

# Analysis of Success Factors of Technology Based Entrepreneurs

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**Abstract:** As the need for technological start-up grows, there are more and more entrepreneurs seeking to start a business based on technology. However, many risk factors exist for technology-based start-up. In this study, we analyze the success factors suggested by successful entrepreneurs in advance, and suggest ways to increase the success rate of technology commercialization to entrepreneurs. To do this, we analyze the success factors of existing researches, derive core success factors, and propose implications by analyzing the priorities of success factors using AHP (Analytic Hierarchy Process). AHP is a very flexible decision-making method that accepts subjective and objective evaluation factors, and can be usefully applied to the weighting or importance of analytical factors by using the qualitative knowledge of experts in decision making field which is difficult to quantify. As a result of AHP analysis, success factors of start-up were relatively high in order of products and technologies, start-up environments, entrepreneur characteristics, start-up management strategies. The products and technologies sub-factors have a high priority to provide differentiation and value. We look forward to seeing steadily rising technology entrepreneurs prioritize entrepreneurial success factors that existing entrepreneurs think.

**Keywords:** Analytic hierarchy process, Technology based entrepreneurs, Success factors, Start-up, Consistency rate, Relative weight

## I. INTRODUCTION

Since the global financial crisis, major countries in the world have recognized the importance of creation for resolving the economic downturn and proposed it as the main policy of the government. In Korea, creative ideas of the people are combined with science and technology to create new markets, and the creation economy to overcome the recession through the creation of high quality jobs is presented as the first goal of the national government. In particular, it emphasizes the activation of technological entrepreneurship, which is the core growth engine of the creative economy[1].

The reason for emphasizing the importance of entrepreneurship is that technology based startup can be an alternative to solving this problem when job creation by large corporations reaches its limit and growth without employment continues. In fact, the employment growth rate of companies with sales over 100 billion won is three times that of large enterprises. A study by the American Kaufman Foundation found that two-thirds of the newly created jobs in the United States came from startups in 2007, and the employment creation of technology based startup is significant[2].

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CB insights, a US venture capital research firm, conducted a survey of 101 start-ups that failed in 2014 to identify the top 20 failures of start-ups. The biggest reason for startup failures was that 42% of respondents said that the market produced products and services they did not want. It has been found that many startups fail because of the fact that the quality of products and services do not reach the consumer's level[3]. In order to solve these problems, many researches suggest ways to revitalize technology based startups through analysis of success factors of technology based startups, but research that systematically analyzes success factors is still insufficient.

It is also necessary to develop a method for quantitatively evaluating factors that are important in analyzing the success factors of technology founders. Success Factor Analysis There is an Analytic Hierarchy Process (AHP) as a multi-attribute decision method, which is useful when processing qualitative and quantitative data as well as various complex analysis criteria.

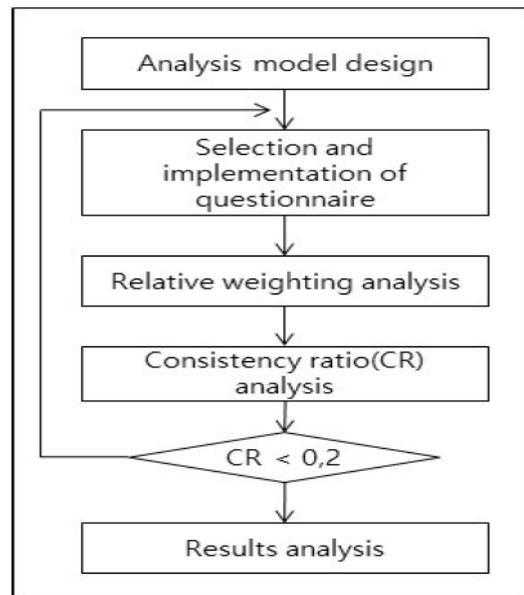


Figure 1. AHP analysis process

In this study, we investigate the success factors of technology based entrepreneurs through literature review of existing researches and derive key success factors and analyze the priorities of success factors using AHP.

## II. LITERATURE SURVEY

In a study on the characteristics of entrepreneurs, Watson et al. [4] classified entrepreneurs into successes and failures and compared the two groups in terms of various aspects. In this study,



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apprenticeship experience, experience of unemployment, possessing skills and management techniques, adaptability to market, leadership, independence were analyzed as success factors. Cho et al. [5] found that the characteristics of entrepreneurs were not a factor in the success of technology startups, but the results are also diverse because researchers have different approaches and characteristics that are considered as variables are very subjective and diverse.

As a research on startup management strategy, Biggadike [6] conducted a study that aggressive market strategy contributes to financial performance such as market share and sales rather than passive market strategy.

As a research on possessed products and technologies, Macmillan et al. [7] pointed out that the organizational skills play a key role in securing competitive advantage and playing a leading role in the market entry of entrepreneurs. Therefore, it was found that securing superior technology has a significant effect on the success of startup companies.

Yang et al. [8] defined technological commercialization capacity of venture firms based on technology as product development ability, productivity ability, and marketing ability, and conducted a study that entrepreneurial capacity influences business performance after having a direct impact on technological commercialization capability in the middle path. Shin et al. [9] selected technology, R & D, and technological competitiveness as success factors and investigated whether their impact on startup firms is significant.

As the research on entrepreneurial environment, Porter [10] stated that startup environment means the overall foundation for entrepreneurs to establish a business, such as favorability of industry and market, government policy support, relaxation of law, and positive atmosphere for startup. Yoon et al. [11] studied the effect of competition intensity and industrial growth rate on firm performance.

In this study, we classify and summarize the success factors that were important in the previous studies as detailed success factors through brainstorming process, and analyze the priorities of success factors using AHP.

## III. EMPIRICAL ANALYSIS DESIGN AND EXPERIMENT

### 3.1 AHP overview

AHP (Analytic Hierarchy Process) is a Multi-Criteria Decision Making Model developed by Saaty as a highly flexible decision-making method that accommodates objective evaluation factors and subjective evaluation factors. It can be applied to the weighting or importance of analytic factors by using qualitative knowledge of experts. The reason why AHP can make decision using qualitative knowledge is that the analysis process itself systematically decomposes the action of the brain (phased or hierarchical analysis) when making human decision. In other words, the human decision making process is based on hierarchical structuring, relative importance setting, and logical consistency maintenance, which is the core theory of AHP [12, 13]

The AHP advantage is to measure the inconsistency index to assess the inconsistency problems that may arise in the process of setting the relative weights. Consistency means that

logical inference errors (A is preferred to B, B is preferred to C, A is preferred to C, but C is preferred to A). Therefore, by measuring the inconsistency index, which is a degree of consistency, it can be confirmed whether the decision maker maintains logical consistency, and the rationality and logic of judgment can be enhanced.

### 3.2 Analysis model and questionnaire design

The priority analysis model used in this study is performed by five analysis processes as shown in [Figure 1]. The five analysis processes are as follows. (1) Defining the factors for analysis, structuring the factors, designing the analysis model to design the questionnaire, and selecting the survey subjects. (2) Selection and implementation phase of survey. (3) Relative weighted analysis step for analyzing relative weights among structured factors based on the survey results. (4) Consistency analysis step that evaluates the results of the survey by the consistency rate (CR). (5) A comprehensive evaluation step that analyzes the model and evaluates the significance of the model through empirical analysis of the evaluation model.

In this study, successful success factors were classified into entrepreneur characteristics, start-up management strategies, products and technologies, and start-up environments, and detailed success factors are summarized in [Table 1].

The questionnaire was designed as [Table 2] and [Table 3] to measure the relative importance between each indicator. In order to measure the relative importance of AHP, a questionnaire that compares the relative importance of success factors at the same level (hierarchy) is created. First, we compare the relative importance of entrepreneur characteristics, start-up management strategies, products and technologies, and start-up environments, and compare the relative importance of each level of success. [Table 4] summarizes the criteria for displaying the preference in pair comparison. [Table 2] shows an example of '1' when there is no significance difference between two success factors (entrepreneur characteristics, start-up environments). [Table 3] is a survey to measure the entrepreneurship and vision of the detailed success factors belonging to the success factor "entrepreneur characteristics". It is an example of indicating that entrepreneurship is preferred rather than vision. The number of these pairwise comparisons is  $nC_2$ , which is designed so that the number of question items is not missing.

We interviewed 33 entrepreneurs who were operating technology companies as a data collection method. AHP analysis was carried out on 30 questionnaires with missing pairs in the double-pair comparison items and 30 non-logistic questionnaires checked by visual inspection.

**Table 1: Classification of success factors and detailed success factors**

Success factors	Detailed success factors
Entrepreneur characteristics	Experience and Career
	Business capability
	Entrepreneurship
	Vision
	Consistency rate



Start-up management strategies	Financing
	Networking
	Marketing
	Employee management
	Consistency rate
Products and Technologies	Differentiation
	No. of technologies
	Providing value
	Technology extension
	Consistency rate
Start-up environments	Government support
	Industry growth
	Market size

**Table2: Questionnaire that measures relative importance between start-up success factors**

Success factor	Rating scale									Success factor
	9	7	5	3	1	3	5	7	9	
Entrepreneur characteristics					√					Start-up environments

**Table3: Questionnaire that measures relative importance between detailed success factors**

Detailed success factor	Rating scale									Detailed success factor
	9	7	5	3	1	3	5	7	9	
entrepreneurship					√					Vision

**Table 4: Preference of pair comparisons**

value	meaning
1	A and B are equally preferred
3	A is weakly favored than B
5	A is strongly more important than B
7	A is much more strongly or demonstrably important than B
9	A is absolutely more important than B

### 3.3 Relative weight and consistency ratio analysis

In order to measure the relative importance of AHP, questionnaires were prepared to compare the relative importance of success factors of the same level (hierarchy) to technology founders. In order to obtain the relative importance of each factor through a pair of comparison matrices based on the geometric average of the groups, we constructed a pair of comparison matrices based on the geometric mean of each individual's questionnaire results. The normalized weights were calculated and arithmetically averaged. The relative weights of success factors were obtained as shown in [Table 5].

The AHP has a device called the Consistency Rate (CR) that can be used to verify the logical consistency of the evaluators' judgments, thereby increasing the reliability of the results. If the respondents responded completely in a paired comparison, the CR would be zero, but in reality it would not be a complete match, and if the CR is usually 0.1 (less than 10%) then the consistency is considered good. And if it is more than 0.2, it is considered inconsistent and needs to be reviewed. In this study, the consistency ratios were 0.086, 0.086, 0.085, 0.062, and 0.092, respectively, for the detailed analysis indicators such as entrepreneur characteristics, start-up management strategies, products and technologies,

and start-up environments. Therefore, it can be seen that the weights of all evaluation indexes are consistent. The consistency ratios of success factors, total coherence ratios, and detailed evaluation indicators are summarized in [Table 5].

**Table 5: The relative weight and consistency ratio of the calculated success factors**

Success factors	weight	Detailed success factors	weight
Entrepreneur characteristics	0.24	Experience and Career	0.24
		Business capability	0.23
		Entrepreneurship	0.27
		Vision	0.26
		Consistency rate	0.087
Start-up management strategies	0.23	Financing	0.26
		Networking	0.24
		Marketing	0.27
		Employee management	0.23
		Consistency rate	0.085
Products and Technologies	0.27	Differentiation	0.28
		No. of technologies	0.22
		Providing value	0.26
		Technology extension	0.24
		Consistency rate	0.062
Start-up environments	0.26	Government support	0.27
		Industry growth	0.24
		Market size	0.26
		Competitor	0.23
		Consistency rate	0.092
Consistency rate	0.086		

### 3.4 Experimental result analysis

To prioritize the relative importance of technology success factors by using AHP technique, the priority of each factor was measured. The results are summarized as follows.

First, technology success factors were relatively high in order of products and technologies (0.27), start-up environments (0.26), entrepreneur characteristics (0.24) and start-up management strategies (0.23). Second, the products and technologies sub-factors have a high priority to provide differentiation and value. In terms of start-up environment, government policy and support and market size were high priorities. Entrepreneur characteristics emphasized entrepreneurship and founder vision. In the start-up management strategies, marketing strategy and current procurement strategy were important.



## IV. CONCLUSION

In this study AHP analysis model which can derive the success factors that are important in technology based start-up from the existing research and analyze it comprehensively is proposed. In the analytical model, we designed the success factors and detailed factors of the technology start - ups, conducted the questionnaire and then performed the relative weight analysis and the consistency ratio analysis.

First, the success factors of the start-up were relatively high in order of products and technologies (0.27), start-up environments (0.26), entrepreneur characteristics (0.24) and start-up management strategies (0.23). The products and technologies of the start-up items were the most important, followed by market-oriented and government-initiated start-up environments. Second, products and technologies have higher priorities in providing differentiation and value. It is consistent with the notion that products and services are differentiated from those of other companies and that the core value to customers is clear and successful. Third, in terms of start-up environments, government policy and support and market size were priorities. When technology entrepreneurs start their business, they have emphasized systems and policies that enable stable start-up through fund-raising and so on. Fourth, entrepreneur characteristics emphasized entrepreneurship and founder vision. It is believed that entrepreneurship is a key characteristic that entrepreneurs should be equipped with creative thinking and action through constant innovation. Fifth, start-up management strategies emphasized marketing strategy and current procurement strategy. It is important to focus on marketing because it is the time to make good quality products and marketing is the most important factor.

These results are consistent with entrepreneur characteristics, start-up management strategies, products and technologies, and start-up environments. . I hope to see the priority of entrepreneurial success factors that existing entrepreneurs think about technology entrepreneurs who have been steadily increasing in recent years.

As in many other previous studies, there was a limit to the representative and sampling methods of the sample. In order to ensure the high accuracy, reliability, and representativeness of the study results, a broader and more accurate sample of the nationwide range in terms of area, age, gender, and technology was required to be selected in selecting successful entrepreneurial entrepreneurs. In subsequent studies, various efforts should be made to obtain correct answers.

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