

# Analysis on the Risk Hierarchy and Key Factors Affecting Entrepreneurship of College Students

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**Abstract.** For entrepreneurship undertaking of college students, what is the hierarchical structure of risk? What factors have more important influences? And how can colleges and universities to use different factors to avoid risks and provide effects that affect college students' entrepreneurship? Most of previous researches lacked suitable methods to analyze the risk level and accurately grasp the impact of different factors. This study uses ISM and DEMATEL integration method to analyze the risk levels and key factors affecting college students' entrepreneurship. And it carries out in-depth understanding and analysis taking graduates engaged in entrepreneurship and students interested in entrepreneurship, cadres and instructors of innovation and entrepreneurship center of Xiamen University Tan Kah Kee college as objects. It is expected to find out the specific risk level and key factors, and propose countermeasure direction, and plan out clear blueprint for clear guidance for colleges and universities in layout of entrepreneurship & innovation education.

## Introduction

In view of major opportunities and challenges of global industrial transformation and technological revolution, as well as the trend changes and characteristics under the new normalcy of economic development, it is of great urgency and importance to cultivate innovative and entrepreneurial talents. Since 2015 and 2016, the State Council and the Ministry of Education have successively issued various policies requiring all colleges and universities to set up innovative and entrepreneurial education courses, and develop compulsory and elective courses for innovative and entrepreneurial education for all students, and incorporate them into credit management. Therefore, it has become an important issue to do a good job in education of entrepreneurship & innovation, and cultivating college students' innovative and entrepreneurial ability. In particular, there are many risks and influencing factors for entrepreneurship undertaking of college students, and among these factors, what is the hierarchical structure of risk? What factors have more important influences? And how can colleges and universities to use different factors to avoid risks and provide effects that affect college students' entrepreneurship?

In recent years, there are many studies on college students' entrepreneurial problems by the academic circles. While most of previous researches used qualitative methods to analyze the risks and influencing factors of college students' entrepreneurship and give countermeasures [1-2], but lacked suitable methods to analyze the risk level and accurately grasp the impact of different factors. Some scholars have begun to apply quantitative tools to analyze the factors affecting college entrepreneurship and their risks, especially the application of systems engineering methods, such as Interpretative Structural Modeling Method (ISM) and Decision Making Trial and Evaluation Laboratory; DEMATEL), all have obtained good analytical conclusions [3-4]. However, more scholars at home and abroad have begun to integrate the use of ISM and DEMATEL tools to analyze and solve specific issues [5-8], which proves the effect of integration application. Therefore, this study uses ISM and DEMATEL integration method to analyze the risk levels and key factors affecting college students' entrepreneurship. And it carries out in-depth understanding and analysis taking graduates engaged in entrepreneurship and students interested in entrepreneurship, cadres and instructors of innovation and entrepreneurship center of Xiamen University Tan Kah Kee college as objects. It is expected to find out the specific risk level and key factors, and propose

countermeasure direction, and plan out clear blueprint for clear guidance for colleges and universities in layout of entrepreneurship & innovation education.

## Methods

Interpretive Structural Modeling (ISM) was invented by Warfield (1973) [9] for the analysis of complex socio-economic systems and is a type of structural modeling techniques. It is characterized by decomposing a complex system into several subsystem elements, using the logical operations of the adjacency matrix of the directed image to obtain the reachable matrix, then decomposing the reachable matrix, and finally decomposing complex systems into hierarchical, multi-level hierarchical forms.

The Decision Making Trial and Evaluation Laboratory (DEMATEL) was proposed by the Bottelle Institute in 1973 [10] to solve complex and difficult problems in the real world. This method uses the theory of graph theory and matrix theory to analyze the influencing factors, constructs a direct influence matrix through the logical relationship between the elements in the system, calculates the degree of mutual influence between various factors, and then calculates the prominence and relation, then classifies and adopts strategies separately.

## Analysis

**Establishment of Evaluation Factor Indicators.** By referring to previous studies, visiting five teachers of the Innovation and Entrepreneurship Center of Xiamen University Tan Kah Kee College, screening and revising these elements, this study has obtained final 12 indicators of evaluation factors on college students' entrepreneurial, as shown in table 1:

Table 1. Indicators of evaluation factors on College Students' Entrepreneurship

Code	Factor	Code	Factor
s1	Macro environment	s7	Entrepreneurial team
s2	Business environment	s8	Entrepreneur's Organizational and Innovative Ability
s3	Construction of Incubation Platform	s9	Entrepreneurial motivation
s4	Enterprising Education Support	s10	Professional knowledge of entrepreneurs
s5	Enterprising Capital Support	s11	Contact resources
s6	Entrepreneurial Resource Mastery Ability	s12	Entrepreneurial experience

**Questionnaire Issuance and Recovery.** The questionnaires were issued to teachers of Business Incubation Center, Practice Instructors, Counselors, Graduates engaged in entrepreneurial and College Students of Xiamen University Tan Kah Kee College. A total of 78 questionnaires were distributed and 64 points were recovered. The recovery rate of the questionnaire reached 82.1%. The measurement scales applied by the questionnaire were four levels of 0, 1, 2, and 3, which indicated no impact, low impact, high impact, and great impact.

**Analysis on ISM Calculation.** In the recovery questionnaire, if the influence relationship is judged to be 1 or more, it is regarded as 1 and the ISM analysis is performed, as follows:

1. Adjacency matrix. The adjacency matrix is established according to whether the factors affect each other or not.
2. Reachable matrix. According to formula (1),  $(A+i)^5=(A+i)^6$  can be obtained, then  $(A+i)^6$  is the reachable matrix.
3. Hierarchical division. According to the reachable matrix, a set of  $R(S_i)$  and  $A(S_i)$  can be obtained, the union  $R(S_i) \cap A(S_i)$  of the two sets is gained as well. According to formula, it is concluded which factors belong to the same level and its level. As follows:

	R(Si)	A(Sj)	R(Si)∩A(Sj)
S1	1,2,3,4,5,7,9,10	1	1
S2	2,3,4,5,7,9,10	1,2	2
S3	3,4,9,10	1,2,3,5,7,11,12	3
S4	4,9,10	1,2,3,4,5,7,11,12	4
S5	3,4,5,9,10	1,2,5,7,11,12	5
S6	6,9	6,8,11	6
S7	3,4,5,7,9,10	1,2,7,12	7
S8	6,8,9	8	8
S9	9	1,2,3,4,5,6,7,8,9,11,12	9
S10	3,4,5,9,10,11	1,2,3,4,5,7,10,11,12	3,4,5,10,11
S11	3,4,5,9,10,11	11	11
S12	3,4,5,6,7,9,10,12	12	12

Figure 1. Hierarchical division

$IR(S_i) \cap A(S_i) = R(S_i)$  of S9 can be found, therefore, S9 is the first layer risk factor. After removing the S9 factor, these steps are repeated and it can be found that risk factors in second level include S3; S4; S5; S6; S10 and S11. And risk factors in third level include S7 and S8, risk factors in fourth level include S2 and S12. And S1 is the risk factor in last level.

4. Divisional division. If  $R(S_i) \cap R(S_j) = \emptyset$ , then  $S_i$  and  $S_j$  do not belong to the same part, and the elements are independent of each other; conversely, if  $R(S_i) \cap R(S_j) \neq \emptyset$ , then  $S_i$  and  $S_j$  belong to the same part. Therefore, the same layer factor can be found as  $R(S_i) \cap R(S_j) \neq \emptyset$ , which is expressed as a mutual influence factor. The resulting risk hierarchy is shown in Figure 2 below:

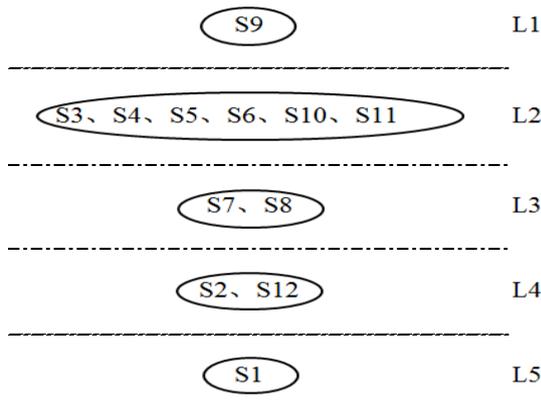


Figure 2. Risk hierarchy

### Analysis on DEMATEL Calculation.

1. Establish a direct relationship matrix X. According to the collected questionnaire, the average degree of influence on the factors is obtained, and the direct relationship matrix is obtained.
2. Calculate the normalized direct relation matrix. Taking max row sum as  $\lambda$ , then the normalized direct relation matrix is gained based on  $N = \lambda X$ .
3. Calculate the direct/indirect relational matrix. According to formula  $T = N(I - N)^{-1}$ , the direct/indirect relational matrix T is obtained, and then value of threshold  $< 0$  is taken to convert to 0 to gain  $T^*$  as follows:

$$T^* = \begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0.036 & 0 & 0 & 0.001 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0.057 & 0 & 0 & 0.001 & 0 & 0 \\ 0 & 0 & 0.001 & 0 & 0 & 0 & 0.008 & 0.057 & 0.051 & 0 & 0.029 & 0 \\ 0 & 0 & 0 & 0.028 & 0.036 & 0.019 & 0.098 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0.047 & 0 & 0.062 & 0.004 & 0 & 0.028 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0.077 & 0 & 0 & 0.002 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0.016 & 0 & 0.096 & 0.024 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0.049 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0.035 & 0 & 0.044 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0.058 & 0 & 0 & 0.011 & 0.013 & 0 & 0 \\ 0 & 0 & 0.049 & 0 & 0 & 0.093 & 0 & 0.083 & 0.083 & 0.038 & 0.077 & 0 \\ 0 & 0 & 0.004 & 0.047 & 0 & 0 & 0 & 0 & 0 & 0.015 & 0 & 0 \end{bmatrix}$$

4. Calculation of Prominence and Relation

First of all, the influence degree ( $D_i$ ) and the influence degree ( $R_j$ ) of each factor are calculated. Set  $D_i$  as the

sum of row  $i$ , which represents the variable  $i$ , and is the cause that affects the sum of other variables.  $R_j$  is the sum of column  $j$ , which represents the variable  $j$ , and is the result and the sum of affected by other variables. Then, the Prominence ( $D+R$ ) and Relation ( $D-R$ ) are calculated, the results are shown in table 2:

Table 2 Prominence and Relation

Factors	$D_i$	$R_j$	Prominence( $D+R$ )	Relation( $D-R$ )
s1	0.0369	0.0000	0.0369	0.0369
s2	0.0588	0.0000	0.0588	0.0588
s3	0.1460	0.0544	0.2004	0.0915
s4	0.1821	0.0749	0.2570	0.1072
s5	0.1408	0.0825	0.2232	0.0583
s6	0.0784	0.0825	0.1609	-0.0040
s7	0.1359	0.3545	0.4904	-0.2186
s8	0.0487	0.1601	0.2088	-0.1115
s9	0.0790	0.2409	0.3200	-0.1619
s10	0.0825	0.1228	0.2053	-0.0403
s11	0.3480	0.0000	0.3480	0.3480
s12	0.0648	0.0000	0.0648	0.0648

5. Draw causal diagram. The average value of  $D+R$  at ordinate intersection is 0.2145, and that of  $D-R$  at abscissa intersection is 0.0191. A causal diagram is drawn as follows Figure. 3:

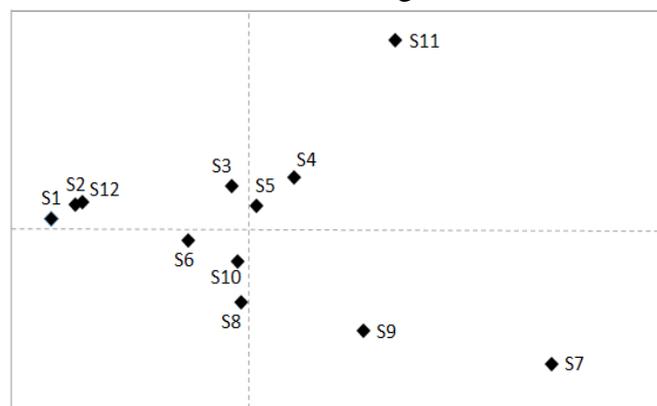


Figure 3. Causality diagram

## Results and Discussions

Through ISM analysis, it can be seen Figure 2 that the most basic risk factor is the macro environment, and the next layer of risk factors are business environment and entrepreneurial experience, and these two factors affect each other. The risk factors at the third level include entrepreneurial team and entrepreneur's ability to organize and innovate, all of them are in interaction. Many factors are grouped at the second level, including incubation platform construction, entrepreneurship education support, venture capital support, entrepreneurial resource mastery, entrepreneurial resource mastery and network resources, and these factors have an interplay relationship. The risk factor at the highest level is entrepreneurial motivation. From the perspective of entrepreneurial results, college students' entrepreneurial motivation and entrepreneurship are deeply influenced by the external environment, their own ability and resources. Secondly, in order to reduce the risk of college students' entrepreneurship, the government must first create a good business environment. Colleges and universities must be able to provide entrepreneurial experience, including lectures by entrepreneurial seniors, popularization of various practical teaching courses and applicability, and participation & visit of entrepreneurial platforms. Then, colleges and universities must open more innovative and entrepreneurial courses, provide more innovative and entrepreneurial training, and enhance the function of the entrepreneurial platform to attract more students to participate. At the same time, more entrepreneurial competitions shall be held to enhance the recruitment and team organization and planning ability of college students. Of course, not all risks can be effectively avoided through the government's support for entrepreneurs or some initiatives by colleges and universities. This requires college students to have

good quality and the spirit of continuous improvement, continuously gain valuable entrepreneurial experience in practice and their experience, so as to find the most suitable business model.

Through DEMATEL method, this paper analyses the influence factors on college students' entrepreneurship, and it has been seen that the macro environment, business environment, incubation platform construction, entrepreneurship education support, venture capital support, network resources and entrepreneurial experience belong to causal factors; the entrepreneurial resource mastery, entrepreneurship team, entrepreneur organization, innovation ability, entrepreneurial motivation, and entrepreneurial expertise are biased towards the outcome factors. According to the causal map of Figure 2, the driving factors include macro-environment, business environment, incubation platform construction and entrepreneurial experience; The core factors include entrepreneurship education support, venture capital support and personal resources; independent factors include entrepreneurial resource mastery, entrepreneurial organization, innovation ability and entrepreneur's professional knowledge; the affected factors include entrepreneurial team and entrepreneurial motivation. Therefore, in order to enhance the success of college students' entrepreneurship, the government should firstly establish good macro environment and business environment; colleges and universities should strengthen the construction of the primary incubation platform and provide training to strengthen the entrepreneurial experience of college students; Secondly, the government and colleges can provide certain venture capital support; and popularize various entrepreneurship education courses, lectures, visits and competitions, etc., this not only strengthens the entrepreneurial ability of college students, but also enables students to accumulate their contact resources in the process. And, college students are still a group of people with less subjective consciousness, so they will be affected to some extent by the surrounding environment. Through the strengthening of the causal factors, it can also enhance the reinforcement of the result factors, such as motivating the motivation of college students to start entrepreneurship, and strengthening the enhancement of their own ability, so as to get better results.

## Conclusion

This study uses ISM to classify risks affecting college students' entrepreneurship, the higher the level, the more the factor is affected and the greater the risk, and, the right steps to avoid risk are obtained. At the same time, the DEMATEL method is used to analyze the mutual influence of the factors affecting college students' entrepreneurship, so as to find the key factors affecting college students' entrepreneurship, and fundamentally improve the chances of success to college students' entrepreneurship. Based on the research results, some specific suggestions should be made by the government and universities, as well as college students. However, due to limited research conditions, some research limitations are inevitable. For example, whether the 12 factors in this study are complete? Secondly, most of the students selected in the questionnaire survey are students at school, they lack entrepreneurial experience, and cannot accurately grasp the interrelationship between factors. And the research objects are limited to Xiamen University Tan Kah Kee college, the representation to all colleges and universities is still insufficient, and more extensive investigations are needed in the future. Finally, the method of public decision making is still not scientific enough, and the integrated application of fuzzy theory is a further research direction in the future.

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