

A risk assessment model for college students entity entrepreneurship program based on fuzzy comprehensive evaluation method

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Abstract— In this paper, according to the characteristics of college students entity entrepreneurship, constructing risk assessment index system of entity entrepreneurship project risk in human resource management, market, management, financial and production and so on, establishing fuzzy comprehensive evaluation model to evaluate the entity undertaking project risk. The research results show that in college students entity undertaking project, the risk of management and production factors account for the main part of risk, the second is financial risk, the lower is the risk of market and human resource management. In order to reduce the risk of entrepreneurship and increase the success rate of entrepreneurship, it is suggested that college students should strengthen their control over the management risk and production risk when they start their own business.

Index Terms— College students, Entity entrepreneurship program, Risk assessment, Fuzzy comprehensive evaluation

I. INTRODUCTION

The current employment situation is grim, with the number of college graduates rising from 1.114 million in 2001 to 7.49 million in 2016, plus the youth employment group, which has about 15 million employment groups in 2016. The employment situation of college students is severe, and the participation rate of independent entrepreneurship of college students in China is increasing, but the success rate of independent entrepreneurship is also extremely low. Therefore, through the assessment of college students entrepreneurial risk, which can better summary and discuss a good solution to solve the problems in the entrepreneurial process, thus it is beneficial to the success of college students entrepreneurship.

Many scholars at home and abroad have conducted in-depth study on project risk assessment. Zhou Jiao and Li Duanming^[1] clarified the development status of project management and the importance of project risk assessment, then introduced the definition, characteristics and traditional project risk assessment methods of project risk and analyzed the defects. At last, they presented and analyzed a method of project risk assessment based on fuzzy mathematics for the form of series and parallel structure. Gao Weiye and Peng Huatao^[2] put forward two-stage analysis, which is a fusion analytic hierarchy process and fuzzy comprehensive evaluation method to evaluate the risk of the project. In 1972, the United Nations industrial development organization commissioned a book called *Project Evaluation Guidelines*, written by two professors, P. Dasgupta and S. Mallein, the method of the book is called the UNIDO method. *Evaluation and Planning of Projects in Developing Countries*, written by

I. Little and J. mielis, and *The handbook for Evaluation of Industrial Projects, Summary of the United Nations, Industrial Feasibility Study*^[3], and *The United Nations Handbook for the Use of Consultants in Developing Countries*^[4], issued by the United Nations, all has been a huge boost to project evaluation. Further, *The Handbook of Industrial Feasibility Study*^[5] provides the main content and calculation methods for the feasibility study. International financial institutions such as the world bank and the international monetary fund have attached great importance to the feasibility study, these have deeply embedded social analysis into the early evaluation of the project, and gradually formed the feasibility study of modern significance. Some scholars have assessed project risks in specific areas, such as Gao Xianyi and Chen Liwen^[6], for uncertainty about the complexity and influence factors in the project risk assessment, extended the traditional analytic hierarchy process from the point scale to the interval scale, thus proposed an engineering project risk assessment method based on interval number analytic hierarchy process. Other scholars have applied risk assessment methods to other related fields. Cui Man^[7] combined the improved group network hierarchy process with the fuzzy comprehensive evaluation method, presented a method for risk assessment of foreign investment projects. Ye Zhen^[8] proposed a fuzzy comprehensive evaluation method based on analytic hierarchy process to evaluate the teaching quality.

The above studies are all about project risk assessment. Entrepreneurship is divided into traditional business, emerging entrepreneurs, and the newest, minimally invasive industries. In terms of methods, entrepreneurial projects are divided into industrial enterprises and Internet start-ups. From the perspective of investment, the entrepreneurial project is divided into the non-cost start-up, the small start-up, the micro entrepreneurship and so on. From the perspective of the way, the entrepreneurial project is divided into self-employment, joining the start-up, experiential training entrepreneurship and entrepreneurship program guide entrepreneurship. Meng Lisha^[9] established the object element model of venture investment project and evaluated the risk assessment of venture capital project by using the correlation function of extension, the empirical analysis shows that the model can be applied effectively in practice. Qi Liwei^[10] applied APH analytic hierarchy process to ITAT venture capital project, providing an effective basis for risk assessment for investors. According to the analysis of the risks of real start-up, the paper analyzes the importance and size of the risk factors of the real venture by using fuzzy comprehensive evaluation analysis, and proposes corresponding solutions. The structure of this paper is to construct the index system for the risk of entity

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entrepreneurship, then based on fuzzy comprehensive evaluation method to establish the risk assessment model of entity venture project, and analyzed the model numerically. Finally, the paper analyzes the risks and countermeasures of college students entity entrepreneurship.

II. RISK EVALUATION INDEX SYSTEM

To construct risk evaluation index system for college students entity entrepreneurship, different entrepreneurial approaches have different main entrepreneurial risks. According to relevant data, there are major risks of human resource management, market, management, financial and production for college students entity entrepreneurship.

2.1 Analysis of risk factors of college students entity entrepreneurship program

Risk factors are any events that increase the frequency or severity of a risk accident. The more conditions that constitute a risk factor, the greater the likelihood of a loss, and the more serious the loss. From the perspective of entity entrepreneurship, the factors influencing college students entity entrepreneurship are: human resource management risk, market risk, management risk, financial risk, production risk^[11].

(1) Human resource management risk: The risk of entrepreneurial human resource management refers to the potential possibility of deviation from operation result and business objective due to human resources in the initial stage of enterprise start-up and long-term development. It mainly includes the risk of entrepreneurial team and the exit risk of key employees. A start-up team needs high quality coordination and cooperation ability of team members and the ability to adapt to the environment. A key employee holds the core business of the enterprise, which generally accounts for 20%~30% of the enterprise staff, but assumes 80%~90% of the company's technology and management functions, and creates 80% of the company's wealth and profits.

(2) Market risk: The risk of entrepreneurial market mainly refers to the realization of entrepreneurial market, which leads to the possibility of failure of entrepreneurship due to the uncertainty of the market. The market risk mainly includes: venture project selection risk and marketing risk. Entrepreneurs must learn to look at and evaluate their own entrepreneurial projects and marketing methods from a risk perspective when choosing a venture and marketing.

(3) Management risk: Management risk refers to the management level of management due to information asymmetry, mismanagement, misjudgment, etc. This risk is embodied in every detail of the management system, which can be divided into three parts: the quality of the entrepreneur, the decision-making risk and the management risk. If the management quality of entrepreneurs is deficient, then it will be limited to the innovation scope of the product and neglect the innovation of market management, which will increase the risk of entrepreneurship. Decision risk is the risk of making mistakes in the process of entrepreneurship. Failure of decision-making often results in incalculable losses, which can lead to failure of entrepreneurship. Organizational risk refers to the risk posed by unreasonable organizational structure of entrepreneurial enterprises. The rapid development of entrepreneurial enterprises, if not accompanied by the corresponding adjustment of

organizational structure, often becomes the potential source of crisis for entrepreneurial enterprises.

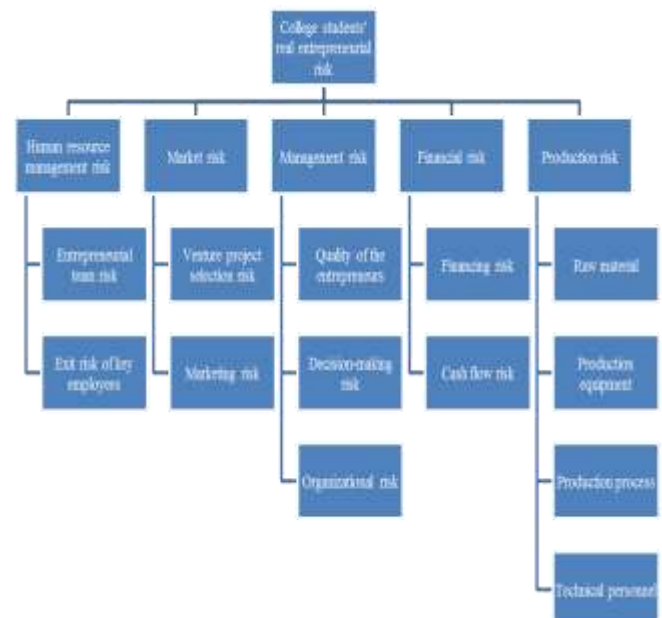
(4) Financial risk: Financial risk refers to the company's financial structure is unreasonable, improper financing the company could lose solvency and lead to the risk of investors expected earnings decline, mainly include the financing risk and cash flow risk. Due to the situation of capital supply and demand, the changes of macro economy and other factors have caused enterprises to raise funds to borrow funds to give financial results. Cash flow risk refers to the possibility of a shortage of funds in the operation of a new start-up company.

(5) Production risk: Production risk refers to the incalculable obstacles in raw materials, production equipment, production process and technical personnel. The production risk will cause the enterprise can't complete the production plan with the planned cost. Raw materials need to ensure continued stability of supply and prevent price changes from adversely affecting production. Existing production equipment and special equipment for new products need to meet the needs of new products. If the production process is not properly formulated, the product's secondary product rate may be increased and the product quality will decrease. The production of high and new technology products is generally high for the technical personnel, whether the technical personnel can meet the requirements of the enterprise is the key to the success of production.

2.2 Construct the risk index system of college students' real entrepreneurial venture

Based on the above risk factor analysis, the paper establishes the hierarchy of risk assessment index system for college students, as shown in table 1:

Table 1: An analysis chart of the index of college students' real venture risk assessment



III. RISK ASSESSMENT MODEL OF COLLEGE STUDENTS' ENTITY VENTURE PROJECT (BASED ON FUZZY COMPREHENSIVE EVALUATION METHOD)

3.1 The basic idea of fuzzy comprehensive evaluation method

Fuzzy comprehensive evaluation theory^[12] was led by an automatic control expert L.A.Zadeh. This theory is an

effective multiple factors evaluation method for the comprehensive evaluation of things affected by many factors through using fuzzy mathematics. Based on the membership theory of fuzzy mathematics, this synthetic evaluation method turns qualitative evaluation into quantitative evaluation. Use the fuzzy mathematics to make a general assessment of objects that are conditioned by multiple factors. Its results are clear and systematic, and are applicable to solving some fuzzy, difficult to quantify and uncertain problems.

This paper will analyze the risk analysis of college students' entity venture with fuzzy comprehensive evaluation. Firstly, the weight of the influence factors of college students' entity entrepreneurship are set up through analytic hierarchy process^[13] to distinguish the importance of each factor. Then determine the degree of membership and establish the evaluation matrix of fuzzy relation. The fuzzy mathematics method is used to make fuzzy arithmetic, and normalize the fuzzy matrix and the weight vector of the factors, thus to determine its comprehensive evaluation results. Finally, the overall risk level of college students' online entrepreneurship is determined.

3.2 The realization of fuzzy comprehensive evaluation method for college students' physical entrepreneurship

Establish an evaluation factor set: The evaluation factor set is a collection of various influencing factors involved in various risk factors. According to the analysis of pretexts about the influencing factors of the college students' real venture risk, the paper establishes a risk evaluation factor set for the college students' entity venture, as shown in figure 1.

It can be concluded from the following figure that the primary risk factors of college students' entity entrepreneurship are set: $U = (U_1, U_2, U_3, U_4, U_5)$, each factor is also composed of a secondary factor set: $U_{ij} = (U_{i1}, U_{i2}, U_{i3}, U_{i4})$, where i is the ordinal number of the primary factor, j is the ordinal number of the secondary factors.

3.3 Establish the judgment matrix and determine the corresponding weight of the risk factors of the college students' entity entrepreneurship

The key link of risk analysis for college students' entity entrepreneurship is to determine the weight of risk factors, and the weight of each factor reflects the importance of each factor. In order to scientifically determine the weight of various indicators, this paper adopts analytic hierarchy process to analyze the risk factors, as shown in table 2:

Table 2: Factors of risk assessment of college students' real entrepreneurial venture

Human resource management risk U_1	Entrepreneurial team risk U_{11}
	Exit risk of key employees U_{12}
Market risk U_2	Venture project selection risk U_{21}
	Marketing risk U_{22}
Management risk U_3	Quality of the entrepreneurs U_{31}
	Decision-making risk U_{32}
	Organizational risk U_{33}
Financial risk U_4	Financing risk U_{41}
	Cash flow risk U_{42}
Production risk u_5	Raw material U_{51}
	Production equipment U_{52}
	Production process U_{53}
	Technical personnel U_{54}

Firstly, to establish the evaluation matrix of production risk factors, college students' real entrepreneurial management

risks include raw materials U_{51} , production equipment U_{52} , production process U_{53} , technical personnel U_{54} , the following conclusions are drawn from the analysis of data of wanfang database and related enterprises:

Table 3: Comparison table of relative importance of college students' entity business management

	Raw material	Production equipment	Production process	Technical personnel
Raw material	1	4	5	8
Production equipment	1/4	1	3	5
Production process	1/5	1/4	1	4
Technical personnel	1/8	1/5	1/4	1

The maximal feature roots and corresponding eigenvectors of the matrix are calculated by approximating the square root method:

- ① Put the number for each row for W_{ij}
- ② The geometric average of the elements $W_i = \sqrt[n]{w_{1j} * w_{2j} * w_{3j} * \dots * w_{nj}}$, thus get the vector W^* .
- ③ $W_1 = \sqrt[4]{1 * 4 * 5 * 8} = 3.5566$ $W_2 = 1.3916$ $W_3 = 0.6687$ $W_4 = 0.2812$
- ④ The normalization is processed and get $W^* (0.6030, 0.2359, 0.1134, 0.2812)$

⑤ Set A is the judgment matrix, W^* is the index weight column vector, AW^* is column vector, then we can determine the structure of matrix index of A and W^* weight vector multiplication. (By using the tacit knowledge of various experts, to evaluate the relative importance of each risk factor, and the relative ratio of each factor weight is not accurate. A consistency check of the standard for evaluation is carried out.)

⑥ The matrix index of A and W^* weight vector multiplication structure:

$$A = \begin{bmatrix} 1 & 2 & 3 & 4 \\ \frac{1}{2} & 1 & 2 & 5 \\ \frac{1}{3} & \frac{1}{2} & 1 & 2 \\ \frac{1}{4} & \frac{1}{5} & \frac{1}{2} & 1 \end{bmatrix} \quad W = \begin{bmatrix} 0.4118 \\ 0.3500 \\ 0.1579 \\ 0.0803 \end{bmatrix} = AW^* = \begin{bmatrix} 1.9067 \\ 1.2732 \\ 0.6308 \\ 0.3322 \end{bmatrix}$$

⑦ $\lambda_{max} = \sum_{i=1}^n \frac{AW_i}{nw_i} = \frac{1.9067}{4 \times 0.4118} + \frac{1.2732}{4 \times 0.3500} + \frac{0.6308}{4 \times 0.1579} + \frac{0.3322}{4 \times 0.0803} = 4.0999$

⑧ Then get $C.I. = \frac{\lambda_{max} - n}{n - 1} = \frac{4.0999 - 4}{4 - 1} = 0.0333$

⑨ When $n < 3$, the judgment matrix is always completely consistent. When $n > 3$, we have to think about the effect of n . According to the table, the average random consistency index $R.I. = 0.89$, so the consistency index $C.R. = \frac{C.I.}{R.I.} = \frac{0.0333}{0.89} = 0.04 < 0.10$. When C.R. is < 0.10 , the consistency of the judgment matrix and the weight vector W^* are considered desirable.

3.4 Establish the evaluation level and use the fuzzy relationship evaluation matrix

The evaluation level is: high, higher, general, low and lower in five, according to the thousands of data and expert evaluation,

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forming a summary table of the level of all factors of college students' entity entrepreneurship and management risk, as shown in the table below:

Table 4

Risk factors	Risk level				
	high	higher	general	lower	low
Raw material	0.4	0.3	0.2	0.1	0.0
Production equipment	0.3	0.2	0.3	0.1	0.1
Production process	0.3	0.1	0.4	0.2	0.1
Technical personnel	0.3	0.2	0.3	0.2	0.0

R_{ij} is the risk factor, i is the i th risk in all risks, and the number of j is the ordinal value of the i th risk, from the table above and we can get:

$$R_{ij} = \begin{bmatrix} 0.4 & 0.3 & 0.2 & 0.1 & 0.0 \\ 0.3 & 0.2 & 0.3 & 0.1 & 0.1 \\ 0.3 & 0.1 & 0.4 & 0.2 & 0.1 \\ 0.3 & 0.2 & 0.3 & 0.2 & 0.0 \end{bmatrix}$$

3.5 Use fuzzy mathematics method to comprehensively evaluate the risk

The risk identification and evaluation of the production risk can be obtained by combining different columns with the fuzzy weight vector W^* , so get the fuzzy comprehensive evaluation result vector B_2 . The specific operation is as follows:

$$B_2 = W^* R_{ij} = \begin{bmatrix} 0.418 & 0.3500 & 0.1579 & 0.0803 \\ 0.4 & 0.3 & 0.2 & 0.1 & 0.0 \\ 0.3 & 0.2 & 0.3 & 0.1 & 0.1 \\ 0.3 & 0.1 & 0.4 & 0.2 & 0.1 \\ 0.3 & 0.2 & 0.3 & 0.2 & 0.0 \end{bmatrix} = (0.4, 0.3, 0.4, 0.2, 0.1)$$

3.6 According to the results of calculation, the risk level of college students' real entrepreneurship is determined

Based on the comprehensive analysis of the above results, the production risk accounted for 40%. Moreover, it is generally believed that the ratio of production risk of the college students' real entrepreneurial is high, which is because that the risk of enterprise operation and production is high. The calculation method is shown above. Through the analysis of the fuzzy calculation, it can be found that the highest risk of entity entrepreneurship is management, production, and higher risk is financial class. General risk is market, human resource management. Using fuzzy comprehensive evaluation theory to evaluate the risks of college students' real business process. The risk evaluation index of college students' entity entrepreneurship is determined scientifically Through analytic hierarchy process, and according to the evaluation team gives different weights of evaluation factors, makes the entity undertaking risk analysis for college students is more comprehensive, objective fair and scientific. To provide risk analysis for college students and reduce the risk of entrepreneurship. Indicators that need to be improved can be judged on the results, then to improve the success rate of the start-up.

IV. THE RISK FACTORS OF COLLEGE STUDENTS'

ENTREPRENEURIAL PROJECT INFLUENCE COUNTERMEASURES

It is inevitable that the risk factors of the college students' entity entrepreneurial process. The most important is how to

reduce the incidence of risk probability and the size of the risk influence. In this paper, we analyze the risk of college students' real business venture and put forward risk management countermeasures. Through the study, it is found that the risk factors of the real entrepreneurial project should strengthen the control of the management risk and production risk, and the control of the market and human resource management should be appropriately reduced. Due to lack of social experience, college students have a great lack of management knowledge. Therefore, college students should take an active part in club activities, to develop their own field of vision, and take part in the school organization department work, to accumulated management experience and find their own shortcomings and to improve continuously in practice. College students also lack of professional knowledge, for this, college students should listen carefully in class and expand their skills. Make sure the product quality is guaranteed and the production cost is in the control square, also can invite the teacher or outside professionals to assist, with the help of teachers and professional personnel, make the production skills was strengthened.

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