

# Risk Assessment Model of College Students' Entrepreneurship based on Analytic Hierarchy Process

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**Abstract**—This paper takes the students' entrepreneurial projects as the research object, and uses the analytic hierarchy process to refine the indicators of the risk assessment model. The first order indicators were risk management, capability risk, market risk, resource risk. Each first-order index has its three to four second- Index. Through the study, we find that the two indexes of management risk and market risk have a very important impact on the risk assessment of college students' venture projects. The risk of risk management is 0.528, the risk is 0.176, the market risk is 0.148, and the resource risk is 0.148. This paper intends to establish a risk assessment model to help college students to evaluate the venture project better, to avoid the risk of entrepreneurship, choose more suitable projects and help students start a more mature and stable situation.

**Keywords**—College Students' Entrepreneurship, Analytic Hierarchy Process, Risk assessment model

## I. COLLEGE STUDENTS ENTREPRENEURIAL BACKGROUND

With the continuous development of economy, the popularity of higher education has been deepened, and the government has provided college students with a series of preferential policies to make the employment of college students become diversified. Under such social background, College students' entrepreneurship [1] has become one of the hot topics on the university campus.

According to the relevant provisions, the college students business is that "college students or graduates within one year of college students can choose to create their own enterprises." And college students' entrepreneurship is the inevitable trend of college students' employment and structure change. With the development of college students' entrepreneurship, the types of start-up projects are becoming increasingly rich. Students can also choose suitable business projects according to their own knowledge and skills, and through the risk of self-financing, the students can start their own projects to seek

opportunities for development career. In the process of marketization of entrepreneurial projects, due to the shortcomings of college students and some aspects of the improper decision-making led to restrictions on the development of the project, they even cause the project in trouble.

At present, the current situation of college students' entrepreneurship is not optimistic. The success rate of Chinese college students is about 1%. Zhejiang University students entrepreneurial success rate in the provinces and cities nationwide is the highest, only four percent.

Compared to the global student business success rate of about 10%, gap is still obvious. According to in-depth understanding. The root cause of the low success rate of college students is that the risk of entrepreneurship is not enough. From the overall situation, both in theoretical research and practice innovation there are still many deficiencies. This article focuses on the risk of college students that may face in the business, and put forward countermeasures.

Therefore, through the assessment of college students venture risk, you can better sum up the problems encountered in the process of college students, and explore good solutions. It is conducive to the success of college students' entrepreneurship.

## II. COLLEGE STUDENTS ENTREPRENEURIAL RISK FACTORS<sup>[2]</sup>

Although the strong support of the national government, college students still face many challenges. The Uncertainty and Complexity of Entrepreneurial Entrepreneurship are in Entrepreneurial Environment. The lack of entrepreneurial capacity or Decision-making error leads to this problem that Venture projects deviate from expectations.

In the process of entrepreneurship, college students will face a lot of links or details needed to choose. When the decision maker brings the crisis or loss caused by

improper decision-making mistakes,, that is, business risk. The entrepreneurial risk of college students mainly comes from the development of the project itself, the financial situation of the project, the social resources, the entrepreneurial consciousness of the entrepreneur or the team, the current market environment and the technical aspects of the team.

The causes of college students' entrepreneurial risk can be divided into two main aspects of the external environment and the internal environment. College students in their entrepreneurial environment are at a disadvantage, because of their lack of experience, an immature technology making the sense of prevention of risk is not strong, the face of the market risk does not have enough tolerance. If they want to make the entrepreneurial project can be better , they must be more clearly aware of their own shortcomings, give enough early awareness of the risks you may face, objectively assess their ability to withstand risks, continue to study and enhance their own strength in the support of the government, So that college students can develop better business.

Venture projects need to test the comprehensive strength of entrepreneurs and groups. And business projects are affected by many factors, the main risk factors are: management risk, ability risk, market risk, resource risk. Which directly affects the success of a business project. Therefore, the risk index of a venture project is particularly important for assessing the feasibility of a project.

This paper analyzes the risk assessment of college students through the analytic hierarchy process (AHP), providing a reasonable model for college students to avoid the risk problems that may be encountered in the business, make reasonable suggestions and provide more convincing data indicating the importance of risk assessment.

### III. INTRODUCTION AND PRINCIPLES OF ANALYTIC HIERARCHY PROCESS<sup>[3]</sup>

Analytic Hierarchy Process (AHP) is a practical decision-making method of scientific examination based on rigorous mathematical operations and a degree of consistency in the judgment made by people due to quantitative difficulties, complex qualitative problems .It is proposed by the operational scientist

3.1 The basic principle: the problem should be analyzed as a system, according to the system within the various factors between the affiliation, transform the various elements of a complex problem into a structured and orderly hierarchy, construct the judgment matrix according to the same level of the various elements in accordance with the previous elements as a criterion, and

compare the two judgments to calculate the weight of the elements. According to the comprehensive weight according to the principle of maximum weight to determine the optimal program, we get a quantitative description of the relative importance of the program or target.

#### 3.2 Steps of solving the Analytic Hierarchy Process

Step 1: Construct the matrix A by the decision maker using the following table:

Relatively important degree	Definition	Description
1	Same	The two goals are equally important
3	Slightly important	Target A is slightly more important than Goal B.
5	Important	Goal A is important than Goal B.
7	Obviously important	Goal A is more important than Goal B.
9	Absolutely important	Goal A is much more important than Goal B.
2、4、6、8	Two comparative levels of intermediate areas	Need to take two comparative intermediate values

Note: The above table is given the relative importance level table based on the general cognitive situation and judgments.

$$A = \begin{bmatrix} a_{11} & a_{12} & \dots & a_{1n} \\ M & M & M & M \\ \dots & \dots & \dots & \dots \\ a_{n1} & a_{n2} & \dots & a_{nm} \end{bmatrix} \approx \begin{bmatrix} \frac{w_1}{w_1} & \frac{w_1}{w_2} & \dots & \frac{w_1}{w_n} \\ \frac{w_2}{w_1} & \frac{w_2}{w_2} & \dots & \frac{w_2}{w_n} \\ \dots & \dots & \dots & \dots \\ \frac{w_n}{w_1} & \frac{w_n}{w_2} & \dots & \frac{w_n}{w_n} \end{bmatrix} \quad (1)$$

Among them, A row of elements in each row and open n

times to get, seeking weight: ,  $w_i = \frac{w_i^*}{\sum w_i^*}$

A sum of elements in each row  $S_j = \sum a_{ij}$  If the decision maker can accurately estimate:  $a_{ij}(i, j \in J)$

There is:

$$a_{ij} = \frac{1}{a_{ji}}, a_{ij} = a_{ik}, \forall i, j, k \in J \quad (2)$$

$$a_{ij} = 1, \sum_{i=1}^n a_{ij} = \frac{\sum_{i=1}^n w_i}{w_j} \quad (3)$$

$$CR < 0.1 \quad (4)$$

By (1), get:

$$AW = \begin{bmatrix} \frac{w_1}{w_1} & \frac{w_1}{w_2} & \dots & \frac{w_1}{w_n} \\ \frac{w_2}{w_1} & \frac{w_2}{w_2} & \dots & \frac{w_2}{w_n} \\ \vdots & \vdots & \ddots & \vdots \\ \frac{w_n}{w_1} & \frac{w_n}{w_2} & \dots & \frac{w_n}{w_n} \end{bmatrix} \begin{pmatrix} w_1 \\ w_2 \\ \vdots \\ w_n \end{pmatrix} = n \begin{pmatrix} w_1 \\ w_2 \\ \vdots \\ w_n \end{pmatrix} \quad (5)$$

That is  $(A - nI)W = 0$ .

If the estimate of A is not accurate enough, the small vibrations of the elements in A mean small vibrations of the eigenvalues.

$$AW = \lambda_{max} W \quad (6)$$

And  $\lambda_{max}$  is the largest eigenvalue of matrix A. The eigenvector method can be used to solve  $\lambda_{max}$  and W.

Among them  $\lambda_{max} = \sum w_i s_j$

From the formula (6) can be used to determine the eigenvector in this way:  $W = (w_1, w_2 \dots w_n)^T$  When the right is determined by this method, since the judgment matrix is not necessarily a consistent matrix so when the judgment matrix is too close, the reliability of this approximation is not reliable.

Step 2 is as follows:

1) Calculate the consistency index,  $CI : CI = \frac{\lambda_{max} - n}{n - 1}$ ,

n is the judgment matrix order;

2) calculate the average random consistency index RI;

3) Calculate the consistency ratio  $CR = \frac{CI}{RI}$ . When

$CR < 0.1$  it was generally accepted that the consistency of the judgment matrix was acceptable.

Step 3, the consistency test of matrix A. If the maximum

eigenvalue  $\lambda_{max} > \sum_{i=1}^n w_i, w_j = \frac{1}{\sum_{i=1}^n a_{ij}}$  gives the

same order matrix  $\lambda_{max}$  And it can not pass the consistency test, we should re-estimate the matrix A,

Until  $\lambda_{max} < \lambda_{max}'$  passed the consistency test to obtain the only effective.

Step 4, sort the programs.

1. When the attribute value of each option is known ,It Can be based on indicator:  $C_i = \sum_{j=1}^n w_j z_{ij}$  to rank the merits of the program:  $i(i = 1, L, m)$

When the attribute value is difficult to quantify under each target, It can be obtained by comparing the pros and cons of each goal (using the rank comparison) to obtain the weight of each program attribute under each target. And then we should calculate the overall weight of each program, according to the size of the overall weight of the program out of the pros and cons of the order.

#### IV. APPLICATION OF ANALYTIC HIERARCHY PROCESS IN COLLEGE STUDENTS' VENTURE RISK ASSESSMENT

4.1 Constructing the Risk Assessment Model of College Students' Entrepreneurship

This article seizes the high-frequency middle layer elements that meet the risk of college students' entrepreneurship form a large number of literature, periodicals and secondary information on the Internet. In order to make the model more representative, the results are more accurate, through the analysis of many aspects, after screening, this paper selects the four elements including management risk, ability risk, market risk, resource risk. We carefully analyze each item, select the most reasonable and objective risk factors, college students to get the risk assessment model shown in Figure 1.

4.2 Establish a judgment matrix

By establishing the judgment matrix [4], in order to make the selected factors reasonable and effective, we determine whether the values in the matrix are approved by the expert scoring method. Using the software to calculate the results, through the consistency check, we get the risk factor for the element layer weight table.

4.2.1 Establish the evaluation index of college students' entrepreneurial risk

According to the college students venture risk assessment model (Figure 1) we build a risk factor set :

$F_i(i = 1, 2, 3, 4)$  Namely, management risk, ability risk, market risk, resource risk expressed as  $F = (F_1, F_2, F_3, F_4)$  In each level factor is divided into

several secondary factors,  $F_{ij}(i, j = 1, 2, 3, 4)$  For example, the second level of risk, risk entrepreneurial skills, entrepreneurial experience, expertise, entrepreneurial awareness can be expressed as:

$$F_2 = (F_{21}, F_{22}, F_{23}, F_{24})$$

4.2.2 Determining the weight of the risk factor

In order to determine the weight of each factor more scientifically, this paper uses the analytic hierarchy process to carry on the detailed calculation analysis to the first level factor. The following shows the weight calculation process

The first layer factor	The second layer factor
Ability risk $F_2$	Entrepreneurial skills $F_{21}$
	Entrepreneurial experience $F_{22}$
	Professional knowledge $F_{23}$
	Entrepreneurial awareness $F_{24}$

For the risk factors of  $F_2$ , because of the importance of judging the importance of each factor, we cannot judge the relative importance of the weight of each factor accurately. We can only judge the risk factor through the common sense and experience of the expert. Matrix, this way will be achieved by judging the consistency of the matrix to ensure that the resulting weight data is desirable.

1) Let A be the judgment matrix of  $F_2$  and calculate the product of each row of elements in the matrix  $M_i$ ,

$$M_i = \prod_j F_{ij}$$

Get  $A = \begin{bmatrix} 1 & 2 & 3 & 4 \\ \frac{1}{2} & 1 & \frac{3}{2} & \frac{1}{2} \\ \frac{1}{3} & \frac{2}{3} & 1 & \frac{3}{4} \\ \frac{1}{4} & 2 & \frac{4}{3} & 1 \end{bmatrix}$ , By calculation got:

$$M_1 = 24, \quad M_2 = \frac{3}{8}, \quad M_3 = \frac{1}{6}, \quad M_4 = \frac{2}{3}$$

2) Calculate the nth root of  $M_i$  is  $\bar{w}_i$ , then  $\bar{w}_i = \sqrt[n]{M_i}$ , and  $\bar{w}_1 = 2.213$   $\bar{w}_2 = 0.782$   $\bar{w}_3 = 0.639$   $\bar{w}_4 = 0.903$

3), For normalization of  $\bar{w}_i$ ,  $w_i = \frac{\bar{w}_i}{\sum_{j=1}^n w_j}$  we obtain

$$W = [w_1, w_2, w_3, w_4]^T$$
 as the required eigenvector

4) Calculate  $AW$  in calculating the largest eigenvalue of the matrix,  $\lambda_{max}$ ,

$$A = \begin{bmatrix} 1 & 2 & 3 & 4 \\ \frac{1}{2} & 1 & \frac{3}{2} & \frac{1}{2} \\ \frac{1}{3} & \frac{2}{3} & 1 & \frac{3}{4} \\ \frac{1}{4} & 2 & \frac{4}{3} & 1 \end{bmatrix} \begin{pmatrix} 0.488 \\ 0.172 \\ 0.141 \\ 0.199 \end{pmatrix} = \begin{pmatrix} 2.051 \\ 0.727 \\ 0.568 \\ 0.853 \end{pmatrix}$$

We get:  $\lambda_{max} = 4.187$ .

When  $CI = \frac{\lambda_{max} - n}{n - 1}$ ,

$$CR = \frac{CI}{RI} = \frac{0.187}{0.9} = 0.02 < 0.1, \quad CR = \frac{CI}{RI} < 0.1$$

Through the random consistency test, we believe that the consistency of the judgment matrix is illustrative, and the weight w can be accepted. Given a list of values, N represents the order.

n	1	2	3	4	5	6	7	8	9
R	0	0	0.5	0	1.1	1.2	1.3	1.4	1.4
I			8	9	2	4	2	1	5

$$CR = \frac{CI}{RI} = \frac{0.187}{0.9} = 0.02 < 0.1$$

When the consistency check of the judgment matrix is completed, the value of the weight vector W is accepted.

We get:

The second layer of factors	Weights
Entrepreneurial skills $F_{21}$	0.488
Entrepreneurial experience $F_{22}$	0.172
Professional knowledge $F_{23}$	0.141
Entrepreneurial awareness $F_{24}$	0.199

5), According to the above calculation steps, we can get the weight of each evaluation factor, the table.

Table 1. The risk factors on the factor layer ranking weight table

Evaluation factors	one - level weight	evaluation factor	two - level weight
Manage risk	0.528	team composition	0.59
		Misuse	0.273
		Significant decision making	0.248
Ability risk	0.176	entrepreneurial skills	0.488
		Lack of experience	0.172
		Professional	0.141

		knowledge Entrepreneurship Wil	0.199
Market risk	0.148	Project selection Market development Market operation Competitors	0.524 0.238 0.119 0.119
Resource risk	0.148	network resources Financing risk Technical equipment	0.577 0.318 0.106

## V. THE MODEL RESULTS ANALYSIS

Students' entrepreneurial projects are relatively high on the composition of the team. If the team is not necessarily built to the project it will bring risks. A team needs to trust each other's common goals, need to support each other, need to encourage each other, so that the team has cohesion. Students in the pursuit of the success of the project should also take care of other people's emotions to conduct a good and effective communication, should not blame each other to guess each other even in the event of each other push responsibility. One of the major reasons for the failure of the project is the disagreement within the team that led to the collapse of the entrepreneurial team.

In the process of advancing the project, the decision-makers in the face of the decision-making with the nature of the project will bring a lot of risk. Wrong decision making is likely to cause the project to be in a difficult position. The detours are contrary to the original intention of the project. As college students because of the lack of experience, but also the lack of part of the professional knowledge and theoretical support, more difficult to make accurate and scientific decision-making, easy to make arbitrary decisions wrong. Therefore, in the face of decision-making, we should be comprehensive consideration, the wisdom of the entire team. If necessary, we should go to ask more professional people, and avoid the subjective assumptions on the face of the arbitrary decision.

Talking about the market, because the economy is a changeable and difficult to find a law of the huge market, that we choose a suitable with the development prospects of the venture project is also particularly important. There have been many cases, in the early stages they chose the wrong or difficult to advance the business projects, resulting in a great burden to the late, or even the failure of the project. Through some of the business projects around the students point of view is not very optimistic. For example, students choose to send dinners for dormitory students. That is, the team itself contacts the

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corresponding snack suppliers, so that students purchase it. Based on the survey, self-research software platform for the operation, then arrange the delivery staff to send the corresponding choice of snacks. From which to earn the difference and profit. In the early stages of the project, college students will be fresh, and the team members are enthusiastic, so the orders of the customers will be more, but to the late team members enthusiasm and profits decline. There are different class time. And the resulting conflict and other causes of the project slowly become no value, in less than a semester of time had to end the project causing the project to slowly become of no value, in less than a semester of time had to end the project. College students are prone to start a three-minute hot psychological, but the lack of market experience. They cannot have a clear understanding of the market, and will blindly confidently choose the project. Lack of perseverance and sufficient corresponding professional knowledge and skills, then appropriate project objective analysis of the market for students should be carefully considered factors.

Funds for start-up projects are also one of the key factors for the long-term sustainability of the project. Because the fund that the students can raise is relatively small. Sufficient liquidity is a strong support for project operations. Once the lack of funds or capital chain exercise, there is not enough liquidity, the entrepreneurial projects for college students is a fatal blow. And in the network resources are relatively small. So sufficient funds for the backup and a strong network of people is to determine whether the project can be a long-term development of the key factors.

## VI. SUMMARY

To sum up, college students entrepreneurship is bound to be risky. This paper aims at the objective evaluation of the risks existing in college students' entrepreneurs and establishes the risk assessment model, Hoping to give college students a better reference system [5] to face the risks facing entrepreneurship, having a deeper understanding, warning students to have entrepreneurial ideas to learn more knowledge, having a understanding of the various crises that may arise in business, and developing the ability to deal with crises and problems and build a solid foundation for the next venture to choose. Of course, there are many factors that affect the entrepreneurial projects of college students, this article is only for a number of common multiple factors to its analysis. In practice, different areas of entrepreneurial projects may also have different risk factors exist, college students should be based on the actual situation to consider, combined with other evaluation methods to analyze the project risk, make more appropriate choices,

in the face of possible risks to use different coping strategies, as much as possible to reduce the risk of the project, in order to maximize the benefits of the project.

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