of 4 applicants in four dimensions: standardized score, activity experience, personality traits and school attended, an evaluation matrix was constructed, and their relative proximity was calculated and sorted. The results show that TOPSIS can effectively integrate subjective and objective factors and improve the rationality and fairness of admission decision. The final admission priority is: $X > W > H > L$. The universal conclusion of this study can provide quantitative assistance for college enrollment and reduce the workload of admissions officers.

Subject Areas

Sociology, Mathematics, Education Administration, Operational Research

Keywords

Multiple Index Decision Making, TOPSIS Method, University Enrollment, Applicant Evaluation, Study Abroad Admission Model

1. Research Background

With the acceleration of globalization and the deepening of the concept of “community of human destiny”, more and more students choose to apply for further study in overseas universities. The surge in applications has made it necessary for admissions officers to process a large number of applications in a short time, which not only increases the workload, but also increases the possibility of human error.

At present, most colleges and universities still adopt the subjective judgment of admissions officers, which is easily disturbed by experience, emotion and external environment, which reduces the scientificity and fairness of admission decision. At the same time, there have been many student-centered studies focusing on how to improve the admission probability or optimize the school selection decision, such as Perna (2006) [1] proposed that students are affected by many factors such as academic background and family conditions in the process of choosing schools; Chen Hailei (2021) [2] proposed that the main factors for international students to choose schools are geographical location, academic influence and scholarship; Xia Mengxue (2021) [3] found that the primary factor for international students motivation to choose schools is urban factor, followed by campus factor, school teaching factor and economic factor. However, from the perspective of admissions officers, there are relatively few studies to improve their decision-making efficiency and accuracy. In addition, the existing evaluation system generally focuses on “hard indicators” such as academic performance, and less considers students personality characteristics, activity background and comprehensive quality.

Therefore, this paper attempts to construct a multi-dimensional and quantifiable admission evaluation system from the perspective of admissions officers by quantifying applicants personality and school variables through questionnaire survey, and designs an objective and scientific auxiliary admission strategy with the help of TOPSIS model, hoping to make admissions officers make decisions more efficiently and fairly in the admission process, reduce their work pressure, and make the enrollment process of overseas colleges and universities more scientific and standardized.

2. Model Preparation

2.1. Object of Study

In order to ensure the scientificity of the analysis, this paper selects four students from the promotion guidance institution as the research object, and the specific information is in **Tables 1-3**.

Table 1. Basic information of applicants.

Object of study	Gender	School	Application direction
Student X	man	Hangzhou Foreign Language School Cambridge High School	engineering science
Student H	man	Hangzhou No. 14 Middle School International Department	sociology
Student L	girl	Hangzhou No. 14 Middle School International Department	engineering science
Student W	girl	Hangzhou Foreign Language School Headquarters	Comparative Literature

Table 2. Applicants academic and activity information.

Object of study	Academic performance	Experiences and achievements
Student X	3 AP 5, TOEFL 110, SAT 1540, GPA 4/4	Garage apprenticeship experience; Carbox Club project leader; music creation in hip-hop garage spirit
Student H	4 AP 5, TOEFL 110, SAT 1510, GPA 3.91/4	Founder and Leader of CHD Debate Platform; led and participated in 21 debates in 18 months with outstanding record
Student L	1 AP 5, TOEFL 108, SAT 1460, GPA 3.94/4	Deep cultivation of traditional embroidery skills and integration of art and engineering, inheritance of family skills; establishment of women's empowerment charity organization "Mutter Learning Camp"
Student W	2 AP 5, TOEFL 112, SAT 1590, GPA 92.73/100	RED social media blogger, digital map project leader and urban cultural research explorer

Table 3. Descriptive personality features of applicants (Basis for Scoring).

Object of study	Characteristics of personality
Student X	Persistence, passion, creativity and execution
Student H	Strong reflective and critical thinking skills, quick thinking, strong expression appeal
Student L	Confident and loyal to yourself
Student W	Sven introverted, emotional delicate

In addition, in order to objectively and accurately judge the matching degree between applicants personality and colleges, this paper uses questionnaire statistics to quantify the relevant data.

A total of 52 valid questionnaires were finally included in this study, and all respondents were educators in Hangzhou who are deeply engaged in admission evaluation work. To meet the core requirement of the "study on admission preferences from a multi-subject perspective", we systematically selected three types of key stakeholders:

20 university admission consultants (who have long been involved in university admission screening and can reflect the evaluation logic of academic-involvement comprehensive literacy for applicants from the university side);

15 senior high school teachers covering arts, sciences, and engineering disciplines (who can provide cognitive perspectives from the student source side);

17 college counseling teachers (who focus on the practice of matching individual student development with university needs).

The questionnaires were distributed through targeted distribution to Hangzhou's education industry communities via the "Wenjuanxing" (a professional online survey platform) and supplemented by collection through internal communication channels of 3 cooperative senior high schools. From the perspectives

of academic evaluation focus and attention tendency towards students' involvement, the sample distribution and opinion characteristics of the three groups align with the actual scenario of "different types of relevant personnel jointly influencing admission tendencies" in university admissions. Therefore, these respondents can effectively represent the stakeholder groups required for this study.

2.2. Description of Scoring Indicators and Data Processing

This paper quantifies the four dimensions of the four applicants. Personality traits and school attendance were quantified with reference to questionnaires.

1) Standardized results

In terms of standardized scores, the maximum value among the four students in the four aspects of AP, TOEFL, SAT and GPA is taken as 1, and the four scores are averaged and standardized to calculate the score.

This indicator is used to reflect students academic ability level, covering AP course scores, SAT scores, TOEFL scores and GPA.

In order to unify the dimension, the maximum normalization method is adopted for each score, that is, the highest score of the four applicants in the item is taken as the benchmark, and the other students are normalized by the ratio of the highest score to the highest score. Each student's four-item normalized scores were then averaged as their final score on the "normalized scores" dimension.

2) Activity Experience

In constructing the "Activity Experience" indicator, this study evaluates students' extracurricular performance from three dimensions: participation, leadership, and achievement.

These three dimensions represent the hierarchical structure of activity engagement—breadth, depth, and outcome: participation reflects the breadth of involvement, leadership captures organizational and coordination ability, and achievement measures the tangible outcomes of such activities.

According to the defined criteria, the scoring rules are as follows:

Students receive 0.1 points for participation in competitions or extracurricular organizations;

0.2 points if they have either received an award or held a leadership position;

And 0.5 points if they both held a leadership role and received an award.

The full score is set at 1 point to ensure comparability among applicants.

To enhance the transparency of score assignment, **Table 4** summarizes the quantified results for the four applicants.

Table 4. Activity experience scoring and composite values.

Applicant	Participation	Leadership	Results (Awards)	Composite Score (0 - 1 Range)
X	0.1	0.2	0.1	0.40
H	0.2	0.3	0.2	0.70
L	0.1	0.1	0.1	0.30
W	0.1	0.2	0.1	0.40

The scoring is based on their competition participation records, leadership roles in clubs or projects, and award achievements.

All sub-scores were normalized to the range [0, 1].

The Composite Score represents the sum of the three dimensions, and since the maximum is set to 1, all values naturally fall within [0, 1].

These standardized scores are directly used as input variables in the subsequent TOPSIS evaluation model (see **Table 5**).

Table 5. Comprehensive quality index scores of evaluation objects.

Evaluation object	Standardized scores	Activity experience	Personality traits	The school
Student X	0.70	0.40	0.31	0.15
Student H	0.72	0.70	0.25	0.06
Student L	0.25	0.30	0.21	0.06
Student W	0.82	0.40	0.13	0.17

3) Personality Traits Scoring

To examine the influence of personality characteristics on admission decisions, this study invited high school teachers, college counselors, and university admissions advisors with evaluation experience to complete questionnaires. The survey aimed to capture their preferences for different applicant personality types, thereby reflecting universities' implicit tendency toward "personality fit" in holistic admissions. The results indicated that evaluators showed a stronger preference for the extroverted, enthusiastic, and expressive type (30.77%) and the calm, independent, and quick-thinking type (25.00%), followed by the persistent, reliable, and goal-oriented type (21.15%), while the introverted, delicate, and reserved type (13.46%) was relatively less favored.

This study focuses on the degree of alignment between students' behavioral expressions in their personal experiences and the predefined core personality traits, and establishes a criterion for determining the correspondence "from personal statement content to personality category", as follows:

a) Extroverted, Enthusiastic, and Confident Type: If a student's personal statement demonstrates initiative in launching creative projects and displays enthusiasm, proactivity, and strong organizational or executive ability in those projects, the student is classified under this type.

b) Calm, Independent, and Insightful Type: If a student's personal statement shows deep engagement in activities requiring critical thinking, logical reasoning, or independent planning, and reveals quick thinking and expressive persuasiveness, the student is classified under this type.

c) Persistent, Practical, and Determined Type: If a student's personal statement reflects long-term dedication to a specific field (such as skills, public welfare,

or academic research) and demonstrates perseverance, steadiness, and sustained effort toward clear goals, the student is classified under this type.

d) Introverted, Delicate, and Cultured Type: If a student's personal statement highlights attention to detail, emotional or cultural depth, or engagement in individual exploration rather than large-scale social interaction, the student is classified under this type.

Based on the applicants' personal statements and recommendation letters (see **Table 3**), the authors identified the dominant personality tendencies of X, H, L, and W, assigning each to one of the four categories: Student X exhibits strong extroversion and creativity; Student H demonstrates quick thinking and eloquence; Student L shows steadiness and perseverance; and Student W displays emotional sensitivity and aesthetic awareness. According to the survey results, the preference ratios of these four personality types were linearly transformed into normalized scores ranging from 0 to 1, corresponding to 0.31, 0.25, 0.21, and 0.13, respectively.

This scoring method is not merely a numerical conversion but a reflection of evaluators' value hierarchy regarding the "ideal applicant personality." The resulting personality trait scores were integrated into the TOPSIS comprehensive model, together with academic performance, extracurricular experience, and school background, to construct a multidimensional evaluation system exploring the relative weight and influence of personality traits in university admissions decisions.

4) School attended

School scores were also based on the same 52-person questionnaire, according to respondents preferences for different schools. The final score is obtained by converting such preference data into numerical form.

The index is the perception of the school attended by students in the eyes of each person, that is, the degree of recognition of the student's academic background.

According to the questionnaire, the preference proportion and score conversion of the three target schools are as follows: Hangzhou Foreign Language School Cambridge High School, 8 people prefer, accounting for about 15.38%; Hangzhou No.14 Middle School International Department, 3 people prefer, accounting for about 5.77%; Ordinary High School, 9 people prefer, accounting for about 17.31%. The above three schools are attended by four students and their school scores are converted from the above percentages.

2.3. Research Technique

At present, there are few decision models for overseas admissions officers to admit students, and most of them adopt data mining methods. Data mining does provide insights on a large scale, but it relies too heavily on data. Once there is a small hole, the whole model loses accuracy. TOPSIS method has good comprehensive ranking ability of multiple indicators, especially suitable for situations with limited sample size and lack of clear weighting among indicators. Compared with traditional score-only theory or single scoring method, this method can objectively integrate

personality, activities, school background and other subjective but significant factors, which conforms to the trend of “comprehensive evaluation of students” in modern enrollment.

Based on this, this paper uses TOPSIS method to establish and analyze the model. TOPSIS method has no limit on the evaluation object, can include a large range, and has no requirement for the number of samples and indicators. It has strong data adaptability and can effectively compensate for the shortcomings of data-dependent decision-making models established by data mining methods in the current market. And this method is widely used in all kinds of multi-objective decision-making and multi-scheme selection, such as: carbon neutral path evaluation based on TOPSIS method [4] and application of AHP and TOPSIS method to evaluate the comprehensive quality of higher vocational students [5].

The ranking of TOPSIS method is to detect the distance between the evaluated object and the optimal solution and the worst solution. If the evaluated object is closest to the optimal solution and farthest from the worst solution, it is the best, otherwise it is not the best. Among them, the values of each index of the optimal solution are the best values of each evaluation index value, and the results of all evaluation indexes of the worst solution are the lowest values of each index. TOPSIS method steps:

Assuming that there are n objects to be evaluated and m evaluation indexes that have been positively transformed, the following decision matrix is formed:

$$x = \begin{bmatrix} x_{11} & \cdots & x_{1m} \\ \vdots & \ddots & \vdots \\ x_{n1} & \cdots & x_{nm} \end{bmatrix}$$

The normalized matrix is denoted Z , and each element in Z is:

$$Z_{ij} = \frac{x_{ij}}{\sqrt{\sum_{i=1}^n x_{ij}^2}}$$

Then, after standardization, weights are added to each indicator. There are many ways to determine weights, such as the Entropy Weight Method (EWM) and the Analytic Hierarchy Process (AHP). Here, assume that each index has the same weight. Thus, the normalized matrix Z is obtained.

$$Z = \begin{bmatrix} Z_{11} & \cdots & Z_{1m} \\ \vdots & \ddots & \vdots \\ Z_{n1} & \cdots & Z_{nm} \end{bmatrix}$$

Namely:

$$\text{Maximum: } Z^+ = (Z_1^+, Z_2^+, \dots, Z_m^+)$$

$$\text{Minimum: } Z^- = (Z_1^-, Z_2^-, \dots, Z_m^-)$$

Then:

The distance between the i th evaluation object and the maximum value is:

$$D_i^+ = \sqrt{\sum_{j=1}^m (Z_j^+ - Z_{ij})^2}$$

The distance between the i th evaluation object and the minimum value is:

$$D_i^- = \sqrt{\sum_{j=1}^m (Z_j^- - Z_{ij})^2}$$

Then the unnormalized scores for i objects are: $S_i = \frac{D_i^-}{D_i^+ + D_i^-}$

It is easy to see that the larger, the smaller, the closer to the maximum.

3. Model Construction and Result Analysis

3.1. Model Construction and Computation

This model takes four applicants (X, H, L and W) as evaluation objects, and selects four core evaluation indicators: standardized scores (*i.e.* academic scores, generally including language scores, GPA, subject scores and SAT), activity experience, personality traits and schools attended. The data are from the actual application materials of applicants and the quantitative analysis results of Hangzhou education-related problems survey. According to the data processing in 2.2, the comprehensive quality index score of the evaluation object in **Table 5** below can be obtained.

So we can get the matrix:

$$x = \begin{bmatrix} 0.70 & 0.40 & 0.31 & 0.15 \\ 0.72 & 0.70 & 0.25 & 0.06 \\ 0.25 & 0.30 & 0.21 & 0.06 \\ 0.82 & 0.40 & 0.13 & 0.17 \end{bmatrix}$$

In order to eliminate the difference in index dimensions, the matrix X is normalized, and the normalized matrix Z is obtained according to the formula:

$$x = \begin{bmatrix} 0.5302 & 0.4216 & 0.6616 & 0.6196 \\ 0.5453 & 0.7379 & 0.5335 & 0.2478 \\ 0.1893 & 0.3162 & 0.4481 & 0.2478 \\ 0.6210 & 0.4216 & 0.2774 & 0.7022 \end{bmatrix}$$

Then determine the optimal solution and the worst solution:

Optimal solution: $Z^+ = (0.6210, 0.7379, 0.6616, 0.7022)$

Worst case: $Z^- = (0.1893, 0.3162, 0.2774, 0.2478)$

Next, the distances between the evaluation object and the optimal solution and the worst solution are calculated, and the following equations are used in **Table 6** and **Table 7**.

Table 6. Distance between each evaluation object and the optimal solution and the worst solution in TOPSIS.

Evaluation object	Distance from optimal solution	Distance from worst solution
Student X	0.3390	0.6427
Student H	0.4781	0.6084
Student L	0.7850	0.1706
Student W	0.4975	0.6356

Table 7. TOPSIS comprehensive evaluation results and ranking.

Evaluation object	Relative proximity	Sort
Student X	0.6547	1
Student W	0.5610	2
Student H	0.5600	3
Student L	0.1785	4

The next step is to determine the relative proximity according to the formula:

Result: The order of admission priority based on TOPSIS method is: $X > W > H > L$.

3.2. Analysis of TOPSIS Evaluation Results

From the ranking results, although X is not absolutely ahead in any of the four indexes, his high scores in “personality traits” and “activity experience” make him dominant in the proximity to the optimal solution, so X’s comprehensive quality is the most outstanding, and the relative proximity is the highest, so it is recommended to be admitted first; W and H have close scores, and are in the middle level; But L student has no high value in each dimension, especially in the standardized score and the activity experience performance pulled down the overall evaluation, the comprehensive ranking is the lowest. It can be seen that TOPSIS method can effectively identify the competitive advantage of “multidimensional equilibrium” applicants, which also confirms the advantage of TOPSIS method—it can comprehensively evaluate multi-dimensionally and avoid one-sided judgment of “fractional theory”.

For admissions officers, this model can be used as an auxiliary admission tool to help them identify candidates with outstanding comprehensive ability more efficiently and objectively in the face of mass applications.

3.3. Weight Justification and Sensitivity Analysis

To examine how variations in factor importance may influence the ranking outcome, this study conducts a weight justification and sensitivity analysis based on four dimensions—standardized academic performance, extracurricular activities, personality traits, and school background—within the context of university admissions in Hangzhou.

1) Equal-weight assumption

In the baseline model, the four indicators were assigned equal weights (0.25 each) to emphasize the integrative logic of the TOPSIS approach and avoid subjective weighting disputes. This configuration aligns with the results of 52 questionnaires, indicating that educators generally perceive the four factors as similarly important.

2) Entropy-weight method: Objective weighting based on data distribution

Based on the degree of data dispersion from the questionnaire responses, the

objective entropy weights were determined as follows: standardized score 0.32, activities 0.26, personality 0.19, and school 0.23. After applying these weights to the TOPSIS model, the ranking remained $X > W > H > L$, indicating that no single dimension dominated the results. Applicant X maintained a leading position due to outstanding extracurricular achievements, demonstrating the model's ability to capture the balance between academic and activity-based strengths.

3) Analytic Hierarchy Process (AHP)

Subjective weighting based on expert judgment

Five university admissions officers and five college counselors participated in pairwise comparisons among the four criteria. The aggregated judgment matrix passed the consistency test ($CR = 0.06 < 0.1$), resulting in the following weights: standardized score 0.40, activities 0.22, personality 0.15, and school 0.23. Under this weighting scheme, the ranking shifted to $W > X > H > L$, showing that when academic indicators are given greater emphasis, high-scoring applicants gain a comparative advantage—consistent with real-world admission logic.

4) Robustness of results

The comparative results under three weighting schemes are summarized in **Table 8**.

Table 8. TOPSIS ranking results under three weighting schemes.

Weighting method	Weight vector (Standardized/Activities/Personality/School)	Ranking result (Student)
Equal weights	(0.25, 0.25, 0.25, 0.25)	$X > W > H > L$
Entropy weights	(0.32, 0.26, 0.19, 0.23)	$X > W > H > L$
AHP weights	(0.40, 0.22, 0.15, 0.23)	$W > X > H > L$

Only a slight ranking change occurred between X and W, while the overall structure remained stable. This consistency suggests that the TOPSIS model maintains structural balance and tolerance across weighting assumptions: all criteria jointly shape the outcome rather than being dominated by a single factor. Thus, the equal-weight configuration serves as an empirically reasonable and interpretable baseline, and the model's adaptability underscores its potential for flexible application in multi-dimensional admission evaluations.

4. Summary

This study investigates the comprehensive evaluation process in overseas university admissions and constructs a data-driven applicant optimization model using the TOPSIS multi-criteria decision-making approach. The model incorporates four core indicators—standardized academic performance, activity experience, personality traits, and school background—and conducts an empirical analysis based on authentic application materials and questionnaire data.

The results show that the final ranking of applicants is $X > W > H > L$. Applicants who exhibit balanced strengths across key dimensions, such as personality

and extracurricular activities, and have no significant weaknesses (e.g., applicant X), demonstrate the highest overall competitiveness. Students who are outgoing, confident, and demonstrate leadership and collaboration skills receive higher composite scores, whereas those relying solely on high standardized test scores do not necessarily achieve top rankings. This finding indicates that admissions officers tend to prefer well-rounded applicants who combine academic potential with non-cognitive qualities rather than those with purely academic strengths.

The findings further confirm the effectiveness and interpretability of the TOPSIS approach in the university admissions context. The model enables quantitative comparison across multiple dimensions, balancing objectivity and operational simplicity. It provides admissions officers with a scientific and transparent decision-support tool when assessing complex and diverse applicant profiles, and offers methodological support for incorporating non-cognitive indicators into the admission process to enhance fairness and reliability.

Four applicants were selected as case samples to verify the methodological validity and logical applicability of the TOPSIS model. Although the sample size is limited, the selected applicants differ significantly in academic achievement, activity involvement, personality traits, and school background, reflecting the diversity commonly observed in admission evaluations. Thus, the sample selection remains representative and methodologically meaningful.

If the model is extended to a larger and more diverse applicant pool, certain variations in results may emerge. Different universities or academic majors may assign varying importance to each indicator, leading to potential adjustments in weighting structures and partial ranking shifts. For instance, STEM-oriented programs may emphasize standardized scores more heavily, whereas humanities and social-science programs may place greater weight on activity experience or personality traits. Moreover, as the sample size expands and additional non-cognitive indicators are introduced, score disparities among applicants may widen. Nevertheless, the overall trend is expected to remain consistent—applicants with balanced and well-developed strengths across dimensions will continue to possess the highest competitiveness.

Future research can be advanced in three directions:

- 1) Introducing dynamic weighting mechanisms to reflect differences in institutional and disciplinary preferences through a hybrid subjective–objective weighting framework;
- 2) Expanding the sample and indicator scope by incorporating factors such as recommendation letters and essay quality; and
- 3) Developing a decision-support system that encapsulates the TOPSIS algorithm into a visualized, user-friendly tool to assist admissions officers in making more efficient and transparent evaluations.

Conflicts of Interest

The authors declare no conflicts of interest.

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