Success Factors of Youth Entrepreneurship Projects based on Fuzzy Analytic Hierarchy Method on the Example of Kazakhstan

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Abstract: The article discusses the different factors that contribute to the success of youth entrepreneurship projects. The research conducted was a systematic review of various research articles that involved the use of keywords such as "youth entrepreneurship", "youth entrepreneurship success", and "entrepreneurial intention". The systematic review helped in categorizing the factors into major groups or areas of influence that affect the success of youth entrepreneurship. These factors have been categorized into five groups based on their role in the creation of such projects. The groups include young entrepreneurs, government, business environment, educational organizations, and the financial sector. Each group consists of 7 to 10 factors that impact the development and successful implementation of a young entrepreneur's project. Although the government, educational organizations, financial sector, and business environment are all important factors that affect young entrepreneurs, a recent review has shown that it is also important to study the personal characteristics of these individuals. This is because many of the traits that lead to success in entrepreneurship develop at a young age, before someone even begins their entrepreneurial journey. The article aims to build a list of important factors based on the group "young entrepreneurs " and role in the project's creation. Using the fuzzy analytic hierarchy method, the article identifies the crucial factors for the development of youth entrepreneurship projects in the "Young Entrepreneur" group. These factors include cognitive capital, non-cognitive capital, human capital, entrepreneurial intentions, family support/help in running the business, and availability of a business plan.

Keywords: youth entrepreneurship; youth entrepreneurship development factors; fuzzy analytical hierarchy method

1 Introduction

Entrepreneurship among the youth is a crucial factor for the growth of the economy. However, despite the awareness of the significance of promoting entrepreneurial ideas among the young generation, there are numerous obstacles and challenges that they face in the labor market, as well as in initiating their own businesses.

In addition, the general labor market conditions are closely linked to the challenges young people face in the world of work. Such conditions include unemployment, redundancy in a financial and economic crisis, graduates of an education organisation with no work experience, low wages in the company [1] [2].

It's becoming increasingly important for young people to take control of their own employment opportunities, especially since there's a lack of jobs available in established businesses and companies. Through starting their own companies and pursuing entrepreneurial activities, young people can create their own employment and take control of their future. This is something that is widely acknowledged by academics, researchers, practitioners, and government officials alike, as sustainable entrepreneurial companies are crucial for boosting the economy, decreasing unemployment rates, and generating new jobs [3].

There are three primary support groups for youth entrepreneurship, namely educational organizations, the state, and the business environment. [4] [5]. It has been identified that each group plays a distinct role and has a specific level of involvement in the various stages of a successive business start-up process. To ensure success, it is important to adopt a detailed project-based approach at all stages of building an initial entrepreneurial business [6].

1.1 Impact of Labour Market Programme on Entrepreneurial Intentions among Young People

It's worth noting that the UN General Assembly has adopted several resolutions aimed at addressing youth unemployment on a global, national, and local level. These resolutions have helped promote youth employment and encourage the development of National Programs that support youth entrepreneurship. Additionally, they have played a key role in strengthening the Secretary-General's network on youth employment [7].

The governments of many countries, both developed and developing, are striving to encourage the younger generation to take up entrepreneurship. Despite the efforts of governments, the private sector in the European Union, the tools and programs developed have not had an unambiguous impact on the business development of young entrepreneurs [8]. Programs such as entrepreneurship training; advisory services, mentoring and practical skills; micro-financing projects, interest-free loans and grants should be a factor for the successful development of youth entrepreneurship [9].

Currently, youth entrepreneurship is not singled out as a separate area of state policy in the Republic of Kazakhstan. However, there are certain support measures for young entrepreneurs in the country. In accordance with the Law of the Republic of Kazakhstan dated 9 February 2015 No 285-V "On State Youth Policy", youth is defined as "citizens of Kazakhstan aged 14 to 29". In addition, the Decree of the Government of the Republic of Kazakhstan dated 24 December 2019 No 968 "On Approval of the State Program for Business Support and Development "Business Roadmap-2025" uses the term "young start-up entrepreneur" defined as an individual entrepreneur under the age of 29 (inclusive).

Kluev et al. [10] conducted a systematic review of active labor market programs that targeted youth employment, entrepreneurship development, technical and business skills training across 31 countries. The study revealed that entrepreneurship development programs are more effective in comparison to youth employment programs. Interestingly, when comparing countries at different income levels, it was found that entrepreneurship development programs are more successful in low-income countries.

Various government agencies, business companies, and financial institutions have initiated and developed programs to promote youth entrepreneurship in Africa [11].

However, despite the wide range of programs and projects to support youth entrepreneurship on the African continent, there is still a low-level of youth employment in entrepreneurial ventures. Researchers point to several reasons for this, including poor program implementation due to inadequate management of existing programs and low or no system of supervision and monitoring.

1.2 Business Environment in the Development of Youth Entrepreneurship

Support for young entrepreneurs can have an individual and a collective focus.

The individual orientation includes provision of access to workspaces or business incubators; mentoring or coaching by experienced professionals; training courses on developing business ideas, starting a business, managing a business and improving company efficiency and productivity [8] [12]. The collective aspect of support for young entrepreneurial businesses should be directed by public, quasi-public and private organizations, such as universities, specialized sector companies and organizations and others. Their actions should focus on creating a cooperative environment between small and large enterprises. This approach would enable small enterprises in their early stages to develop their business at the lowest possible cost.

1.3 Influence of Educational Organization on the Success of Youth Entrepreneurial Initiatives

Research conducted in Africa has found a weak relationship between the level of education (vocational training) and youth entrepreneurship development [13] [14]. The most important factor for successful youth entrepreneurship is the level of knowledge and skills of an entrepreneur in starting and managing a business, obtained by taking special courses and training. A successful business project requires a highly viable business idea, knowledge, and skills to build a sustainable business [15] [16].

Higher education institutions can play a crucial role in fostering youth entrepreneurship. In [17] the creation of student spin-off companies at universities in Brazil is studied. The survey conducted among young entrepreneurs involved in the actual business process revealed the significant role of incubated company organization in increasing entrepreneurial intentions.

A study [18] investigated the effect of entrepreneurial courses on the entrepreneurial intentions of students at the University of Malaga in Spain. The study adopted the components of the Theory of Planned Behavior model. The study found that a large number of entrepreneurial courses positively affected students' entrepreneurial intentions and self-efficacy (purposefulness, sovereignty) [19].

There is a mismatch between the knowledge and skills provided by the higher education system and those required in the labor market, leading to low levels of employability and entrepreneurial culture among young people [20] [21] [22] [23].

1.4 Financial Sector Support to Youth Entrepreneurship

Financial support for projects plays a crucial role in determining the success of youth entrepreneurship. [24].

According [25], determining the factors or criteria for the development of an entrepreneurial business project depends on several conditions. However, results of measuring entrepreneurial success can be ambiguous. For instance, the age groups of people considered and the industries in which entrepreneurial initiatives emerged can affect the results.

The assessment of the impact of the social business fund, a new support tool for youth entrepreneurship, on entrepreneurial income and costs has been conducted. [26]. The study used the propensity score matching method. However, this method has a disadvantage in that it overlooks the influence of unobserved variables on the outcome.

1.5 Entrepreneurial Intention and Personality Characteristics of a Young Entrepreneur

An important area of research in inculcating the entrepreneurial spirit is studying the students' attitude towards entrepreneurial activity. It has been found that the decisive factors of entrepreneurial intentions of undergraduate students are personal attitude, perceived behavioral control, and perceived relational support [27] [28] [29]. The perception of the benefits, satisfaction, and attractiveness of entrepreneurial activity by students is reflective of their personal attitude.

In addition, the innovativeness of a small business plays an essential role in its growth and sustainability. There is a significant correlation between intellectual capital and firm performance [30]. The study highlights that human and organizational capital, which are the two components of intellectual capital, have a positive impact on organizational performance through innovation.

A study on the impact of personality traits on entrepreneurial intention among Turkish university graduate students was conducted [31]. The research considered cognitive traits of future entrepreneurs such as locus of control, risk-taking, achievement needs, and entrepreneurial readiness.

In addition to contributing to the success of entrepreneurship, it has been found that the entrepreneurial intentions of young individuals play a crucial role. A recent study has identified four different subspecies of entrepreneurial intention [32]. These include pure intentions, self-determined intentions, entrepreneurial

determination, and a focus on entrepreneurial tasks and outcomes expressed through commitment and initiative.

The researchers utilized various methods to assess the four subspecies of entrepreneurial intention, which included a modified Delphi method and exploratory factor analysis with the Fleiss kappa index and the content validity index. It is suggested further research could focus on expanding the subspecies of entrepreneurial intention [33].

There are certain indicators that define an aspiring entrepreneur, which include:

1) Human capital – this refers to the existing knowledge and skills of the entrepreneur;
2) Social capital – this pertains to the existing relations with society;
3) Cognitive capital – this encompasses the psychological traits and behaviors of the entrepreneur, such as risk perception, cognitive thinking, high-level of information collection and processing, confidence and determination, forecasts and desires.

The impact of different indicators and their combinations on the success of a new entrepreneurial venture was studied, and the results showed that cognitive capital had a significant impact on the success of the business when considered both individually and in combination. On the other hand, human and social capital were found to have a negligible influence. However, even if the levels of human and social capital are low, entrepreneurial success can still be achieved if the cognitive indicator has high values.

Oktavio A. et al. [34] investigated cognitive characteristics such as creativity, passion, and alertness that significantly influence entrepreneurial intentions and behavior. This model was tested by gathering data from a panel study of entrepreneurial dynamics.

A study [35] found that the components of the model of planned behavior theory, entrepreneurial education, self-efficacy, motivation, and entrepreneurial intention all have mutual influence among Chinese students. The study usedstatistical processing methods using the SPSS package.

In modern psychology science, the basic "Big Five" personality traits or components of non-cognitive capital play an important role in entrepreneurial intention [36]. The development of an entrepreneurial personality profile (non-cognitive capital) is influenced by the orientation of young people at an early age to acquire a variety of skills (educational and work skills), which in turn is a precursor to entrepreneurial intention [37]. However, when comparing gender development [38] also found different results in entrepreneurial intention between men and women in adulthood.

Researchers [39] constructed a new, integrated model of entrepreneurship called the Entrepreneurial Personality System, where two strands of personality characteristics, the "Big Five" personality profile and elements of a specific entrepreneurial profile, are combined. The research was conducted on three national projects in Germany, Australia, and the United States and showed, in general, the influence of cognitive and non-cognitive personality traits on entrepreneurial intention. However, the dependence between the components of these personality traits led to different results. The study also highlighted the different effect of educational courses on entrepreneurial intention.

Maheshwari and co-authors [40] conducted a review of articles published between 2005 and 2022, exploring the factors that influence students' entrepreneurial intentions. The review found that many of the articles studied the influence of cognitive factors and components of the theory of planned behavior model on entrepreneurial intention. Based on the research, the authors developed a conceptual model of factors that were categorized into seven groups: cognitive, personal, social, environmental, contextual, demographic, and educational.

Based on this review, the research problem can be formulated as follows: What are the factors that influence the success of young entrepreneur's projects in the creation of their company? To answer this question, it is necessary to classify these factors into groups (directions). The research was based on a systematic review of research articles using the keywords "youth entrepreneurship", "youth entrepreneurship success", and "entrepreneurial intention". The systematic review led to a categorization of factors into major groups or areas of influence of factors on youth entrepreneurship success. Despite the importance of the government, educational organization, financial sector and business environment, the systematic review prompted a more in-depth study of the personal capital of the young entrepreneur. This is because these factors emerge in a young person at an earlier age before he or she engages in entrepreneurship.

The next research step is to identify the most significant (effective) factors within the group so that young entrepreneurs can pay special attention to them. The problem also lies in the choice of a method for identifying effective factors.

2 Methodology

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The purpose of the study is to identify the factors that contribute to the success of youth entrepreneurship projects and to classify them into specific groups. This classification will lead to a more systematic consideration of the problem. In order to achieve the goal, the following tasks were set:

- to propose a classification of success factors of youth entrepreneurship projects in the context of groups, for which their role in supporting initiatives among young people is designated.;

- to analyze the methods of determining the essential factors from the set of available factors and to choose one of them, with the help of which to determine the important factors in one of the groups.

To achieve the above objectives, a review of articles that explore the factors or criteria for youth entrepreneurship development was conducted. The paper used the literature study method in descriptive analysis to receive more detailed results. Based on the identified factors, they were classified into groups such as Young Entrepreneurs, Government, Business Environment, Educational Organizations, and Financial Sector. The classification is presented in Table 1.

It appears that the table provides a non-exhaustive list of factors that can contribute to the development and success of entrepreneurial projects among young people. However, further research is needed in order to complete this list. According to the article, the first part of the research is focused on determining the existing and investigated factors of entrepreneurial success, while the second part is dedicated to examining the measurements and methods for identifying criteria or factors of entrepreneurial success. The methods are specifically designed to identify the most important factors of entrepreneurial success, which can vary depending on the industry and sector of the economy in which the young entrepreneur wishes to start a business.

Table 1.

Classification of factors by group

№	Factor groups	Factors	
1	**Young entrepreneurs**	1) Business experience 2) Qualifications 3) Business plan	6) Human capital 7) Social capital 8) Cognitive capital

		4) Availability of initial capital 5) Support or help from family in running the business	9) Non-cognitive capital 10) Entrepreneurial intentions
2	**Government**	1) Law on youth policy 2) State youth entrepreneurship support program 3) System of informing youth about existing support programs 4) Special grants	5) Special subsidies 6) Special infrastructure 7) Support for cooperation between education organizations and industry
3	**Business environment**	1) Business mentoring 2) Business incubators 3) Courses on business idea development and business start up 4) Association of entrepreneurs 5) Cooperation between small and large companies	6) Establishment of non-bank financial institutions 7) Business angels (sponsors) 8) Assistance in gaining credibility on the market
4	**Educational Organizations**	1) Educational programs in universities and vocational colleges 2) Disciplines on entrepreneurship 3) Special disciplines on entrepreneurship at HEIs and vocational colleges; 4) Student organizations;	5) Partnership of educational organizations and business environment 6) Dual degree programs 7) Creation of student spin-off companies 8) Long-term relationship with alumni of student spin-off companies
5	**Financial sector**	1) Social business fund 2) Flexible micro-financing system for young entrepreneurs 3) Facilitated collateral system 4) Concessional lending system	5) Targeted financial education courses 6) Advisory services 7) Incentive scheme

Source: author's work based on a review

The article mentions that researchers have used various methods and tools, such as surveys and questionnaires, to determine how different factors can affect entrepreneurial success or development.

A study conducted [41], it was found that there is a strong correlation between entrepreneurial success and motivation to succeed. The study used various scales and questionnaires, such as the Entrepreneurial Success Questionnaire and the Overall Self-efficacy Scale, to measure this relationship.

Another study [42] used the structural equation method to examine the influence of individual motivations on entrepreneurial success. Meanwhile [43] also conducted a study, which used partial least squares analysis to explore the impact of creative thinking ability and innovation on entrepreneurial success.

In their paper, the authors propose the use of the analytical hierarchical process method and fuzzy analytical hierarchical process method to identify significant factors among all existing factors that affect entrepreneurial success. The reason we chose this method is because the questionnaire survey provides us with a qualitative assessment of factors. However, for a more in-depth data analysis, quantitative indicators are required. Factors are complex and may consist of several components. The overall assessment is obtained by either summing up the scores obtained through various methods or by summing up the answers of respondents who evaluate their attitude to the factors. However, this approach has the drawback of analyzing factors with a different scale or unit of measurement of their assessment, which may result in loss of information and erroneous results. An expert survey was conducted among 47 entrepreneurs who started their businesses in the field of transport services and tourism.

2.1 Method of Fuzzy Analytical Hierarchy Process

Many different types of fuzzy methods are used in various fields. Some popular methods include the Triangular Chang method, the Delphi fuzzy method, the Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS), Data Envelopment Analysis (DEA), as well as multi-criteria aggregation methods such as Fuzzy AHP, AHP-PROMETHEE, Dematel, among others [44] [45] [46] [47] [48].

According to the paper's objective, we have decided to shift our focus from T. Saaty's analytical hierarchy method to the fuzzy hierarchy analysis method. The latter will provide us with a more precise assessment of the "importance" of the factors in question.

One of the disadvantages of the analytic hierarchy method is that it can only handle clear expert judgments. This significantly narrows the application of this method in cases where there is incomplete information about the objects under study. To eliminate uncertainty and incompleteness of information on the studied factors, the method of fuzzy analytical hierarchy is applied.

To begin with, let us take a brief theoretical overview of both the analytic hierarchy methods and the fuzzy analytic hierarchy method.

The first step of the process involves constructing a matrix of pairwise comparisons, denoted as $A = (a_{ij})$, using expert judgment. This is done using the analytic hierarchy method, as explained in [49]. The matrix of pairwise comparisons is as follows (1):

$$A = (a_{ij}) = \begin{matrix} a_{11} & a_{12} & \dots & a_{1n} \\ a_{21} & a_{22} & \dots & a_{2n} \\ a_{n1} & a_{n2} & \dots & a_{nn} \end{matrix} \quad (1)$$

It is worth noting that in the matrix of pairwise comparisons (1), the value of the element a_{ij} indicates the relative significance of the ***i***-th element (factor) in relation to the ***j***-th element (factor). The AHP matrix is obtained by expert judgment on the basis of pairwise comparisons of factors. The values of the elements of the AHP matrix show the comparative evaluation (superiority or vice versa) of two factors among themselves. This value is determined using the T. Saaty scale [49].

We transition from the analytical hierarchy method to the fuzzy hierarchy analysis method next.

To proceed with Step 2, you need to use the data from the pairwise comparison matrix (1) and construct a fuzzy pairwise comparison matrix (2) where the matrix's dimension is [n x 3n] [49] [50]:

$$\tilde{A} = \tilde{a}_{ij} = \begin{pmatrix} (1,1,1) & (l_{12}, m_{12}, h_{12}) \cdots & (l_{1n}, m_{1n}, h_{1n}) \\ (l_{21}, m_{21}, h_{21}) & (1,1,1) \cdots & (l_{2n}, m_{2n}, h_{2n}) \\ (l_{n1}, m_{n1}, h_{n1}) & (l_{n2}, m_{n2}, h_{n3}) \cdots & (1,1,1) \end{pmatrix} \quad (2)$$

Phasification is the process of translating one crisp number into a group of fuzzy numbers, which will result in the fuzzy pairwise comparison matrix.

To construct the fuzzy pairwise comparison matrix, we utilize the triangular scale for translating the fuzzy numbers from Table 2, which presents a triangular scale for fuzzy number translation.

Table 2

A triangular scale for fuzzy number translation

T. Saaty scale	**(l_{ij}, m_{ij}, h_{ij}) if a_{ij} integer in matrix (1)**	**(l_{ij}, m_{ij}, h_{ij}) if a_{ij} – a non-integer number in matrix (1)**
1	(1,1,1)	(1,1,1)
3	(1,3/2,2)	(1/2,2/3,1)
5	(3/2,2,5/2)	(2/5,1/2,2/3)
7	(2,5/2,3)	(1/3,2/5,1/2)
9	(5/2,3,7/2)	(2/7,1/3,2/5)
2,4,6	(1/2,1,3/2)	(2/3,1,2)

To perform step 3, you need to carry out a straightforward calculation of the sum of fuzzy numbers (l, m, h) on the rows of matrix A tilde according to equation (3) [50]:

$$\left(\sum_{j=1}^{n} l_{ij}, \sum_{j=1}^{n} m_{ij}, \sum_{j=1}^{n} h_{ij}\right), \qquad i = \overline{1,n}; \quad (3)$$

This will give you a new matrix $\widetilde{A1}$ of dimension (n,3), where row (n+1) determines the sums for each column.

Once you have the new matrix, you can proceed to step 4 where you calculate the normalized weights of fuzzy row sums using equation (4) [51]:

$$\widetilde{S_i} = \left(\frac{\sum_{j=1}^{n} l_{ij,}}{\sum_{j=1}^{n}\sum_{j=1}^{m} h_{ij}}, \frac{\sum_{j=1}^{n} m_{ij,}}{\sum_{j=1}^{n}\sum_{j=1}^{m} m_{ij}}, \frac{\sum_{j=1}^{n} h_{ij,}}{\sum_{j=1}^{n}\sum_{j=1}^{m} l_{ij}}\right), i = \overline{1,n;} \quad (4)$$

Moving on to step 5, we will now proceed to the defuzzification process, which converts the fuzzy set of numbers into a crisp number by following the guidelines set in equations (5), (6), and (7)

$$X_{max}^{1} = \frac{l+m+h}{3} \quad (5)$$

$$X_{max}^{2} = \frac{l+2m+h}{4} \quad (6)$$

$$X_{max}^{3} = \frac{l+4m+h}{6} \quad (7)$$

Step 6 requires us to construct a new matrix of defuzzification weights, which is denoted as A^d by using equation (8).

$$a_{ij}^{d} = \max\{X_{max}^{1}; X_{max}^{2}; X_{max}^{3}\} \quad (8)$$

Determining the weights for each factor is crucial as it allows the researcher to prioritize which factors will have a greater impact than others. Without this step, it would be difficult to determine the relative importance of each factor in the decision making process.

3 Results

Based on the results of the study, it was found that identifying the most significant factors is crucial for young entrepreneurs aged 20 to 25. The study involved in-depth interviews and questionnaires with 47 young entrepreneurs who started their projects from the student bench in various fields. The fuzzy hierarchy method was used to analyze the data, and the results were evaluated by experts using Saaty's method.

Step 1. The expert assessment of the factors for the "Young Entrepreneur" group is summarized in the matrix of paired comparison and presented in Table 3.

Step 2: Table 4 shows only a part of the matrix of pairwise comparisons, which is constructed from the fuzzy matrix of pairwise comparisons. This is due to the matrix's large dimensionality.

Table 3
Expert evaluation of the "Young Entrepreneur" group

№	Factors	Availability of a business plan	Business experience	Qualifications	Support or help from family in running the business	Human capital	Cognitive capital	Non-cognitive capital	Availability of initial capital	Entrepreneurial intentions	Social capital
1	Availability of a business plan	1	5	5	2	4	6	0,333	5	4	5
2	Business experience	0,2	1	3	0,2	0,2	0,333	0,2	3	0,111	3
3	Qualifications	0,2	0,333	1	0,2	0,2	0,2	0,143	3	0,143	3
4	Support or help from family in running the business	0,5	5	5	1	3	0,2	0,2	7	6	7
5	Human capital	0,25	5	5	0,333	1	3	7	7	4	7
6	Cognitive capital	0,167	3	5	5	0,333	1	6	9	5	9
7	Non-cognitive capital	3	5	7	5	0,143	0,167	1	7	5	7
8	Availability of initial capital	0,2	3	0,333	0,143	0,143	0,111	0,143	1	0,2	3
9	Entrepreneurial intentions	0,25	9	7	0,167	0,25	0,2	0,2	5	1	7
10	Social capital	0,2	0,333	0,333	0,143	0,143	0,111	0,143	0,33	0,143	1

Table 4
Fuzzy matrix of pairwise comparisons (excerpt)

Factors	Availability of a business plan			Business experience		
Availability of a business plan	1	1	1	1,5	2	2,5
Business experience	0,4	0,5	0,667	1	1	1
Qualifications	0,4	0,5	0,667	0,5	0,667	1
Support or help from family in running the business	0,667	1	2	1,5	2	2,5
Human capital	0,667	1	2	1,5	2	2,5
Cognitive capital	1	1,5	2	1	1,5	2
Non-cognitive capital	1	1,5	2	1,5	2	2,5
Availability of initial capital	0,4	0,5	0,667	1	1,5	2
Entrepreneurial intentions	0,667	1	2	2,5	3	3,5
Social capital	0,4	0,5	0,6667	0,5	0,667	1

Source: Developed by the authors based on [50] [51]

Table 5 is obtained by finding the sum of fuzzy numbers on the rows of the fuzzy pairwise comparison matrix according to equation (3), which is Step 3 of the process.

Table 5

Sum of fuzzy numbers

	Factors	**l**	**m**	**h**
1	Availability of a business plan	9,7	13,7	18,5
2	Business experience	6,4	8,5	11,1
3	Qualifications	5,8	7,5	9,7
4	Support or help from family in running the business	11,0	14,5	18,8
5	Human capital	12,7	16,7	21,5
6	Cognitive capital	13,5	17,7	22,0
7	Non-cognitive capital	13,5	17,4	22,0
8	Availability of initial capital	5,6	7,2	9,2
9	Entrepreneurial intentions	11,8	15,0	20,3
10	Social capital	4,5	5,4	7,1
	TOTAL	94,4	123,5	160,2

Source: Developed by the authors based on [50] [51]

In Step 4 of the process the normalized weights of line sums of the fuzzy numbers are calculated by equation (4).

Based on the defuzzification process, fuzzy numbers are converted into crisp numbers using equations (5), (6), and (7). The resulting crisp numbers are then presented in Table 6.

Table 6

Crisp numbers

	Factors	$\mathbf{X^1_{max}}$	$\mathbf{X^2_{max}}$	$\mathbf{X^3_{max}}$	**Maximum weight**	**Residual weight**
1	Availability of a business plan	0,1224	0,1194	0,1165	0,1224	**0,1117**
2	Business experience	0,0753	0,0737	0,0721	0,0753	0,0688
3	Qualifications	0,0663	0,0648	0,0634	0,0663	0,0605
4	Support or help from family in running the business	0,1285	0,1257	0,1229	0,1285	**0,1173**
5	Human capital	0,1473	0,1442	0,1411	0,1473	**0,1344**
6	Cognitive capital	0,1535	0,1509	0,1483	0,1535	**0,1401**
7	Non-cognitive capital	0,1528	0,1498	0,1468	0,1528	**0,1394**

8	Availability of initial capital	0,0637	0,0623	0,061	0,0637	0,0581
9	Entrepreneurial intentions	0,1369	0,133	0,1292	0,1369	**0,1249**
10	Social capital	0,049	0,0478	0,0465	0,049	0,0448
				Total	1,0956	

In step 6, the maximum defuzzification weights in each row of the resulting matrix are found using formula (8), as shown in Table 6. The residual weight is defined as the ratio of the maximum value of the weights to the sum of the maximum defuzzification weights for all factors.

4 Discussion

The discussion of the results reveals that the most important factors have the highest residual values. Specifically, Table 9 indicates that the most significant factors in the Young Entrepreneur group were Cognitive Capital, Non-cognitive Capital, Human Capital, Entrepreneurial Intentions, Support or help from family in running the business, and Availability of Business Plan.

The findings from the research reinforce the significance of equipping young entrepreneurs with psychological readiness to tackle risks, aptitude to acquire new skills, manage large amounts of data, and possess confidence and determination.

Conclusion and recommendation

The importance of fostering youth entrepreneurship cannot be overstated, as it plays a significant role in boosting the economy and reducing unemployment rates. Recognizing this, many governments, companies, business environments, and educational institutions have started paying more attention to developing creativity, initiative, independence, innovativeness, and entrepreneurship among young people. While extensive research has been conducted to identify criteria and factors for successful entrepreneurship among young entrepreneurs, it is essential to identify the most important factors that determine entrepreneurial success.

This paper delves into the factors of youth entrepreneurship that contribute to its development and success. The factors are classified into groups, and various methods of identifying significant factors are explored. The researchers carried out an analytical hierarchical process method and fuzzy analytical hierarchical process method to identify the most important factors in the "Young Entrepreneur" group. Similar research will be conducted on other groups of factors among young entrepreneurs in various sectors of the economy.

It is worth noting that the success factors of young entrepreneurs' projects may differ across fields and activities. In other words, the most important factor for a particular project may not be as crucial for another project. Therefore, this study needs to be

continued, and more in-depth research is required to identify the most critical factors that contribute to the success of youth entrepreneurship.

Future research is expected to apply various modified decision making methods as well as expand the success factors of youth entrepreneurship.

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