

# A New Venture Performance Model in the Korean Information and Telecommunications Industry

Myeong-Cheol Park and Sang-Woo Lee

**In this paper, we investigate on the determinants of new venture performance empirically and suggest a new venture performance model in the Korean Information and Telecommunications (IT) industry. A total of seven hypotheses is established and tested using a combination of factor analysis, cluster analysis, analysis of variance, and correlation analysis. Ninety-two sample ventures in the Korean IT industry were investigated and analyzed to test hypotheses. We found that new ventures performance depends on their environment, strategy, internal resources factors, and, most importantly, two-way and three-way interactions of these factors. These findings could be interpreted as supporting the general strategy theory that when environment and internal resources are fitted, performance might be maximized and, further, strategy is the means that make internal resources and environment fit. The venture performance model presented in this paper can explain how new ventures achieve their successes. The strategic implications to the venture firms are also discussed.**

## I. INTRODUCTION

New ventures are the important part of the healthy economy. They are vital to the national economy, with most of the net new jobs created by new venture, especially in Korea. Recently, the formation of new ventures in Korea is increasing. However, according to The Wall Street Journal, the failure rate of new ventures is substantial and more than 62.7% of all new companies fail by their sixth year, most of those in the first three years of existence in the U.S. [1].

Despite the importance of new ventures, prior research and theory on how new ventures achieve success are incomplete. Therefore, the purpose of this study is to seek to answer the question: In what ways and to what extent do strategy, environment, and the internal resources influence new venture performance for very rapidly growing new ventures? Also, based on empirical findings, this study provides venture entrepreneurs with business strategies more suitable for their environments and further forms a foothold for creating new ventures and fostering their growth by presenting a guideline to assist new ventures in building their business strategies.

The research definition for the phrase “new venture in the IT industry” for this study is based on prior research in the field of venture strategy and entrepreneurship. The research of Biggadike has been widely cited for its contribution to delineating the stages of development for a young business. He pointed out that it takes an average of 10 to 12 years before the Return On Investment (ROI) of ventures equals that of mature business [2]. Miller and Camp also identified the eight years that a company was in business as the “start-up” phase of the venture, and the next four years as the “adolescent” phase [3]. Consistent with their prior research, this research also used the age of eight years to define ventures that would be classified as “New”. In

---

Manuscript received June 15, 2000; revised October 31, 2000.

The authors are with School of Management, Information and Communications University, Teajon, Korea.

Myeong-Cheol Park (phone: +82 42 866 6300, e-mail: mcpark@icu.ac.kr)

Sang-Woo Lee (phone: +82 42 866 6323, e-mail: woody71@icu.ac.kr)

addition to defining a venture by age, this research was only concerned with the Korean IT industry.

This study is organized into six sections in order to examine the determinants of new venture performance, build the venture performance model and find out what strategy ventures in the Korean IT industry should adopt for the competitive advantage. First section provides a general overview. The second section reviews the relevant literature in determinants of venture performance and model of new venture performance. Section three develops and discusses the research questions and hypotheses addressed in this study. Section four presents the empirical results of the determinants of environments, strategy and internal resource types. The test results of the hypotheses are presented for each of the multiple dependent variables used in the study. Section five suggests the appropriate strategies suitable for the environmental conditions and internal resources to venture entrepreneurs based on the test results. Finally, section six concludes the study with a summary of the research findings and a discussion of the contribution. Also the limitations of this study for future research are presented.

## II. LITERATURE REVIEW

### 1. Determinants of New Venture Performance and the Current Model of New Venture Performance

The researches focusing on the determinants of new venture performance have been mostly developed since 1980. Traditional academic literature in the field of new ventures has concentrated on the characteristics of entrepreneur as the primary determinant of new ventures. Especially, most of the beginning studies on the venture performance were focused on three aspects: the entrepreneurship, industry structure and strategy.

The traditional academic model of new venture performance was a simple model that contains only one variable. However, recent researches on the venture performance tend to explain the venture performance in view of multi-dimension such as entrepreneurs, industry structure, strategy, and interaction of each other because of limits of single dimension's explanation. Sandberg developed a venture performance model based on the venture capitalist's performance model through the empirical examination of 17 (both successful and unsuccessful) venture companies. In his research, he found that industry structure and venture strategy are the strongest determinants of new ventures, and the interaction of these measures also influence the venture performance, i.e.,  $NVP = f(E, IS, S)$ <sup>1)</sup> [4]. This model was empirically demonstrated by McDougall and Kunkel [5], [6]. However, Sandberg's findings were not able to find the

relationship between the characteristics of entrepreneur and new venture performance. Chrisman, Bauerschmidt, and Hofer suggested that Sandberg's model of new venture performance model should be extended to include the resources and the organizational structure, process, and systems developed by the venture to implement its strategy and achieve its goals [7]. Timmons suggested a framework of entrepreneur's desirable characteristics and behaviors for the success [8]. Stuart & Abetti suggested environments and strategy as factors explaining new venture performance as well as characteristics, experience, and ability of entrepreneur [9].

In overall, the results of these empirical studies on the venture performance tend to indicate that entrepreneurship, strategy, industry structure, and their interaction are major determinants of new venture performance. In summary, the new venture literature suggests several observations about strategy, environment, and new venture performance. First, there is mixed evidence in the new ventures empirical literature as to the single effects of strategy or environment on performance. Second, some evidence suggests that the interaction between the new venture's strategy and its environment is important.

Based on the results of the prior studies on the determinants of new venture performance, we can summarize the venture performance model as following:

$$NVP = f(VS, IS, VS*IS)^2).$$

### 2. Limitations of Existing Research.

Despite various results of studies on determinants of venture performance, none of the prior studies has empirically identified factors other than venture strategy and industry structure. To our knowledge, there seems no consensus as to other determinants than such two factors. Cooper & Gascon explained the reasons as follows [10]:

First, due to the diversity of sample in venture age and industry sector, it is difficult to understand situational relation of variables and also most researches on the new venture have concentrated on cross-sectional studies, so it is difficult to generalize the result of researches.

Second, previous researches have utilized various methods for evaluating venture performance, but the relation between determinants and performance can be changed by varying the performance measure. Market measures such as market share, frequently used in finance or strategy researches are inadequate in evaluating venture performance. Accounting information such as return on investment and return on sales cannot be easily obtained and influenced by entrepreneurs and features of

1) NVP: New Venture Performance, E: Entrepreneur, IS: Industry Structure, S: Strategy

2) IS: Industry Structure, VS: Venture Strategy, VS\*IS: Interaction between two factors.

the industry. Sales or the number of employees is often used for evaluating venture performance, but since the growth potentiality is different from one another and the evaluation on performance depends on entrepreneur's point of view, there is no relation between subjective and objective evaluation in prior research [11]. On the other hand, Gregory Dess and Richard Robinson found that there are highly correlation between objective data and subjective measures on return on assets, sales growth, and global performance. They suggested that subjective measures should also be useful to access broader organizational and environmental performance determinants [12]. Kenneth Robinson suggested that future researchers should utilize multiple measures of firm performance since alternatives measures of firm performance are not necessarily interchangeable proxies for one another [13].

Finally, most of the earlier researches often utilized cross-tabulation or univariate analysis. It is only recently that much of the research has utilized the multivariate analysis that allows the impact of interaction between different factors. In spite of these various results of venture performance model, there is some doubt whether prior venture performance model can be applicable to the Korean IT firms because venture business environment in Korea is very different from that in U.S.

### III. RESEARCH QUESTIONS AND HYPOTHESES

#### 1. The Beginning Model of This Research

In this study, we propose a new venture performance model by including new factors which have not been examined in prior researches and internal resources which can be controlled by entrepreneur, as well as venture strategy and industry structure which were considered in the existing model.

The research design used in this study can be presented by the following model:

$$NVP = f(VS, VR, VE)$$

VE: Environment Factors,  
VR: Internal Resources Factors,  
VS: Strategy Factors

In order to investigate these groups of factors comprehensively, we first analyzed individual hypotheses considering each group of factors separately: strategy, environment, and internal resources. These are followed by hypotheses accommodating all possible interaction effects of strategy, environment, and internal resources. Thus, a total of seven hypotheses including three sub-hypotheses will be analyzed.

#### 2. Hypotheses

##### A. The Influence of Environment on New Venture Performance: $NVP = f(VE)$

All the economic entities including new ventures are subject to be influenced by environmental conditions such as industry structure or regulatory policy. Particularly, in case of IT industry, it is thought that new venture performance is more sensitive and more dependent on the change of environmental conditions due to the special characteristics of IT industry. IT environment has many aspects: Competition, Technology, Product, and Market. Based on this conceptualization of the environment, we hypothesize as following:

Hypothesis 1: New venture performances are subject to be influenced by environmental conditions only:

$$\text{New Venture Performance (NVP)} = f(\text{Environment})$$

##### B. The Influence of Strategy on New Venture Performance: $NVP = f(VS)$

Until now, many researchers have tried to find out the relationship between strategy and new venture economic performance. According to Broom and Longenecker's research, it is more effective for ventures to focus on the niche market rather than to compete with incumbent firms for maximization of their performance [14]. However, some recent researches suggested different results. That is, focusing strategy might be ineffective for maximization of new venture performance. Due to the diverse results of prior studies on relationship between strategy and performance, the influence of strategy on the venture performance has not been empirically concluded.

Thus, we hypothesize that the performance for a new venture will differ across the strategy types.

Hypothesis 2: Performance for a new venture will differ by its strategy types only:

$$\text{New Venture Performance (NVP)} = f(\text{Strategy})$$

##### C. The Influence of Internal Resources on New Venture Performance: $NVP = f(VR)$

Starting from the Selznick's research concerning the internal resources, Selznick defined internal resources as a "Distinctive Competence" [15]. The concept of resource capability was embodied by many researchers such as Hofer & Schendel, Rumelt and Barney. Barney defined internal resources as a "Firm Resources" [16] and Grant as a "Resource Capability".

According to the resource-based theory, internal resources are found to be the most important factors on new venture performance [17].

In this study, we defined internal resources as “all distinctive internal capacities that bring competitive advantages including quantitative and qualitative resources”.

Based on this definition of internal resources, we hypothesize,

Hypothesis 3: Performance for a new venture will differ by its type of internal resources that a new venture has:

$$\text{New Venture Performance (NVP)} = f(\text{Internal Resources})$$

#### D. The Two-Way Interaction Effects of Venture Strategy, Environment or Internal Resources on New Venture Performance

It is generally known that success of new ventures depends on not only various external factors but also internal resources. Although new ventures have many favorable factors for success, they are still susceptible to failure if they don't respond to the changing environment.

Basic proposition on the existing theory of strategy is that new ventures should operate their business in extent to internal resources and technologies they might have in order to maximize the performance. Thus, strategy could be a means that directs the allocation of internal resources efficiently and effectively to adapt to the changing environment. Therefore, we hypothesize,

Hypothesis 4: New venture performance will be influenced by an independent factor and interaction of them. More specifically,

$$\text{H 4-1: NVP} = f(\text{VE, VS, } \alpha),$$

$$\text{H 4-2: NVP} = f(\text{VE, VR, } \alpha),$$

$$\text{H 4-3: NVP} = f(\text{VR, VS, } \alpha),$$

$\alpha$ : interaction of two factors

#### E. The Three-Way Interaction Effects of Venture Strategy, Environment or Internal Resources on Venture Performance

Whether environment, strategy or internal resources have an effect on the viability and success of new venture has not been concluded yet. But many researchers have studied on the assumption that venture performance is determined by fitting of strategy, internal resources, and environment.

According to the Sandberg's study, for example, venture strategy should be different by environment. He suggested in his study that differentiation strategy is more useful in “start-

up” phase of the industry, but on “adolescent” phase, focusing strategy is more useful rather than differentiation.

Based on these assumptions about venture performance, we finally hypothesize,

Hypothesis 5: New ventures will differ in new venture performance based on strategy, internal resources, environment and fitting of these factors.

$$\text{New Venture Performance (NVP)} = f(\text{VS, VR, VE, } \alpha)$$

$\alpha$ : interaction of three factors, VS, VR and VE

### 3. Sample, Variable, and Research Methodology

#### A. The Sample and Data Gathering Method

As described in section I, according to Biggadike, it takes eight years for new ventures to get to profitability and 12 years to be similar to existing company. Follow-up studies by Hobson and Morrison [18] and MacMillan and Day [19] support Biggadike's conclusion. In this study, based on the above research results, the sample was selected using the following four criteria.

The first criterion is that sample companies are independent companies without investment of a large enterprise or existing companies. Second criterion is that samples should belong to IT industry, which is classified as service, equipment, software, and supporting sector of IT. Third, new ventures should be through 3 to 8 years passed. Fourth is that the number of employee is less than 80 employees<sup>3)</sup>, and sample companies were required to have publicly available revenue data at least for the three previous fiscal years.

Two primary types of data gathering methods were used in this research: mailed questionnaire and interview. As of May 2000, it is estimated that there are total 7,110 ventures in Korea and among them 2,051 ventures belong to IT industry. The percentage of ventures passed through 3 to 8 years is estimated at about 29.1 %<sup>4)</sup>. Of the approximately 600 new ventures that meet the first, second and third criterion, finally 396 new ventures met the fourth criterion. Data was collected in two phases. First, data was surveyed from 396 new ventures in the Korean IT industry and 86 of them responded. Second, for gathering more precise and in-depth data, six other new ventures were interviewed. In addition to that, to check the consistency and reliability of the response, we deliberately included some redundant questions in the survey. We use that kind of mechanism.

3) In Korea, ventures can be defined by number of employee (less than 80)

4) Korea Small and Medium Business Administration, Status of Small and Medium Enterprises, 2000. 5.

Table 1. The characteristics of sample ventures surveyed.

Sectors	Responded	%
Service	13	9.49 %
Equipment	28	20.44 %
Software	62	45.26 %
Supporting	33	24.09 %
Others	1	0.73 %
Total	137*	100 %

\* Since 42 companies engage in more than one business domain, total number of companies responded (137) is greater than total sample size (92).

Through these two data gathering methods, total of 92 sample data was obtained. Thus, the effective response rate was 21.7%. To test that the respondent sample was not biased, respondent and non-respondent firms were compared with regard to business sector, number of employee, and years passed. One-way ANOVAs showed no significant difference between two groups.

### B. Operationalization of Variables

#### 1) Strategy

In this study, strategy is operationalized as a means to secure competitive advantage. The operationalization has two issues to be resolved: Theoretical and Methodological.

First, the intended strategy is not always the same with the realized strategy. That is, a realized strategy may be the result of intention or may be emergent with little resemblance to the strategy that was intended [20], [21]. Thus, to avoid the concern related to this theoretical issue, in this study, strategy was defined in terms of intentions, guidelines for the future – essentially in terms of plan and self-reported measures were adopted as the way of estimating a venture’s strategy.

The second concern is related with the range of strategy. The scope of strategy, broad or narrow, should be determined by the research purpose. Because the purpose of this study is to define the venture performance model comprehensively, the questionnaire was constructed not to be narrow but to be broad enough to cover the all business functions related to strategies such as general management, product, marketing, technology, and financing. The questionnaire asked the respondents to describe their strategy that the new venture seek to pursue emphasizing a certain function of management. All questions were operationalized on a five-point scale.

#### 2) Environment

Strictly speaking, to fully understand environmental conditions facing the new ventures, it should be examined from in-

ternational level to corporate level.

As previously noted, the purpose of this study is to define the venture performance model and suggest the appropriate strategies suitable for the environmental conditions and internal resources to venture entrepreneurs based on the results of testing five hypothesis. With consideration of this purpose, the environment was operationalized to reflect these three dimensions: Product and Market, Competition, and Technology. Also we relied on the respondent’s perception of the environment while keeping in mind the measure’s vulnerability to bias.

#### 3) Internal Resources

In this study, we are interested in examining the influence of internal resources on the performance of new ventures. The internal resource capability of the firm is a source of competitive advantages and essential to the success of a firm’s strategy [16], [17]. Prior researches on the internal resources were rarely conducted other than entrepreneurs or organization.

In order to measure the internal resources, we should measure the intangible resources such as the value, rareness or imitability of new venture as well as tangible resources. But, it is very difficult to measure the value, rareness or imitability of new venture quantitatively [16]. We measured the amount of the physical or intellectual resources of new ventures as an indicator of internal resources. In this study, we tried to measure all possible management functions related to internal resources including entrepreneurs and organization. As with strategy and environment measure, all questions were operationalized on a five-point scale.

#### 4. Data Analysis Techniques and Methodology

The sixty-four different variables concerning strategy, environment, internal resources and performance were measured on the ordinal and ratio scale. Sixty-one of those variables were independent variables, and three variables were dependent variables. Prior theory and research in the fields of industrial organization, strategic management, and entrepreneurship suggest that measures of business performance based on Return On Assets (ROA), Return On Equity (ROE), Return On Sales (ROS), and Sales Growth (SG) are the most important goals of business enterprises [13]. Sandberg and Hofer chose ROE as their primary performance criterion [22] and Stuart and Abetti [9] chose growth in sale, growth in employment, profitability, and productivity (revenue/employee) as a quantified performance measures and six subjective performance measures such as meeting plan, employee satisfaction, overall evaluation of progress, survivability of the firm, ability to attract capital, and cash flow. This study selected three performance-related variables—Growth Rate of Sales (GRS), Growth Rate of Assets (GRA), and Return on In-

vestment (ROI)—as measures of firm performance (dependent variables).

The hypotheses were tested using a combination of factor analysis, cluster analysis, analysis of variance, and correlational analysis. In order to test seven hypotheses, seven different models were constructed. Factor analysis was employed for several reasons in this study. First, it is a technique that reduces the data to a smaller number of factors in the range of minimizing the information loss by identifying the nature of covariance among the variables. Second, factor analysis aids in detecting the presence of meaningful patterns among variables.

Then, the factor scores derived from factor analysis were used as input data for the clustering analysis. The K-means cluster method employed attempts to identify relatively homogeneous groups of cases based on the selected characteristics. This procedure produces clusters that minimize the average squared Euclidean distance within each cluster. There is no definitive statistical procedure for choosing the final number of cluster. This choice is usually made by the researcher depending on the nature of the study and the objectives of the clustering [23], [24]. In this study, in consideration of the objectives of the clustering, we chose the four clusters. In order to identify the cluster produced by cluster analysis, multivariate analysis of variance was used. That is, MANOVA was performed using the three performance variables.

#### IV. ANALYSIS AND RESULTS

##### 1. Factor Analysis

Factor analysis was employed for identifying independent group variables rather than simple independent effects of each variable. And factor scores of each derived factor were also used as the input data into cluster analysis. There are two representative methods of factor extraction: Principal components and Maximum likelihood. In case of Maximum likelihood method, as its name implies, this method finds a solution by maximizing the likelihood function<sup>5)</sup>. On the other hands, principal component method can help you to understand the underlying data structure and/or form a smaller number of uncorrelated variables. In this study, we chose the principal component method as a method of factor extraction in consideration of purpose of factor analysis.

There are two steps in an exploratory factor analysis. The first step is to determine the number of underlying common factors and the second step is to enhance our ability to interpret the factors through rotation.

<sup>5)</sup> This method was used in Sethi and King's research [25].

##### A. Environment

10 variables used for deriving the dimension related to environment were selected from the aspect of market growth, competition, and technology. Of the 10 variables, the factor analysis revealed 3 underlying factors with eigenvalue of greater than one. These 3 factors account for 65% of the total sample variance. As in Table 2, 5 of the 10 environmental variables loaded on Factor 1, 3 variables on Factor 2, and 2 variables on Factor 3. A description of each factor and its corresponding variables are provided in Table 2.

Table 2. Description of environmental factors and its corresponding variables.

Factors	Environment variables	Component		
		Factor 1	Factor 2	Factor 3
Level of Market Competition	Number of Competitors	0.822	0.252	5.719E-02
	Entry Barriers	-0.749	4.714E-02	-0.123
	Existence of Competitors	0.694	9.221E-03	0.367
	Level of Competition	0.688	0.307	-0.268
	Industry Concentration	-0.536	0.267	0.125
Uncertainty of Environment	Difficulty in Forecasting Change of Customer Needs	-53295E-03	0.884	-2.376E-02
	Difficulty in Forecasting the Technology Development	-5.065E-02	0.766	-6.909E-02
	Difficulty in Forecasting the Actions of Competitors	0.179	0.763	-7.536E-02
Possibility of Market Growth	Industry Growth Rate	-4.672E-02	-0.135	0.897
	Potential Market Size	0.122	-1.027E-02	0.867

Factor 1 can be characterized by environmental variables relating to the market competition such as the number of competitors and difficulties of entry or exit. Thus, we named Factor 1 as “Level of Market Competition.” Factor 2 can be characterized by “Uncertainty of Environment” and Factor 3, “Possibility of Market Growth.”

##### B. Strategy

28 variables related to strategy were selected from the aspect of general management, product, marketing, technology, and financing. Using the 28 variables, the factor analysis yields 7 factors. Derived 7 factors account for 63% of the total sample

Table 3. Description of Strategy Factors.

Factor	Characteristics	Number of variables loaded
Factor 1	• Innovation of Technology	6
Factor 2	• Availability of External Resources	6
Factor 3	• Financing	4
Factor 4	• Market Familiarity	5
Factor 5	• Market Scope	3
Factor 6	• Fitness of Products or Services	3
Factor 7	• Flexibility to Market Changes	1

Table 4. Cluster membership.

Cluster & membership	I	II	III	IV	Missing	Total
Environment	22	23	16	24	7	92
Strategy	9	18	42	16	7	92
Internal Resources	4	27	37	8	16	92

variance. A description of each factor is explained in Table 3.

### C. Internal Resources

Factor analysis could be used for several reasons. The major purpose of employing factor analysis related to internal resources is to eliminate unnecessary variables and then to detect the meaningful patterns among the variables easily. 51 variables were used for internal resources. Those variables are selected to explain all the expected functions related to internal resources such as entrepreneur, organization, general management, accounting and financing and so on. Of the 51 variables, the factor analysis revealed 9 factors with eigenvalue of greater than one. But for additional tests relating to internal resources, we used the 9 representative variables in each factor instead of 9 revealed factors. The reason for using representative variables rather than revealed factors is that when factors are diverse and excessive, representative variables are superior to show the difference between groups and to interpret meanings [26].

## 2. Cluster Analysis

Cluster analysis was used to partition the sample firms into several groups in terms of their characteristics of environment, strategy and internal resources. The cluster analysis is considered a useful tool for distinguishing various firms in terms of

Table 5. The Characteristics of clusters.

Cluster	Cluster 1 (Potential Market)	Cluster 2 (Matured Market)	Cluster 3 (Saturated Market)	Cluster 4 (Growing Market)
Dimension				
Level of Market Competition	Low	High	Low	High
Possibility of Market Growth	Very High	Low	Very Low	High
Uncertainty of Environment	Relatively Low	Very High	High	Low

their environment, strategy, and internal resources. Furthermore, cluster analysis introduces statistical rigor by using measures of variance and distance to establish grouping of firms that are similar to each other and dissimilar to firms in other clusters. In this study, as a method of cluster analysis, quick cluster method was used. Quick cluster is a nonhierarchical method and employs a K-means clustering algorithm. Table 4 shows that the total of 92 sample ventures were classified into four groups based on the factor scores generated by factor analysis.

### A. Environment

There is no definitive statistical procedure for choosing the number of clusters and also cluster analysis does not explicitly provide a clearly acceptable or unacceptable solution. In this study, an objective criterion led to the selection of the four cluster solutions. It was significance of F-value: Factor 2 “Uncertainty of Environment” becomes significant when the number of clusters was increased from three to four. Total 92 new ventures were grouped into four environment clusters. Cluster membership and characteristics associated with the environmental factors are presented in Table 5 and each cluster was named by its major characteristics.

The characteristics of 4 clusters are as followings:

- Cluster 1 (Potential Market): The level of market competition and uncertainty of environment are low, but growth rate of the industry is fast and potential market size is huge. So, firms in this cluster may have many chances to create new customer’s demand.
- Cluster 2 (Matured Market): The level of market competition and uncertainty of environment are high, but possibility of market growth is low. This means that firms in this cluster should carefully observe the change of customer needs and trends of technology development to cope with the uncertainty of environment.
- Cluster 3 (Saturated Market): Potential market size is low but

uncertainty of environment is high. Due to these characteristics of cluster 3, it may be said that this market type is already saturated, thus there is few additional chances to create new demand.

- Cluster 4 (Growing Market): Although uncertainty of environment is low, the level of market competition and possibility of market growth are high. So, it is expected that firms in this cluster is in growth stage or sensitive to technology development. There are already many firms in this market and the market is highly competitive.

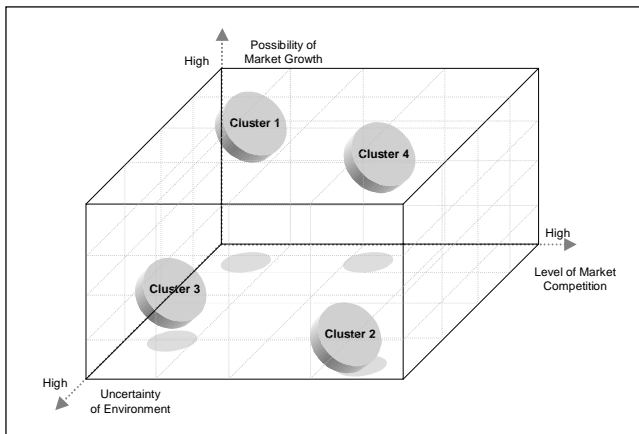


Fig. 1. The Characteristics of clusters.

### B. Strategy

The cluster analysis was used to partition the firms into strategy groups based on the nature of their emphasis on different patterns of strategic orientation among the 7 strategy factors derived from factor analysis. Similar to clustering of environment, an objective criterion led to the selection of the four cluster solutions as the more appropriate. It was significance of F-value: Factors 3, 4 and 7 become significant when the number of clusters was increased from three to four ( $p < 0.1$ ). Cluster memberships are presented in Table 4.

- Cluster 1 (Pursuing Stability): There are 9 firms in this cluster. Firms in this cluster emphasize the efficient use of external resources through diverse methods such as outsourcing and seeking the financial stability rather than investing on R&D for exploiting new market.
- Cluster 2 (Product-Orientation): 18 firms belong to this cluster. Firms in this cluster strongly emphasize providing better products and services to the market. They also attempt to differentiate from other competitors by offering the products and service that are not provided by other firms.
- Cluster 3 (Pursuing Omnipotence): This cluster was found to be more numerous than other clusters, 42 firms. New ventures in this cluster emphasize diversifying the market and

seeking financial stability. In addition, these firms also attempt to provide various products for maximizing their profits.

- Cluster 4 (Technology Orientation): There are 7 firms in this cluster. Although IT industry is technology-oriented industry, there are only 7 firms. This seemingly paradox might be interpreted that most Korean IT ventures have recognized the need to rely on some other competitive dimensions in building their competitive advantages. Firms in this cluster emphasize the continuous investment on R&D and keeping their level of technology higher than their competitors. They also emphasize the provision of better products and services to meet the customers' changing needs in an efficient and timely manner.

### C. Internal resources

76 new ventures among the 92 ventures were grouped into 4 clusters that were significantly different from one another based on the nine internal resource-related variables. For the number of clusters, the change of significance of F-value in individual variable was also used as a criterion as before.

- Cluster 1 (Organizational Flexibility): There are only 4 firms in this cluster. Firms in this cluster have the following characteristics: i) close relationship between product/service development and sales team; ii) slim and flexible organization; iii) short product development cycle.
- Cluster 2 (Entrepreneur's Leadership): There are 27 firms in this cluster. Firms in this cluster have the competitiveness in the areas such as technology, entrepreneur's expertise, and close relationship between entrepreneur's prior career and major products or services.
- Cluster 3 (Marketer): There are 37 firms in this cluster. Firms in this cluster are superior to their competitors in marketing skills. They also have diverse markets.
- Cluster 4 (Shared Financial Risk): There are 8 firms in this cluster. Firms in this cluster generally pursue stabilization through sound cash flows and strategic cooperation with other firms rather than investing on the technology development and marketing on a stand-alone basis.

### 3. Results of Hypotheses Tests

In this section, we present the results of the hypotheses testing. As previously described, the objectives of this study are to understand the role of strategy, environment and internal resources in a new venture, and to build on a new venture performance model. Thus, each hypothesis could correspond to an individual venture performance model as followings:

- H1:  $NPV = f(\text{Environment}) \rightarrow \text{Model 1}$
- H2:  $NPV = f(\text{Strategy}) \rightarrow \text{Model 2}$



- H3: NPV = f(Internal Resources) → Model 3
- H4: NPV = f(Environment, Strategy,  $\alpha$ ) → Model 4-1  
NPV = f(Environment, Internal Resources,  $\alpha$ ) → Model 4-2  
NPV = f(Internal Resources, Strategy,  $\alpha$ ) → Model 4-3
- H5: NPV = f(Strategy, Internal Resources, Environment,  $\alpha$ ) → Model 5.

In order to test these hypotheses, the following steps and procedures are as selected.

- First step is ANOVA or MANOVA test. But correlation analysis must be performed before selecting ANOVA or MANOVA test. If correlation exists between performance measures, MANOVA must be used, otherwise ANOVA should be used.
- Second is to test identity between average vectors after investigating multivariate normal distribution and same covariance as a basic proposition.
- If null hypothesis “all average vectors are equal” could be accepted, test ends at this point but if null hypothesis could not be accepted, each variable should be investigated in detail to clarify the which variables are different and how much different.

Before proceeding with the analysis of variance, as a result of analysis of relationship between dependent variables, there is a close relationship between performance variables such as GRS, GRA and ROI. Thus, it is more desirable to use MANOVA than ANOVA in this study.

#### A. Hypotheses 1: NPV = f(Environment): Rejected

Venture performance Model 1 predicted that new venture performance would be a function of environment. In other words, ventures under certain conditions would outperform others under different conditions in their performance. In order to test this hypothesis, a multivariate analysis of variance (MANOVA)<sup>6)</sup> was performed and GRS, GRA and ROI were used for the dependent variables.

Depending upon the purpose of researcher, various values such as Pillais’s trace, Wilks’ Lamda, Hotelling’s Trace, and Roy’s Largest Root could be used for MANOVA test. In this study Wilk’s Lamda was used. According to the results of multivariate test, value of Lamda was 0.844 and if converted into F-value, it could be 1.136, which is insignificant at the 0.05 significance level (All three dependent variables were insignifi-

6) The Multivariate procedure provides regression analysis and analysis of variance for multiple dependent variables by one or more factor variables or covariates. And we can also investigate interactions between factors as well as the effects of individual factors. In addition, the effects of covariates and covariate interactions with factors can be included.

Table 6. The results of the multivariate test for environment, internal resources and strategy factors.

Effect	Value	F	Hypothesis df	Error df	Sig.
Environment	0.844	1.136	9.000	141.307	0.341
Internal Resources	0.801	1.347	9.000	126.705	0.219
Strategy	0.703	2.405	9.000	138.874	0.014

cant at the 0.05 significance level). These results of the MANOVA test indicated that for a given environmental condition, firms would not differ in their performance. The results of the MANOVA are presented in Table 6. In short, we can draw preliminary conclusions as followings:

- None of the factors related to environment were significant. This indicates that venture performance is not a function of environment only.
- Three aspects of environment such as market competition, uncertainty of market and possibility of market growth are only representatives of environments, but performance is not wholly dependent on these.
- Even if a venture is in the unfavorable environments, the appropriate strategy or management skills can overcome unfavorable conditions. The other case, a venture in the favorable environments could have difficulties if it adopts an inappropriate strategy or management skills.
- In short, performance of ventures in the IT industry is not dependent on the environments only. The Most important factors on performance of ventures may be strategy or internal resources or interaction of these factors.

#### B. Hypotheses 2: NPV = f(Internal Resources): Rejected

Model 2 predicted that new venture performance would be a function of internal resources which ventures have. This model was also tested using multivariate analysis. Performance was measured in terms of the GRS, GRA, and ROI as previously used. The results of the MANOVA are presented in Table 6.

According to the results of multivariate test, value of Lamda was 0.801 and it would be converted into F-value of 1.347, which is insignificant at the 0.05 significance level. Neither of these statistics are significant, indicating that Model 2 did not achieve a good fit. Based on the results of MANOVA test, we can draw preliminary conclusions as followings:

- Internal resources can only represent the strength and weakness of the venture firm, but do not have significant influence on venture performance.

- The only existence of internal resources could not be a critical factor. Rather, an efficient allocation of resources could be more important to venture performance.

*C. Hypothesis 3: NPV = f(Strategy): Partially Accepted*

Model 3 predicted that venture performance would be a function of strategy. In other words, it means that performance for a new venture will differ across the strategy types. In section IV, four strategy clusters were derived: i) Pursuing Stability, ii) Product-Oriented, iii) Pursuing Omnipotence, iv) Technology-Oriented.

The overall fit of models shown in Table 6 are significant at the 0.05 significance level. In the view of Scheffe statistics, two variables – GRS, GRA – are significant at the 0.05 significance level. Especially, the strategy cluster 1 named “Pursuing Stability” is relatively inferior to other strategy clusters in terms of GRA and ROI.

4. Hypothesis 4: Model 4-1, 4-2, 4-3

Model 4 is essentially Model 1, 2 and 3 with the addition of two-factor interaction terms in the multivariate test. Model 4 was organized into 3 sub-models in order to examine not only the individual influence of environment, internal resource or strategy factors but also the effects of two-factor interaction.

**Model 4-1:** NPV = f(Environment, Strategy,  $\alpha$ ):  
Partially Accepted

The purpose of Model 4-1 is to look at the influence of environmental factor, strategy factor, and interaction of two factors. Model 4-1 is not tested within the framework of a multivariate test. Rather, the correlation analysis was used to determine the level of significance of the fit of the model. Model 4-1 states that under some environmental conditions, firms with a certain type of strategy are expected to outperform the others in terms of GRS, GRA and ROI. The results for Model 4-1 are presented in Table 7.

Interestingly, in most cases, Factor 4 “Market Familiarity” is negatively related to performance. But in case of new ventures operating in environment where market is not expected to grow, “Market Familiarity” strategy is positively related to performance measures.

**Model 4-2:** NPV = f(Environment, Internal resources,  $\alpha$ ):  
Accepted

This model predicted that new venture performance would be a function of environment, internal resources and environment-internal resources interaction. According to the results of test, the overall fit of the Model 4-2, as indicated by an F-value of 76.026 for internal resource factor and 81.716 for environ-

Table 7. Results of the correlation analysis.

Environmental Conditions		Positive	Negative
Competition of Market	High	• Factor 3: Financing • Factor 6: Fitness of Product	-
	Low	• Factor 6: Fitness of Product	• Factor 4: Market Familiarity
Uncertainty of Environment	High	-	-
	Low	• Factor 6: Fitness of Product • Factor 7: Flexibility to Market changes	• Factor 4: Market Familiarity
Possibility of Market Growth	High	• Factor 6: Fitness of Product	• Factor 4: Market Familiarity
	Low	• Factor 4: Market Familiarity	-

Table 8. The results of the multivariate test for Environment/Internal Resources and Interaction effect factors.

Effect	Value	F	Hypothesis df	Error df	Sig.
Intercept	0.023	538.854*	3.000	38.000	0.000
Environment	0.005	81.716	9.000	92.633	0.000
Internal Resources	0.006	76.026	9.000	92.633	0.000
Environment * Internal Resources	0.002	36.424	9.000	110.813	0.000

\*: the statistics is an upper bound on F that yields a lower bounds on the significance level

ment was significant. Further, adding the interaction term was also significant at the 0.05 significance level with an F-value of 36.242.

According to these results, we can draw some preliminary conclusions as followings:

As can be seen in Model 1 and 2, venture performance was not influenced by factors individually. In case of considering two factors simultaneously and adding the interaction term, however, fit of the model was improved significantly.

This result indicates that venture performance could be improved when these two factors are fitted. In other words, venture performance is a function of matching the firm’s internal resources to its environment.

**Model 4-3:** NPV = f(Internal Resources, Strategy,  $\alpha$ ):  
Marginally Accepted

Model 4-3 is essentially Model 4-2 with the substitution of strategy for environment. This model predicted that new venture performance would be a function of strategy, internal resources, and interaction of these two factors. According to the results of test, the overall fit of the Model 4-3, as indicated by F-value of 1.937 for internal resource, was not significant at the 0.05 significance level. However, it is marginally significant at the 0.1 significance level. In case of individual influence of factors, two of three factors are significant at the 0.05 significance level. Thus, we can conclude that venture performance could be marginally a function of strategy, internal resources, and interaction of two factors.

Table 9. The results of the multivariate test for internal resources/strategy and interaction effect factors.

Effect	Value	F	Hypothesis df	Error df	Sig.
Intercept	0.788	3.864 <sup>a</sup>	3.000	43.000	0.016
Internal Resources	0.688	1.937	9.000	104.801	0.054
Strategy	0.615	2.572	9.000	104.801	0.010
Internal Resources*Strategy	0.453	2.194	18.000	122.108	0.006

a: the statistics is an upper bound on F that yields a lower bounds on the significance level

### 5. Hypothesis 5: NPV = f(Environment, Internal Resources, Strategy, $\alpha$ ): Accepted

As described in section III, the beginning model of this study was NPV = f(VS, VR, VE). Until now, we examined the various functions, which is broken down into component part. As can be seen from the previous analysis, Model 1, 2, and 3 are not adequate to venture performance model and Model 4 is also not enough to explain the venture performance fully. Thus, back to the beginning model, we now examine Model 5 including not only all factors but also all interaction terms. In order to test the final model, multivariate analysis of variance was also performed. And GRS, GRA and ROI were used for the dependent variables as before.

The result of this analysis is shown in Table 10.

According to Table 8, Lamda values of each factor are 0.361, 0.428 and 0.003, which are all significant at the 0.05 significance level. This indicates that venture performance would be influenced by all these factors. Especially, in case of interaction terms between strategy and environment, value of Wilk's Lamda is 0.173, which is significant at the 0.05 significance level with an F-value of 2.856. Interaction term between three factors is also significant at the 0.05 significance level with an

Table 10. The results of the multivariate test for internal resources/strategy/environment, two way and three way interaction effect factors.

Effect	Value	F	Hypothesis df	Error df	Sig.
Intercept	0.010	713.089a	3.000	21.000	0.000
Internal Resources	0.361	2.958	9.000	51.259	0.007
Strategy	0.428	2.379	9.000	51.259	0.025
Environment	0.003	55.109	9.000	51.259	0.000
Internal Resources*Strategy	0.575	1.454	9.000	51.259	0.191
Internal Resources*Environment	0.543	1.210	12.000	55.852	0.300
Environment*Strategy	0.173	2.856	18.000	59.882	0.001
Strategy*Environment*Internal Resources	0.232	3.343	12.000	55.852	0.001

a: the statistics is an upper bound on F that yields a lower bounds on the significance level

F-value of 3.343. Interestingly, two interactions relating to internal resources are not significant at the 0.05 significance level. These statistics could be interpreted as following: Since new ventures usually does not have enough internal resources compared with the already-established companies, new ventures may not be able to use internal resources as their competitive weapons generally.

This finding could be interpreted as supporting the general strategy theory that when environment, internal resources, and strategy are fitted, performance could be maximized and further, strategy is the means that make internal resources and environment fit. So, we can obtain the final venture performance model as follows:

$$NVP = f(VS, VR, VE, \alpha).$$

### 6. Summary of Tests

This section reported the results of the statistical analysis for the five models, namely, five hypotheses developed in this study. One of the major findings to emerge from the analysis is that individual action in the form of factor would not have a significant effect on performance. That is, the ability of the model to predict performance can be significantly improved by adding the interaction terms between factors.

Based on test results, we can draw conclusions as followings:

- The venture performance in the Korean IT industry would be influenced by internal resources, environment, strategy, and

interactions of these factors.

- It is confirmed empirically that an individual firm's strategy should be matched the firm's resources with the environment in order to attain maximum performance outcomes.

## V. IMPLICATIONS FOR VENTURE FIRMS

Until now, three variables, environment, internal resources, strategy, and their interaction effects between these variables, were shown to play important roles in a new venture performance. These findings may not be so surprising in the field of entrepreneurship research although we added one more variable to the existing model. For the first time, however, this research empirically confirms that this type of model can be extended and made applicable to the Korean IT industry by rigorous statistical procedures. One important implication of these findings is that each venture firm should establish its appropriate business strategy based on the environments and internal resources that it has. In the Korean IT industry, many different types of venture companies currently exist. They have different internal resources and environments. How can they exploit these findings?

In this section, correlation analysis was employed to figure out what types of strategy new ventures should adopt or avoid in order to increase their performance while considering their environmental conditions and internal resources. We classified new venture firms into 24 types based on their environmental conditions and clusters of internal resources identified in Section IV. In each type of venture companies, the correlation analysis between performance variables and types of strategies shows which strategies are positively effective to their performance and which ones are not. These results are summarized in Table 11. Let's take an example. For the venture company where the 'Possibility of Market Growth' is high and its internal resources belong to Cluster 4, the strategies such as 'Fitness of Products or Service' and 'Flexibility to Market Changes' are found to be effective, but 'Innovations of Technology' may not be effective to increase the performance. These correlation analysis results of this example can be interpreted as following combined with the previous test results (See Table 5). We can assume that the venture company where 'Possibility of Market Growth is high' and its internal resources belong to "Shared financial risk" may be at the early stage such as 'Potential Market' or 'Growing Market' in view of company life cycle. Accordingly, the best ways to maximize the venture performance of this example company might not be to create the new market through innovation of technology but to raise the market shares with an efficient marketing method through sound cash flow for obtaining the first mover advantages [27]–[29].

According to the results of this analysis, there appears to be a wide difference for effective and ineffective strategies, which

depend on the environmental conditions and internal resources. These results can be used for each venture firm that has unique environment and internal resources to identify effective and ineffective types of strategies. This analysis also confirmed the previous findings that, for a given environmental condition and internal resources, venture firms should adopt different strategies in order to attain competitive advantages in the Korean IT industry.

## VI. SUMMARY AND CONCLUSION

### 1. Contributions of this Study

The purpose of this study was to contribute to the literature on new venture study in two ways. First, we sought to investigate that what factors among the strategy, environment, and internal resources impact new venture performance and the extent to which strategy, environment and internal resources influence new venture performance in the Korean IT industry. So, our first purpose of this study was to conduct a detailed investigation of the performance of the new ventures in the Korean IT industry reflecting the unique characteristics that they solely have. Our second objective was to suggest the appropriate strategies suitable for the environmental conditions and internal resources to venture entrepreneurs based on the test results.

In summary, three basic research questions were investigated in this study: i) the impacts of strategy, environment, and internal resources on the Korean IT new venture performance; ii) whether basic beginning model of strategy, environment, and internal resources could be able to predict the Korean IT venture performance outcomes using quantitative performance measures such as GRS, GRA, and ROI; iii) what is the appropriate strategies suitable for the given environmental conditions and internal resources?

### 2. Limitations and Further Study

As with all studies, the analysis and interpretations of the findings of the study are subject to a number of limitations. The first limitation is the inability to classify new ventures into more detailed categories within the IT industry. For example, the software sector differs from the service sector in terms of inventory requirement, and personnel requirement, etc. Thus, they are expected to show differences in the strategy, environment, internal resources, and performance relationship. A second limitation is associated with the measurement of performance. The ability of the model to predict performance would differ by the performance measures used. In this study, three performance measures were used: GRS, GRA, and ROI. However, GRS, GRA, and ROI may not be true indications of the profitability of the new ventures. Up to now, however, it is generally accepted that the performance measures

Table 11. Effective and ineffective strategies under environmental and resource conditions.

Environment		Clusters of Internal Resource	Strategy	
Dimension	Condition		Positive	Negative
Level of Market Competition	High	1	-	-
		2	-	• Innovation of Technology*
		3	-	• Financing**
		4	• Fitness of Products or Services**	-
	Low	1	-	-
		2	• Flexibility to Market Changes**	-
		3	• Innovation of Technology* • Fitness of Products or Services***	-
		4	• Flexibility to Market Changes**	• Availability of External Resources*** • Financing***
Possibility of Market Growth	High	1	• Financing*** • Fitness of Products or Services** • Flexibility to Market Changes**	• Innovation of Technology*** • Availability of External Resources*** • Market Familiarity**
		2	• Innovation of Technology**	-
		3	• Innovation of Technology*	• Market Scope*
		4	• Fitness of Products or Services* • Flexibility to Market Changes**	• Innovation of Technology *
	Low	1	-	-
		2	• Innovation of Technology ** • Market Scope*	-
		3	• Availability of External Resources** • Financing** • Fitness of Products or Services**	-
		4	-	-
Uncertainty of Environment	High	1	-	-
		2	-	• Innovation of Technology** • Market Familiarity**
		3	• Innovation of Technology**	• Market Scope**
		4	• Fitness of Products or Services* • Flexibility to Market Changes*	-
	Low	1	-	-
		2	-	• Innovation of Technology*** • Financing*
		3	• Financing* • Market Familiarity* • Fitness of Products or Services*	• Flexibility to Market Changes**
		4	-	-

used in this study are more objective indicators of economic returns to entrepreneurs than others.

There are several suggestions for future studies. First, further study needs to be done utilizing multiple and differing measures of new venture performance. Our results suggest that

models of new venture performance need to be tailored to the type of performance being measured. Also, performance measures for new ventures need to be refined so that future studies can be more consistent and comparable. Second, while acquiring the large and longitudinal data is time consuming and

expensive, it would be useful to investigate the relationship of strategy, environment, internal resources, and performance. Especially, in terms of performance, its significance may become increasingly important.

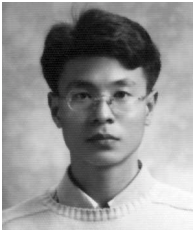
In spite of these limitations, the aim of this study was to understand more fully determinants of new venture performance. We expect that this study would encourage venture entrepreneurs to create new ventures in the IT industry and assist new ventures in establishing the business strategies more suitable for their characters.

## REFERENCES

- [1] *The Wall Street Journal*, October 16, 1992: R7.
- [2] E. R. Biggadike, "The risky business of diversification," *Harvard Business Review*, Vol. 57, 1979, pp.103-111.
- [3] A. Miller and B. Camp, "Exploring determinants of success in corporate ventures," *Journal of Business Venturing*, Vol. 1, 1985, pp. 87-105.
- [4] W. R. Sandberg, "New venture performance: The role of strategy and industry structure," *Lexington: Lexington Books*, 1986.
- [5] P.P. McDougall, "An analysis of strategy, entry barriers, and origin as factors explaining new venture performance," *Ph.D. thesis*, University of South Carolina, 1987.
- [6] S. W. Kunkel, "The impact of strategy and industry structure on new venture performance," *Ph.D. thesis*, University of Georgia, 1991.
- [7] J.J. Chrisman, A. Bauerschmidt, and C.W. Hofer, "The determinants of new venture performance: An extended model," *Entrepreneurship Theory and Practice*, Vol. 23, Iss.1, 1998, pp. 5-25.
- [8] J. Timmons, "New Venture Creation," Irwin, 1994.
- [9] R. W. Stuart and P. A. Abetti, "Impact of entrepreneurial and management experience on early performance," *Journal of Business Venturing*, Vol. 5, 1990, pp. 151-162.
- [10] A.C. Cooper and F.J. Gimeno Gascon, "Entrepreneurs, process of founding and new firm performance," *The State of the Art in Entrepreneurship*, 1992.
- [11] Sapienza, J. Harry, K.G. Smith, and M.J. Gannon, "Using subjective evaluations of organizational performance in small business research," *American Journal of Small Business*, Vol. 2, 1988, pp. 45-53.
- [12] G.G. Dess and R.B. Robinson, "Measuring organizational performance in the absence of objective Measures: The case of privately-held firm and conglomerate business unit," *Strategic Management Journal*, Vol. 5, 1984, pp. 265-273.
- [13] K.C. Robinson and P.P. McDougall, "The impact of alternative operationalizations of industry structural elements on measures of performance for entrepreneurial manufacturing ventures," *Strategic Management Journal*, Vol. 19, 1998, pp. 1,079-1,100.
- [14] H.N. Broom and J.G. Longenecker, *Small Business Management*, Southwestern, Cincinnati, OH, 1979.
- [15] P. Selznick, *Leadership in Administration*, Evanston, Ill.:Row, Peterson, 1957.
- [16] J. Barrey, "Firm resources and sustainable competitive advantage," *Journal of Management*, Vol. 17, No. 1, pp. 99-120.
- [17] R.M. Grant, "The resource-based theory of competitive advantage: Implications for strategy formulation," *California Management Review*, Spring, 1991, pp. 114-135.
- [18] E.L. Hobson and R.M. Morrison, "How do corporate start-up ventures fare?," *Frontiers in entrepreneurship research*, 1983, pp. 390-410.
- [19] I.C. MacMillan and D.L. Day, "Corporate ventures into industrial markets: Dynamics of aggressive entry," *Journal of Business Venturing*, Vol. 2, 1987, pp. 29-39.
- [20] H. Mintzberg, "Patterns in strategy formulation," *Management Science*, Vol. 29, 1978, pp. 934-948.
- [21] H. Mintzberg and A. W. James, "Tracking strategy in an entrepreneurial firm," *Academy of Management Journal*, Vol. 25, 1982, pp. 465-499.
- [22] W. R. Sandberg and C. W. Hofer, "Improving new venture performance: The role of strategy, industry structure, and the entrepreneur," *Journal of Business Venturing*, Vol. 2, 1987, pp. 5-28.
- [23] K.R. Harrigan, "Entry barriers in mature manufacturing industries" *Advances in Strategic Management*, Vol. 2, 1983, pp. 67-97.
- [24] K.R. Harrigan, "An application of clustering for strategic group analysis," *Strategic Management Journal*, Vol. 6, 1985, pp. 55-73.
- [25] V. Sethi and W.R. King, "Development of measures to assess the extent to which an information technology application provides competitive advantage," *Management Science*, Vol 4, No. 12, 1994, pp. 1601-1627.
- [26] W.B. Gartner and K.H. Vesper, "A taxonomy of new business ventures," *Journal of Business Venturing*, 4, 1989, pp. 169-186.
- [27] M.C. Park, An analysis of strategies of new technology-based ventures of IT industry in Korea, Information and Communications University (ICU), 1999.
- [28] M.H. Rim, J. Y. Choung and H.R. Hwang, "The sources and directions of technological capability accumulation in Korean semiconductor industry," *ETRI Journal*, Vol. 20, No. 1, 1998.
- [29] T. H. Hyun and D.H. Kim, "The evolution of Korean information infrastructure and Its future direction: A system dynamics model," *ETRI Journal*, Vol. 20, No. 1, 1998.



**Myeong-Cheol Park** received the B.S. degree in Industrial Engineering, and M.S. degree in Business Administration from Seoul National University, Seoul, Korea, in 1976 and 1978 respectively. He received his Ph.D. degree in Management Sciences from University of Iowa in 1990. From 1981 to 1997, he worked for ETRI, where he engaged in many research projects related to IT management and economic issues. Currently, he is an associate professor at the School of Management, Information and Communications University (ICU). His main research interests include IT management, Strategies and venture business management.



**Sang-Woo Lee** received the B.S. degree in Business Administration from Sogang University, Seoul, Korea in 1996, and M.S. degree in Business Administration from Information and Communications University (ICU), in 2000. Currently, he is a Ph.D. student in Business Administration, ICU. From 1996 to 1998, He worked for Ssangyong Information and Communications Corporation.

His main research interests include strategy for ventures and IT management.