

# A Study on Impeding Factors of Venture Firms in Daedeok Valley\*

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## 요 약

본 연구는 대덕밸리 벤처기업들의 현황 분석을 목적으로, 벤처 기업들의 CEO들을 대상으로 설문조사를 실시하였다. 이를 토대로 의미미분법을 적용하여 심층 분석해 본 결과, 대덕밸리의 벤처기업들은 대체로 자금조달, 마케팅 전략, 그리고 네트워크에 문제가 있는 것으로 나타났다. 특히, 제한된 자금조달 원천, R&D에 치중한 기업 전략, 낮은 산학연간 협력구도가 핵심 현안문제로 제기 되었다.

**Key words** : Daedeok Valley, venture habitat, high tech venture success factor analysis, venture network, science town

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## I . Introduction

Daedeok Valley was born out of Park Chung Hee's dream of "industrial big push" in the 1970s. As labor-intensive light industries had been fully developed by the late 1960s, the Korean economy faced a crisis of 'industrial deepening,' lacking the vertical integration of industrial structure. To make a strategic breakthrough, the Park regime launched capital-intensive heavy-chemical industrialization in 1973, envisioning a great leap forward (Jeon, 1994-95). For doing so, it was imperative to develop science and technology. Hence the government began to invest in R&D and develop specialized science parks, aiming at nurturing science and technology. Against this background, Daedeok Valley was established in 1973 with a view to laying a solid foundation for R&D and thus to buttressing sustained economic growth. Soon thereafter, Daedeok Valley was full of national research institutes, academies, government agencies, and private institutions.

However, it was not until the financial crisis in the late 1990s that lots of venture firms were housed in Daedeok Valley. The Kim Dae Jung Government(1998-2003) pursued a policy to nurture venture firms as a viable instrument to overcome the financial crisis during 1997-98, providing ventures with generous subsidies and various incentives. Aided by such incentives, a variety of venture firms have been proliferated in Daedeok Valley since 1998. Most venture firms are originated from Electronics and Telecommunications Research Institute(ETRI) and Korea Advanced Institute of Science and Technology(KAIST). At present, the venture firms in Daedeok Valley are about 171, which mainly focus on Information Technology and Bio Technology(Shin, 2004). Daedeok Valley has thus become the leading technology-oriented venture ecosystem where most venture firms are in the stage of 'early growth' and potential venture firms are rapidly developing(Miller, 2003).

The political leadership change in 2003 from Kim Dae Jung to Roh Moo Hyun has, however, led to a policy change regarding venture firms. The new leaders in the Roh Moo Hyun Government focused its policies on "technological innovations." The government is taking "indirect approaches" such as, analysis of key obstacles of venture firms and support

in terms of technological and business aid, to ignite the "second venture boom(MOST, 2004)." The government is planning to drive innovative clusters, cultivate desirable environment for foreign firms to join the innovative clusters, and activate cooperation among the industries, academies, and research institutes(SMBA, 2004a). Korea's administrative capital will be moved to Chungchong province, bio industries will be fostered, and world leading innovative clusters will be formed by designating Daedeok Valley as R&D specialized-zone(Shim, 2004). Hence venture firms are reportedly in serious difficulties especially regarding problems of lack in human resources, limited fund procurement resources, and low sales results(Lee, 2002).

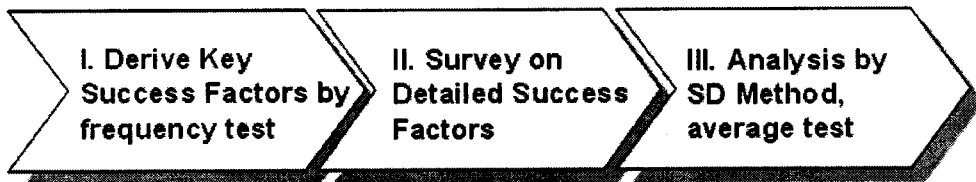
Most studies of venture firms in Daedeok Valley focused on the exogenous or environmental factors that would impede the start-up of venture firms in Daedeok Valley. For example, Seol Sung Su et al(2002) concluded that while fund procurement and human resources were negatively influencing the 'start-up stage', fund procurement and marketing strategy were impeding the 'early stage.'Likewise, Cho(2003) reported that venture firms in Daedeok Valley faced an acute shortage of marketing capabilities, human resources on R&D, and fund procurement. As such, these studies were undertaken from the perspective of external environment and thus unlikely to be helpful to implement a desirable venture ecosystem. Now it is time for venture firms to find out a new way to establish a desirable venture ecosystem, based on an in-depth diagnosis of current situation from their own inner-perspective.

This study is an attempt to figure out a clearer picture of the venture ecosystem in Daedeok Valley. A clear understanding of the impeding factors of venture firms is the first step to take for a viable venture ecosystem in Daedeok Valley and also to explore a strategic roadmap to bring up successful venture firms in general.

## II. Research Method

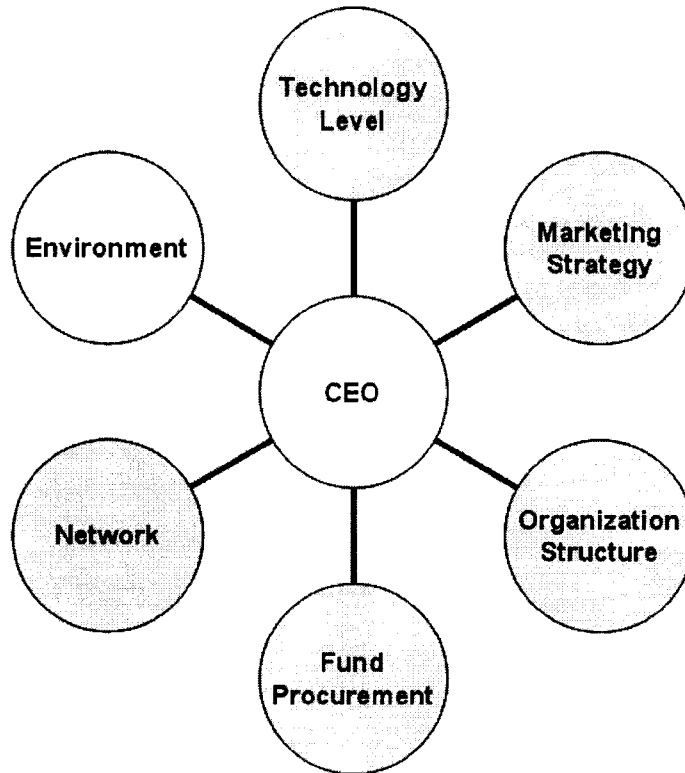
To study the impeding factors of venture firms in Daedeok Valley, randomly sampled firms are surveyed by five key success factorsnetwork, fund procurement, technology level,

organization structure, and marketing strategy. To do so, three-phase approach is taken as Figure 1 shows.



<Figure 1> Three-phase approach

At phase 1, seven key success factors for venture firms, as shown in <Figure 2> are derived by identifying the most frequently used success factors from randomly selected ten published research papers. For instance, Lee and Chang(1998) suggested CEO, industrial environment, strategy, fund procurement, and organization structure to be the key success factors and Park et al(1999) suggested CEO, technology, marketing, organization and human resources, market as key success factors for venturefirms. The detailed procedure is as follows. The papers were randomly sampled, key success factors were sort out, and prioritized by its used frequency. Each success factor was counted only once if it repeatedly appeared in the same paper. The frequency test derived seven key success factors for venture firmsCEO, environment, network, fund procurement, technology level, organization structure, and marketing strategy. However, the environment and CEO factors are excluded from the analysis for the following reasons. Environment is common to all the firms and would have no significant effects on success or failure of a particular firm. The CEO factor is likely to be very important but it is beyond the scope of this study. The CEO factor is dependent on a variety of variables such as personality, leadership style, strategic orientation, characteristics, and so on, all of which are likely to vary from one person to another and wouldbe extremely difficult to be quantified. As a result, five factors are analyzed.



<Figure 2> Seven Key Success Factors

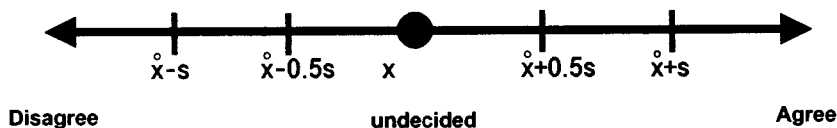
At phase 2, CEOs of randomly selected 21 venture firms are surveyed via e-mail across the five key success factors: fund procurement, technology level, network, organization structure, marketing strategy. E-mail was sent to 123 firms, and received replies from 31 firms. With initial screening, targets showing inconsistency and low confidence level were excluded and 21 firms appeared useful for the study. The survey (See Appendix 1) was composed of eight questions for each key success factor. Our survey covers 21 firms out of total 171 ventures in Daedeok Valley. Therefore, the survey result is substantial for the study on the current situation of venture firms in Daedeok Valley.

At phase 3, the survey result is analyzed. Each key success factor consists of eight detailed success factors which is the component of our questionnaire. Semantic Differential Method<sup>1)</sup> is employed to derive three detailed success factors from each key success factor, which are

the indicators of the current situation of venture firms. The SD Method measures the emotional meaning behind each detailed success factor based on the survey results and derives prioritized factors. Emotional meanings are carefully instilled in the survey questions(See Appendix 1). SAS 8e has been used to derive detailed factors from each key success factor. Lastly, average and standard deviation are drawn out from the raw data and analyzed. T-test is taken for reference.

### III. Factor Analysis of Venture Firms by Key Success Factors

Based on the survey results, key success factors of venture firms are analyzed. First, three detailed-factors are sort out from each key success factor by Semantic Differential Method. Second, the average and mean are taken to analyze the survey results. The survey is in seven point Likert scale. Based on the one sample standard deviation( $s$ ) limit from the sample mean ( $\bar{x}$ ), we interpret the results by the location of the average(See Figure 3). If the average is positively outside the one standard deviation limit, we agree with the detailed factor. If it is between  $\bar{x} + 0.5s$  and  $\bar{x} + s$ , there is a positive bias towards the detailed factor. If the average is negatively outside the limit, we disagree with the detailed factor. If it is between  $\bar{x} - 0.5s$  and  $\bar{x} - s$ , there is a negative bias towards the detailed factor.



<Figure 3> Analysis of survey results

- 1) The semantic differential technique offers a quick and easy, very widely used and reliable method to measure the emotional connotation of concepts. Created by Osgood et al(1957), it has been applied to problems in marketing, clinical psychology, personality measurement, cross-cultural communications(Snider and Osgood, 1969).

As the samples are just a few and cannot be confirmed unbiased, average and standard deviation are used to find out the general trend of the detailed factors. We attach the results of the 90% t-test for reference(See Appendix 3). If the t-value is within the limit, t-test is accepted, and we are undecided regarding the detailed factor. If the t-value is negatively out of limit, t-test is rejected, and the detailed factor has a negative meaning. If the t-value is positively out of limit, t-test is rejected, and the detailed factor has a positive meaning.

## 1. Integrated Key Success Factors

Following are the three detailed-factors sort out from the 32 survey questions of organization structure, technology level, fund procurement, and marketing strategy.

■ Detailed-factor 1: R&D and sales team cooperate with one another for product development and its feedback(Organization Structure).

⇒ The average is within the one standard deviation limit(See Appendix 2). However, the detailed factor is positively biased as the average is in between  $\bar{x} + 0.5s$  and  $\bar{x} + s$ . The analysis shows that R&D and sales team tend to cooperate with one another for product development and its feedback.

■ Detailed-factor 2: Ratio of R&D investment to sales is high.(Technology)

⇒ The average is positively outside the one standard deviation limit(See Appendix 2). This indicates that the CEOs feel like they highly invest on R&D compared to sales.

■ Detailed-factor 3: External Fund is procured smoothly.(Fund Procurement)

⇒ The average is within the one standard deviation limit(See Appendix 2). However, the detailed factor is negatively biased as the average is in between  $\bar{x} - 0.5s$  and  $\bar{x} - s$ . The analysis indicates that the firms feel like having limited external capital sources.

To sum up, R&D and sales team tend to cooperate for product development and external fund is not likely to be procured smoothly. Technology was the most prominent factor sorted

out from the Integrated Factor Analysis. The venture firms in Daedeok Valley highly invest on R&D.

## 2. Organization Structure

Following are the three detailed-factors sort out from the 8 survey questions of organization structure.

- Detailed-factor 1: Decisions are made by low level workers for urgent issues.

⇒ The average is within the one standard deviation limit(See Appendix 2). However, the detailed factor is positively biased as the average is in between  $\bar{x} + 0.5s$  and  $\bar{x} + s$ . It looks like urgent decision making is likely to be carried out by low level workers.

- Detailed-factor 2: Operations are practically influenced by the decisions made.

⇒ The average is positively outside the one standard deviation limit(See Appendix 2). The analysis shows that the decision-making has influence on practical operations.

- Detailed-factor 3: Role and duty are defined clearly.

⇒ The average is within the one standard deviation limit(See Appendix 2). However, the detailed factor is positively biased as the average is in between  $\bar{x} + 0.5s$  and  $\bar{x} + s$ . The firms self diagnose themselves to have clear job specification.

In general, ventures tend to have few decision-making levels, thus providing flexibility, effective communication channels. Therefore, the roles and duties are clearly defined and urgent issues are resolved by low level workers. Furthermore, operations are practically influenced by decision-making. Thus, firms in Daedeok valley tend to have a clear job specification, agility in decision making, and strong operational leadership.



### 3. Technology Level

Following are the three detailed-factors sort out from the 8 survey questions of technology level.

- Detailed-factor 1: Main product has the world's top technology level.

⇒ The average is positively outside the one standard deviation limit(See Appendix 2). The analysis shows that the firms possess the world's leading technology in their main products.

- Detailed-factor 2: Technology is developed and supplied through close cooperation among the industries, academies, and research institutes.

⇒ The average is within the one standard deviation limit(See Appendix 2). However, the detailed factor is positively biased as the average is in between  $\bar{x} + 0.5s$  and  $\bar{x} + s$ . The analysis shows that the firms tend to cooperate with one another to develop technologies.

- Factor 3: Within two years, the highest technology level will be achieved in Korea.

⇒ The average is within the one standard deviation limit(See Appendix 2). However, the detailed factor is positively biased as the average is in between  $\bar{x} + 0.5s$  and  $\bar{x} + s$ . The analysis shows that the firms tend to achieve the leading domestic technologies in two years.

In general, the firms have the world's top technology for their main products. Also, the venture firms tend to obtain technology through cooperation with academies and research institutes, with visions to achieve the highest technology level in the domestic market(SMBA, 2004b). Therefore, venture firms in Daedeok Valley have high technology level and great potential to make leaps toward success.

## 4. Fund Procurement

Three detailed-factors are sorted out from eight survey questions of fund procurement.

- Detailed-factor 1: The firm is capable of procuring funds from various external sources.

(External Capital)

⇒ average is within the one standard deviation limit(See Appendix 2). However, the detailed factor is negatively biased as the average is in between  $\bar{x} - 0.5s$  and  $\bar{x} - s$ . The firms think that they have limited external fund procurement sources.

- Detailed-factor2: Accounting transparently reflects all of the firm's financial condition.

(Financial Transparency)

⇒ The average is positively outside the one standard deviation limit(See Appendix 2). It is self diagnosed that accounting transparently reflects all of the firm's financial condition.

- Detailed-factor 3: Owner's capital ratio is high, compared with the competitors'.(Owner's

Capital)

⇒ The average is within the one standard deviation limit(See Appendix 2). As the average is in between the sample mean  $\bar{x}$  and  $\bar{x} + 0.5s$ , the detailed factor is undecided.

Financial transparency is in good condition, while the fund procurement from external sources is likely to be limited. The results imply that venture firms in Daedeok Valley are in short of external capital sources. Financial and political support from the government would be of great importance for sufficient fund procurement(Park et al, 2001). The venture firms should improve capabilities for stable fund procurement while keeping up financial transparency.

## 5. Marketing Strategy

Three factors are sorted out from eight survey questions of marketing strategy.

■ Detailed-factor 1: Mid- and long-term objectives and strategies are implemented on each strategic business unit(SBU).

⇒ average is within the one standard deviation limit(See Appendix 2). As the average is in between the sample mean  $\bar{x}$  and  $\bar{x} + 0.5s$ , the detailed factor is undecided.

■ Detailed-factor 2: Customer needs are quickly applied in product development.

⇒ The average is within the one standard deviation limit(See Appendix 2). However, the detailed factor is positively biased as the average is in between  $\bar{x} + 0.5s$  and  $\bar{x} + s$ . The analysis shows that the firms quickly figure out customer needs and reflect it in product development.

■ Detailed-factor 3: Analysis on strengths and weaknesses of the firm are well done.

⇒ The average is within the one standard deviation limit(See Appendix 2). However, the detailed factor is positively biased as the average is in between  $\bar{x} + 0.5s$  and  $\bar{x} + s$ . The analysis shows that the firms tend to carry out fine corporate analysis.

The results indicate that there is a substantial capability to project a specific marketing strategy and implement corporate strategy planning. The firms tend to quickly notice customer needs and apply them to product development and corporate analysis is carried out. However, it is assumed that most firms are in their 'start-up' and 'early' stage, yet focusing on R&D over marketing.

## 6. Network

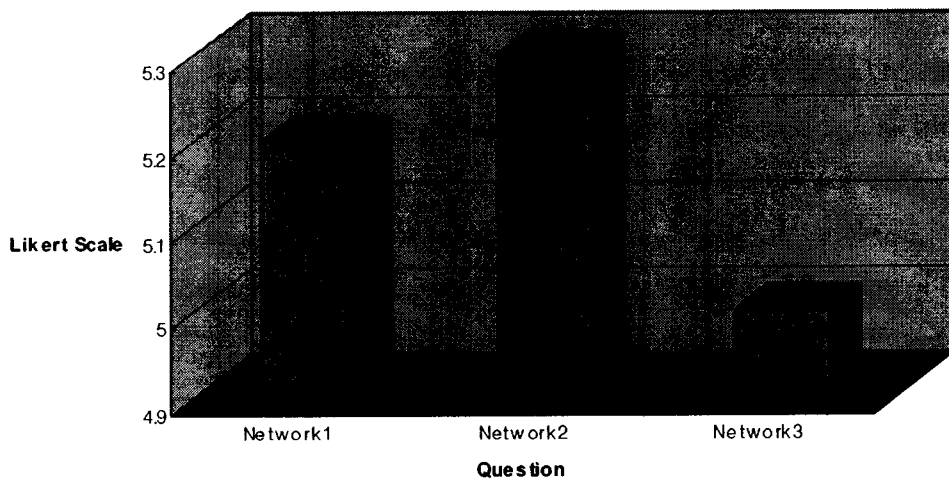
Following are the detailed factors for network.

Network 1: The firm is strongly engaged in strategic alliance with other firms.

Network 2: Weaknesses are overcome through close cooperation with other firms.

Network 3: The firm closely cooperates with the industries, academies, and research institutes

<Figure 4> shows the average of the survey results. As you see, network cooperation of venture firms in Daedeok Valley is in mean level. "Weaknesses are overcome by cooperation" received 5.3 out of 7 and "cooperation among the industries, academies, and research institutes" was the lowest by 5.0 points.



<Figure 4> Network Survey Results

From the previous survey results, we see that the ventures tend to cooperate to secure R&D channels in the microscopic level. However, a macroscopic analysis shows that the cooperation among the industries, academies, and research institutes is not carried out smoothly and the following commercialization rate of technologies is low.

## 7. Summary

Factor analysis by five key success factors fund procurement, organization structure, technology level, marketing strategy, and network provides a relatively clearer picture of the current situation of venture firms in Daedeok Valley. As explored by the analysis of detailed factors, there are the following strengths and weaknesses of venture firms in Daedeok Valley.

Success Factors	Strength	Weakness
Organization Structure	Operational leadership. Agile decision-making. Clear job classification.	
Technology Level	Leading technologies for main products. Achieve best domestic technology level in two years.	
Fund Procurement	Financial Transparency.	Limited external capital sources. Owner's capital ratio(undecided).
Marketing Strategy	Quick reflection of customer needs. Well processed corporate analysis.	Focus on R&D over marketing. Mid and long term objectives are properly implemented(undecided).
Network	Cooperation among the industries, academies, and research institutes to develop technology. Notice that the results are based on a microscopic analysis of ventures having their own R&D channels.	Cooperation among the industries, academies, and research institutes is not carried out smoothly in macroscopic level.

#### IV. Conclusion

Our study shows three significant findings about the key success factors of venture firms in Daedeok Valley.

First, the venture firms tend to focus on R&D over marketing. Our study indicates that venture firms in Daedeok Valley highly invest on R&D compared to marketing, while it is normal to focus on marketing as much as on R&D because the most venture firm's basic objective is to earn profit. It is suggested to pursue quantitative and detailed study on the following topics to find out the underlying reasons of higher R&D investment rates. Some of the venture firms in Business to Government(B2G) seem to be possessed with the illusion that

they still belong to research institutes and focus their government fund on R&D. It may be interesting to know the percentage of B2G, B2B, and B2C firms. It is also recommended to further study how R&D investment influences marketing investment.

Second, cooperation among the industries, academies, and research institutes is not carried out smoothly in macroscopic level. Generally the firms in Daedeok Valley are thought to have low commercialization rate of technologies and lack cooperation among the industries, academies, and research institutes. However, our study indicates that they have smooth technology procurement channels and synergy effect among the industries, academies, and research institutes. The studied firms can be divided up to two groups highly potential firms and general firms. Our results show that both groups self diagnosed to have systematic technology procurement channels. It may be because they are spin-offs from research institutes making direct personal technology channels available. There may be such limited microscopic individual channels but in the long term smooth cooperation at macroscopic level should be fostered among the industries, academies, and research institutes to increase the commercialization rate of technologies.

Third, the other three key success factors fund procurement, organization structure, and technology agreed with the general analysis on current situation of venture firms in Daedeok Valley. Venture firms in Daedeok Valley have limited fund procurement sources, flexible organization structures, and high technology levels.

Following strategic alternatives are recommended to eliminate the impeding factors of venture firms in Daedeok Valley. Sufficient and systematic financial support should be provided, especially on potential venture firms (Kim, 2004). Also, mammoth corporations should be induced as system organizers of the innovative Middle-Up-Down-Network Clusters. Middle-up-down each has separate roles and cluster network is divided by R&D and production. Network's organization culture is open and similar to each other. Cluster is composed of vision provider (up), system organizer (middle), and specialized supplier (down) (Bok et al, 2002). An association of academies, research institutes, and the government (for instance, ETRI and KAIST) should be formed to provide national vision to bring up successful

venture firms(Sung, 2003). Consulting firms focusing on management, patents, and legal issues should be placed; global marketing networks and channels should be open up; and venture capitals should create their headquarters in Daedeok Valley to provide direct and swift investments(Park, 2003).

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## Appendix 1

Following is the survey which has been carried out to analyze venture firms in Daedeok Valley.

### <Survey for venture firms in Daedeok Valley>

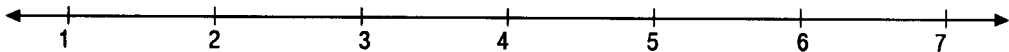
**Survey Objectives:** Analyze the key success factors of venture firms in Daedeok Valley by using Semantic Differential Method

**Survey Target:** CEO or Management Team Director of venture firms in Daedeok Valley

**Survey Method:** e-mail Survey

**Survey due date:** January 7th, 2004

The following is the survey to study the key success factors of venture firms in Daedeok Valley. Please mark the most appropriate answer based on the current situation of your firm. Answers are given in seven point scale.



1. strongly disagree 2 disagree 3 weakly disagree 4 undecided 5 weakly agree 6 agree 7 strongly agree

### [Fund Procurement]

1. External funds are smoothly procured.	1	2	3	4	5	6	7
2. The firm has various sources of external fund procurement.	1	2	3	4	5	6	7
3. Fund procurement is done periodically.	1	2	3	4	5	6	7
4. Owner's capital ratio is high compared with the competitors'.	1	2	3	4	5	6	7
5. The firm is in low debt compared to its competitors.	1	2	3	4	5	6	7
6. Accounting materials reflect all of the financial conditions.	1	2	3	4	5	6	7
7. Accounting and financial materials are transparently managed.	1	2	3	4	5	6	7
8. The firm's cash flow rate is high compared to its competitors'.	1	2	3	4	5	6	7

**[Technology Level]**

1. Technology innovation level of the major product is high.	1	2	3	4	5	6	7
2. Technology development period of the major product is quite short.	1	2	3	4	5	6	7
3. Main product has the world's leading technology level.	1	2	3	4	5	6	7
4. The firm is active in technological coalition with others.	1	2	3	4	5	6	7
5. The firm will achieve the highest technology level in the domestic market within two years.	1	2	3	4	5	6	7
6. Technology is developed and supplied through close cooperation among the industries, academies, and research institutes.	1	2	3	4	5	6	7
7. Ratio of R&D investment to sales is high.	1	2	3	4	5	6	7
8. The firm holds lots of patents.	1	2	3	4	5	6	7

**[Network]**

1. The firm is strongly engaged in strategic alliance with other firms.	1	2	3	4	5	6	7
2. Weaknesses are overcome by cooperation with other firms.	1	2	3	4	5	6	7
3. The firm maintains tight cooperation with the industries, academies, and research institutes.	1	2	3	4	5	6	7

**[Organization Structure]**

1. Operations are practically influenced by decision-making.	1	2	3	4	5	6	7
2. Role and duty are clearly defined.	1	2	3	4	5	6	7
3. Various methods are used to motivate the employees.	1	2	3	4	5	6	7
4. Low level workers have power to make decisions for urgent issues.	1	2	3	4	5	6	7
5. Cooperation between R&D and Sales are smoothly done in the stage of product development and its feedback.	1	2	3	4	5	6	7
6. Cooperation among R&D, production, and sales department is smoothly carried out.	1	2	3	4	5	6	7
7. Various measures are sought for communication purposes.	1	2	3	4	5	6	7
8. Organization structure is flexible enough to quickly adapt to changing environment.	1	2	3	4	5	6	7

## [Marketing Strategy]

1. The firm's strengths and weaknesses are well analyzed.	1	2	3	4	5	6	7
2. The strengths and weaknesses of big firms and competitors are appropriately benchmarked for your firm's current situation.	1	2	3	4	5	6	7
3. Mid and long term management objectives and strategies are established by strategic business units.	1	2	3	4	5	6	7
4. Diverse strategies are established to penetrate the existing market.	1	2	3	4	5	6	7
5. The firm makes effort for niche marketing.	1	2	3	4	5	6	7
6. The firm carries out high level customer service.	1	2	3	4	5	6	7
7. The firm has diverse distribution channels.	1	2	3	4	5	6	7
8. Customer needs are swiftly reflected in the product.	1	2	3	4	5	6	7

## Appendix 2

Following are the averages and standard deviations of detailed factors

Key Success Factors	detailed factor 1		detailed factor 2		detailed factor 3	
	average	standard deviation	average	standard deviation	average	standard deviation
Integrated Factor	5.05	1.36	5.45	0.67	2.68	1.39
Org. Structure	4.64	1.14	5.82	0.66	5.00	1.27
Technology Level	5.36	1.14	5.18	1.53	5.36	1.64
Fund Procurement	2.77	1.31	6.00	1.07	4.32	1.36
Strategy Factor	4.59	1.53	4.90	1.15	5.00	1.38

## Appendix 3

Following is the t-values by detailed-factors of key success factors.

( $\alpha=0.10$ ,  $t = 1.323$ )

T-values

Integrated Factor	3.60005	10.16692	-4.43683
Organization Structure	2.627702	12.83264	3.685896
Technology Level	5.630789	3.618511	3.878802
Fund Procurement	-4.4045	8.774187	1.098233
Strategy Factor	1.808421	3.704464	3.398228