기술가치 평가시스템을 이용한 기술가치 전략 분석

Analysis of Technology Value Strategy using Technology Valuation System

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요 약

기술 투자와 거래의 증가는 기술가치 평가에 대한 관심을 증대시키고 있으나 평가의 전문성과 기술가치의 다양성으로 인해 객관적인 기술 가치 평가가 용이하지 않은 문제점을 가지고 있다. 이 연구는 웹 기반의 대화형 기술가치 평가(WITV) 시스템을 개발하고 이 시스템을 이용한 기술가치의 평가 및 기술가치의 전략 분석에 그 목적을 두고 있다.

WITV 시스템은 내적 기술가치(IVT)와 외적 기술가치(EVT)로 구성된 기술가치 매력도(TVA) 모형을 이용하여 기술가치를 평가하고 해당 산업에서 기술의 가치를 제고하기 위한 전략을 분석하는데 이용되고 있다.

이 연구는 코스닥에 등록된 IT산업의 중소 제조기업을 대상으로 TVA 모형과 WITV 시스템의 타당성과 적용가능성을 실험하였으며, 실험결과에 의해 그 효용성을 검증하였다.

키워드 : 기술가치, 평가, 기술가치 매력도, 전략 매트릭스, 기술가치 평가시스템

I. Introduction

In the late 1990s, the Korean economy experienced a venture company boom that ensued with a growing interest in technology value of these venture companies. In spite of the lack of technique and insufficient number of cases or processes of the valuation to refer to, technology valuation for investment purpose was being conducted in related fields. Furthermore, as technology valuation converted into monetary terms, the investment institutions involved started to take great interest in the result of the valuation as well as its method and process.

Generally, the application field of technology valuation are classified into six fields as follows; 1) transaction field for purchase and sale of the technology and decision of price in licensing, 2) the financial field for transforming technology into financial securities and setting it as collateral for a loan, 3) the taxation field for establishing a tax plan including donation, disposal, and amortization of technology and tax payment, 4) the strategy field for improvement of company's value, incorporating technology into the product, spin-off and other long-term management plan, 5) the liquidation field for asset appraisal under bankruptcy or structural adjustment and forming debt payment plan, and 6) the suit field for infringement of patent right, default, and other legal actions related to conflicts on assets (Reilly and Schweihs, 1999).

Technology value is formulated by many categories

subject to various situations of the interested party involved in the transaction of technology, such as the technology developer or supplier and the technology consumer and investor. The interested parties determine the value of technology by calculating the value of the future profit that will be gained by adopting various standards of the technology.

Technology valuation has been a widely discussed subject in many previous studies. With different concepts and factors in compliance with various purposes, its functions are to assign, to grant, and to supply intellectual property including patent right. Various approaches of technology valuation have been used in conducting practical business. Thus, it is imperative to come up with an objective methodology for technology valuation to promote growth of sound venture companies, technology trade, and technology investment.

The purpose of this study is to develop the technology valuation model. The subjects of this study is small and medium enterprises listed on KOSDAQ in IT industry with business operations centering on a singly main product.

The organization of this paper is as follows: in section Ⅱ, the literature review on the concept, criteria, factors of technology, and technology valuation are implemented.

In section Ⅲ, the structure and variables of TVAM is presented to measure the technology value. The application of the TVAM is implemented in section Ⅳ. And technology strategies of each company are proposed as means to increase the value with TVA Matrix. And in section Ⅴ, the web-based interactive technology valuation (WITV) system is proposed. WITV system, which is designed to support novice for the valuation, provides the results of technology valuation. The main purpose of WITV is to provide additional information and to offer results of valuation whenever they want. Conclusion is addressed in the last section.

Ⅱ. The Approach for Technology Valuation

Previous technology valuation used traditional methods such as valuation on real assets or valuation of company done in financial institutions. These methods use a typical financial approach relevant to many existing theories. However, to determine whether investment in research projects of research institutes or company is considered profitable, methods that use new approaches are called for. Recently, as the importance of intellectual property or intangible assets is emphasized, new approaches are being introduced in response to skeptical views of the existing approaches.

In this paper, we will conduct an analysis on theories, techniques and processes of the current technology valuation from a technology assessment, grade rating, asset valuation, and intellectual property valuation.

2.1 Technology Assessment Approach

The technology assessment is defined as the most effective research for new technology and its social effect (OTA, 2000) and judgment for all technical opportunity, feasibility, and results of technology against the environment and company from a synthetic viewpoint (Braun, 1998).

In previous studies on technology assessment, researchers, including Medford (1973), made many efforts to propose a new scientific principle of the methodology. Representatively, there are the life cycle model (O'Brien, 1962; Abernathy and Townsend, 1975; Abernathy and Utterback, 1978; Ford and Ryan, 1981;

Hambreck et. al., 1983; Foster, 1986), the R&D selection model (Souder, 1972; Baker and Freeland, 1975; Albala, 1975; Schmidt, 1982; Mitchell and Hamilton, 1988; ITEP, 2000), the technology forecasting model (Kim and Whang, 1989) and Exclusive technology assessment method (Henriksen, 1997).

2.2 Asset Valuation Approach

Financial decision regarding expenditure and profit is required in selection of R&D project because of the major investment and financial expenditure that occurs in the project. Financial method for technology valuation can be classified into 3 patterns; 1) traditional valuation without considering the present value of cash, 2) cash flow valuation that considers the present value of cash, and 3) real option valuation that considers future profitability.

In accounting approach, the size of the cost invested is considered for the selection of technology. There are undiscounted benefit-to-cost ratio, cash flow payback, NPV, and IRR (Ellis, 1984), sensitivity analyses (Manners and Louderback, 1980) and the break-even point method (Ellis, 1988). In cash flow approach, the return on investment (ROI) is a very familiar concept to the decision-maker of investment (Liberatore and Titus, 1983). The NPV, frequently called the Discount Cash Flow (DCF), affirms that the value of all assets can be measured by the sum of the present value of all expected cash flow with the asset. However the assumption of fixed future cash flow is not justifiable because calculation of cash flow each year is done within a specific planning period (Kester, 1984; Ellis, 1988; Marren, 1993; Tipping et. al., 1995). The probability of success and failure is remote in an actual business environment, especially with insufficiency of reference data for valuation. As a result, valuation approach that utilizes real option becomes a substitute for traditional analysis. In the real option approach, the Option Pricing Model (OPM) of Black & Scholes is used for valuation (Meyer, 1977; Kester, 1984; Mitchell and Hamilton, 1988). This method did not require the probability estimation on the expected earning rate in the future for the underlying asset and the adjustment of the discount rate on the risk (Nichols, 1994; Smith et al., 1995).

2.3 Intellectual Property Valuation Approach

Nowadays, intangible asset, or intellectual property, has been a subject of interest. American Society of Appraisers (ASA) considers patents, trademarks, employment agreements, and copyrights as the major intellectual assets (ASA, 1999). Smith & Parr (1994) itemized proprietary technology, patents, copyrights, trademarks, computer software, mask works, and right of publicity as intellectual property. The intellectual assets management models, such as the Skandia model, the Balanced Scorecard (BSC) model, the intellectual assets monitor, the intellectual assets navigator and the intellectual assets inspection model (Whang, 2000), were proposed in line with classifications of leading knowledge management scholars. The National Computerization Agency (1997) defined the intellectual property that named all rights on the intellectual products and marks, and classified the intellectual property.

ASA (American Society of Appraisers) proposed the income approach, the market approach, and the asset-based approach for the valuation of intellectual assets of a company. Similarly, the cost approach, the income approach, and the market approach are acknowledged as the representative valuation methods. These three approaches are linked with each other; therefore they should produce the same results in

〈Table 3-1〉 Technology Value Attractiveness (TVA)

Space / Time	Intrinsic Characteristic	Extrinsic Characteristic
Present Characteristic	Technology Competence (TC)	Profit Size (PS)
Future Characteristic	Technology Sustainability (TS)	Profit Growth Rate (PG)
TVA	Intrinsic Value of Technology (IVT)	Extrinsic Vaule of Technology (EVT)

3.3 Variables of Intrinsic Characteristic in TVAM

The intrinsic characteristic that exhibits competence under technology advantage is classified into technology competence and technology sustainability.

Technology competence has the characteristic of the present competence in that it indicates competitive advantage compared with that of competitors. The main valuation factors in the technology competence are (1) substantiality, (2) functionality, and (3) effectiveness. The summary on factors, sub-factors and details for the technology competence is shown in <Table 3-2>.

Technology sustainability is the characteristic on the possibility to preserve the competitiveness of the present technology into the future market. It is evaluated over the next five years, which is commonly assumed as the technology obsolescence period in the practical business. Technology sustainability is composed of (1) protectiveness, (2) stability, and (3) environment. The summary of factors, sub-factors, and details for the technology sustainability is in <Table 3-3>.

〈Table 3-2〉 Factors of Technology Competence

Characteristic	Factor	Sub-factor	Details
Competence	Substantiality	Core Capability	• Degree of contribution to function of product. • Degree of relative importance in operation of product.
		Generality	• Possibility to be utilized in the development of other product. • Possibility to be applied in other industry.
		Substitutability	• Difficultly in substitution of technology. • Number of similar or substitute technology / product.
	Functionality	Sufficiency	• Degree of functional completeness for stable operation. • Degree of consumer's satisfaction on performance.
		Superbness	• Degree of difference for core technology comparing to internationally best technology / product. • Degree of performance comparing to internationally best technology / product.
		Convenience	• Degree of easiness to learn using. • Degree of easiness to use.
	Effectiveness	Cost	• Degree of production efficiency. • Degree of reduction for cost in raw material.
		Originality	• Degree of independent development. • Degree of royalty.
		Manufacturability	• Degree of easiness on procuring materials or production facility. • Degree of easiness in external technology support. • Degree of possibility for mass production

3.4 Variables of Extrinsic Characteristic in TVAM

The market environment is divided into the present and the future with direct influence on technology profitability. The present profitability is defined as the profit size, which indicates the present total profit size gained in the market. The future profitability indicates the total profit to be gained in the future from the grown market size, and also is defined as the profit growth rate. The summary of characteristics, factors and details for the extrinsic characteristic of technology evaluation is as shown in <Table 3-4>.

〈Table 3-3〉 Factors of Technology Sustainability

Characteristic	Factor	Sub-factor	Details
Sustainability	Protectiveness	Proprietorship	• Degree of technology right including patent right. • Degree of residual period for technology right.
		Reverse Engineering	• Degree of difficulty for characteristic of technology. • Degree of specialty for production.
		Imitability	• Degree of comprehension for technology right. • Degree of protection for technology right.
	Stability	Innovativeness	• Degree of leading company for technology innovation. • Degree of possibility to innovate the technology by the company and competitors.
		Replaceability	• Degree of advent for substitute technology.
		Stickiness	• Cost and time loss for change of use. • Degree of brand royalty.
	Environment	Regulation	• Degree of restriction on market entry. • Degree of interference on business activities.
		Market Structure	• Degree of necessity for cooperation with suppliers/distributors. • Degree of initiative for trade negotiation with suppliers/distributors.
		Financeability	• Degree of required capital investment for development and commercialization. • Degree of restriction and limit for external supply of investment.

〈Table 3-4〉 Factors of Extrinsic Characteristic

Characteristic	Factor	Details
Profit Size	Sales	• Sales of technology related product in domestic market. • Sales of technology related product in overseas market.
	Profit Rate	• Average operating profits in domestic market for technology related product. • Average operating profits in overseas market for technology related product.
Profit Growth Rate	Sales Growth Rate	• Sales increase of technology related product in domestic market. • Sales increase of technology related product in overseas market.
	Growth Rate of Profit	• Average operating profits increase of technology related product in domestic market. • Average operating profits increase of technology related product in overseas market.

3.5 Measurement of TVA

The technology value attractiveness is the relative index to measure technology value in comparison with the specific company in the same or different business category. It is measured by combining Intrinsic Value of Technology (IVT) and Extrinsic Value of Technology (EVT).

IVT is the value to evaluate market value by comparing unique characteristics of competitive advantage between technologies in the same business category.

3.5.1 Measurement of IVT

Intrinsic Value of Technology (IVT) is measured by weighed average between technology competence and technology sustainability. Technology competence and technology sustainability are measured by weighed average between value factors and sub-factors in each characteristic.

The process to measure Intrinsic Value of Technology is as follows.

$$IVT = \Sigma\,(weight\ of\ IVT\ variable \times value\ of\ IVT\ variable) = (w_1 \times TC) + (w_2 \times TS)$$

$$TC = \Sigma\,(weight\ of\ TC\ variable \times value\ of\ TC\ variable)$$

$$TS = \Sigma\,(weight\ of\ TS\ variable \times value\ of\ TS\ variable)$$

In the model, characteristics, factors and variables in each hierarchy for intrinsic value of technology have weight. Weight of characteristic means relative importance of technology competence and technology sustainability in the formation of Intrinsic Value of Technology. The weight can be calculated with Analytic Hierarchy Process (AHP) method (Saaty, 1977, 1987).

In this study, expert knowledge of venture capital companies in Korea is used to measure the weight of IVT variables. The experts invest capital on prospective venture companies, and seek for investment profit by selling the stocks of companies after being listed on KOSDAQ. Consequently, they are experts with lots of experiences and sensitive intuition on the profitability of technology possessed by companies in the market. The survey for the experts was carried out in June 2000. Total of 11 experts in 3 institutions including a senior venture capitalist in the representative venture company, KTB Network in Korea, replied to the questionnaire.

3.5.2 Measurement of EVT

Extrinsic Value of Technology intends to evaluate the market value between technologies in the different business categories by comparing total profit size to be gained in the market. The market environments in different business categories have different market size, growth rate, and average operating profit rate. In the model, profit size is calculated with multiplying sales to operating profit rate. Profit growth rate is calculated by multiplying sales growth rate to operating profit growth rate. And extrinsic value of technology is measured by sum of geometric sequence between profit size and profit growth rate.

The process to measure Extrinsic Value of Technology is as follows.

Profit Size (PS) = *(profit size in domestic market)* × *(profit size in foreign market)*

profit size in domestic market
= *(sales in domestic market)* × *(operating profit rate in domestic market)*

profit size in foreign market
= *(sales in foreign market)* × *(operating profit rate in foreign market)*

Profit Growth rate (PG)
= *(1 + sales growth rate)* × *(1 + operating profit growth rate)*

sales growth rate

$= \omega_1 \times$ *(sales growth rate in domestic market)*
$+ \omega_2 \times$ *(sales growth rate in foreign market)*

operating profit growth rate

$= \omega_1 \times$ *(operating profit growth rate in domestic market)* $+ \omega_2 \times$ *(sales growth rate in foreign market)*

where, ω_1 = *(sales in domestic market) / (total sales)*

ω_2 = *(sales in foreign market) / (total sales)*

$$EVT = PS\,time \frac{(1 - PG^q)}{(1 - PG)}, \text{ here,}$$

q is the measurement periods.

3.5.3 Measurement of TVA

In TVAM, competitive advantage of technology is divided into Intrinsic Value of Technology and Extrinsic Value of Technology, and then the relative difference of competitive advantage is measured using Technology Value Attractiveness (TVA). Also, the standard technology is selected to express the relative difference of competitive advantage in the relative rate between Intrinsic Value of Technology and Extrinsic Value of Technology. Intrinsic Value of Technology Index (IVTI), the relative rate of Intrinsic Value of Technology, expresses relative size of technology own value against the standard technology. Also, Extrinsic Value of Technology Index (EVTI), the relative rate of extrinsic value of technology, expresses relative size of extrinsic value of technology. TVA measures the relative difference of competitive advantage against the standard technology using the relative rate of IVTI and EVTI. TVA expresses the rate of the difference of competitive advantage in market value, and it is an index to show the relative size of technology value.

The basis of TVA is Price-to-Book value Ratio (PBR) in this study. PBR is more objective than subjective valuation basis under cash flow discount method, and it can be used in deficit current net income (Damodaran, 1996). And when market value on asset value is high, PBR can be evaluated as intangible asset.

TVA links the difference in competitive advantage of technology into value with PBR. TVA is the relative size of total technology value decided under IVT and EVT, and it becomes the basis of estimation for PBR. As PBR is used for proxy variable for technology market value in TVAM, the relation between IVT and EVT against PBR should be understood for technology valuation. The representative mode of intangible assets, technology, is the main decisive factor of stock price. Accordingly, competitive advantage of technology is the key determinant in the difference between book value and market value of the company. Thus, PBR is calculated by function with independent variables of IVT and EVT, the main variables of competitive advantage of technology.

$$PBR = f_1(IVT,\ EVT) \qquad (3\text{-}1)$$

When index is converted in the relative size of dependent variable, PBR, and independent variables, IVT and EVT, and named PBRI, IVTI and EVTI, the equation (3-1) is converted as follows.

$$PBRI = f_2(IVTI,\ EVTI) \qquad (3\text{-}2)$$

The equation (3-2) evaluates the size of relative market value, on the grounds of relative size of intrinsic and extrinsic value, in target technology against benchmarked value. When normalized dependent variable and independent variables are named ZPBRI, ZIVTI and ZEVTI, the equation (3-2) is formulated as follows.

$$ZPBRI = f_3(ZIVTI,\ ZEVTI) \qquad (3\text{-}3)$$

In the equation (3-3), function $f_3(\ )$ can be estimated by multiple regression analysis. The ZPBRI is the proxy variable of competitive advantage in technology decided by Intrinsic Value of Technology and Extrinsic Value of Technology, and it is also the proxy variable of the market value. In TVAM, ZPBRI will be defined as TVA. Accordingly, the equation (3-3) is expressed as follows.

$$TVA \approx ZPBRI = f_3(ZIVTI,\ ZEVTI) \quad (3\text{-}4)$$

Accordingly, TVA is calculated as follows.

$$TVA = \beta_0 + \beta_1 ZIVTI + \beta_2 ZEVTI$$

Ⅳ. Application of TVA Model and Technology Value Strategy

In this study, the basis of the market value of technology is the intangible assets. The company value evaluated in the market can be determined by the total market price of issued stocks. As mentioned in section III, there are various decision factors affecting the stock price of company. However, in case of new small and medium enterprises, due to their inferior state of capital, sales organization, experiences, and image compared to the competitors, the most important contributing factor to the company value is the technology, excluding tangible assets. The objects of this study are listed companies in IT (Information Technology) industry on KOSDAQ, wherein technology is the main basis of company value and main products with core technology account for most of the sales.

Data collection from the IT companies was conducted twice. The first survey was conducted for the pre-examination purpose to inspect the appropriateness of the survey questionnaire and the research model from July 2000 to August 2000.

In the base on the result of first survey, new questionnaire of 45 items was reconstructed. The first nine questions intend to find out the status of company's main product, especially profit size (PS) and profit growth rate (PG), in domestic and global market. And the other 36 questions are designated to evaluate the level of technology competence (TC) and technology sustainability (TS) by scale of 1 to 7.

The second survey is conducted out by mailing and visiting the examinees with the revised questionnaire from January 2001 to March 2001. The second survey yields responded from 47 companies. Inaccurate and unreliable data as well as missing data were excluded subject to findings from the two collections. Finally, 33 companies in IT industry were selected for the research.

According to the collected data, Weight of the main product in sales of IT companies are all more than 85%. The surveyed companies manufacture a single product with core technology or its application products, and they are suitable for the purpose of this study.

The sales of IT industry is 63.6 billion won, and about 43% of companies in this industry has more than 50% of export volume, of which their industry focuses on the overseas market. The average domestic sales increase rate of IT companies, estimated for the next 5 years, is recorded at 42%, which is very high. It can be understood that the listed IT companies on KOSDAQ are mainly new companies, and domestic market is in the growth stage. The potential of growth of IT industry is much higher than other industries. The average estimated growth rate for export of companies for the next 5 years is 31%. and the average estimated growth rate for operating profit of companies recorded high at 4.76%.

The statistical results of IVT, EVT and PBR are as shown in <Table 4-1>. And the multiple regression analysis for IT industry is as shown in <Table 4-2>.

According to the results of coefficients, multiple regression line of ZIVTI and ZEVTI over ZPBRI can be calculated as follows.

$$TVA = 0.539\ ZIVTI + 0.495\ ZEVTI \quad (4\text{-}1)$$

The constant value was 7.695E-04; it is excluded owing to the difficulty of expression.

According to the results of this study, the strategy to increase the technology value of the company is offered, whereupon the value of intangible assets of companies is increased. Furthermore, it will help to gain the continuous competitive advantage and to increase the results of companies.

In this study, the attractiveness of technology value as well as incorporated intrinsic value of technology and extrinsic value of technology are used to analyze the position and merits & demerits of technology value. Ensuing this process, the threat and opportunity of technology is analyzed to offer methods to increase technology value. For the above-mentioned intention, the technology value strategy matrix is used as shown

〈Table 4-1〉 The statistical results of IVT, EVT and PBR for IT Industry

Variable	TC	TS	IVT	PS	PG	EVT	PBR
Average	3.007	1.593	4.6	49.465	1.421	783.487	3.907

〈Table 4-2〉 Multiple Regression Analysis for IT Industry

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.803[a]	.644	.621	.6159

a. Predictors: (Constant), ZEVTI, ZIVTI.

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	20.627	2	10.313	27.188	.000[a]
	Residual	11.380	30	.379		
	Total	32.007	32			

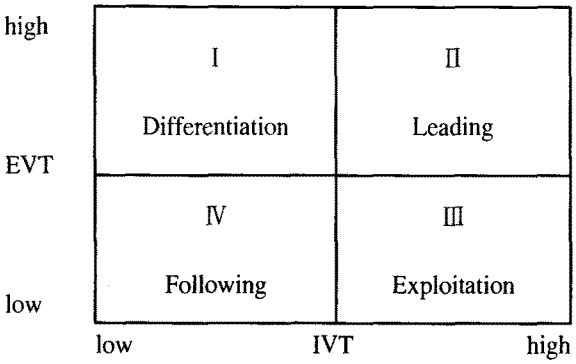
a. Predictors: (Constant), ZEVTI, ZIVTI.
b. Dependent Variable: ZPBRI.

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	7.695E-04	.107		.001	.999
	ZIVTI	.539	.114	.539	4.743	.000
	ZEVTI	.459	.114	.495	4.040	.000

a. Dependent Variable: ZPBRI.

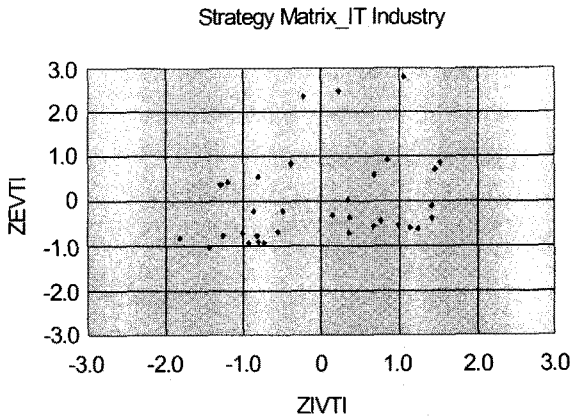
in <Figure 4-1>.



〈Figure 4-1〉 Strategy matrix of Technology Value

In the technology value matrix, X-axis indicates the future and present technology competitiveness, and Y-axis indicates the profitability of the technology in the present and future. The strategies to improve technology value by each cell are as shown in <Table 4-3>.

Positioning in Strategy matrix for 33 IT companies is shown in <Figure 4-2>. The axes of strategy matrix in <Figure 4-2> are replaced as ZIVTI and ZEVTI. This replacement is to fix the limit of axes from -3 to 3 by normalized distribution.



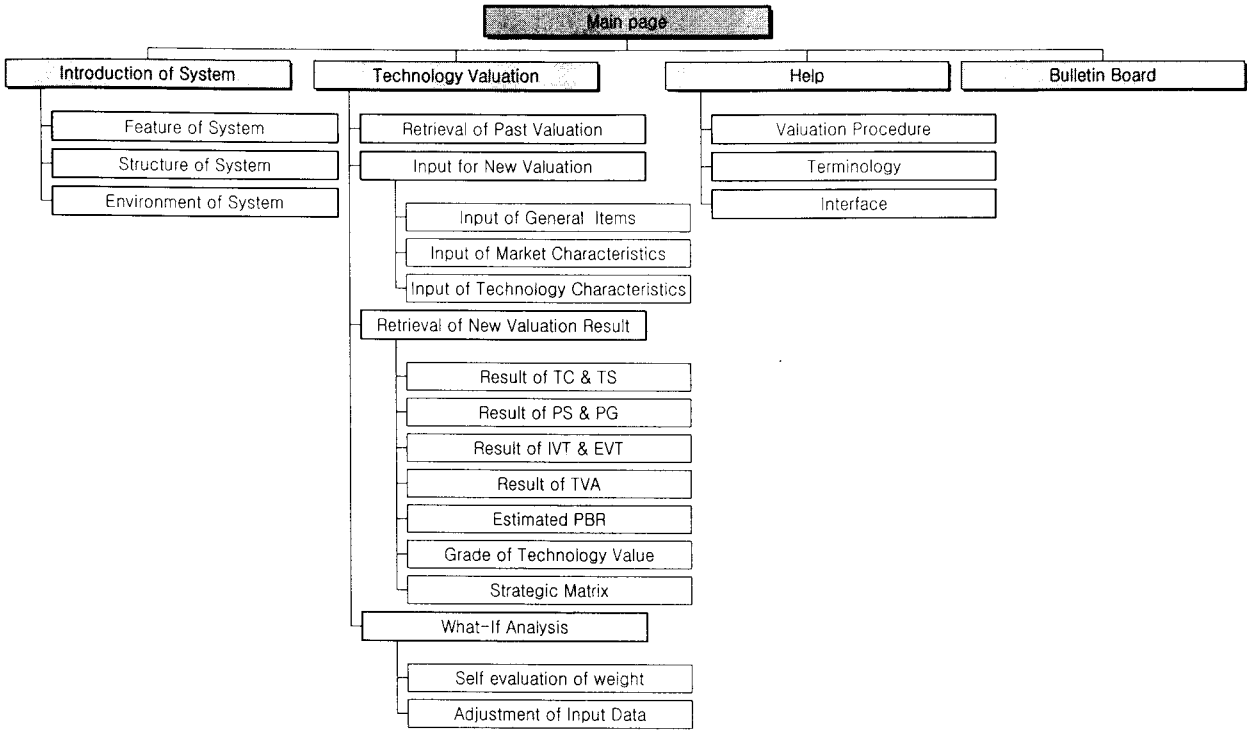
〈Figure 4-2〉 IT Company's Position in Strategy Matrix

V. Construction of Web-based Interactive Technology Valuation System

The Web-based Interactive Technology Valuation (WITV) System based on ATVM is proposed. The WITV System is a web-based DSS (Decision Support System) for supporting end-users through the Internet.

〈Table 4-3〉 the strategies to improve technology value

Cell	Strategy	Situation		Policy
		IVT	EVT	
I	Differentiation	low	high	• Licensing Core Technology • Technical Cooperation • Product Differentiation
II	Leading	high	high	• R&D • Market Blocking • Customer Stickiness
III	Exploitation	high	low	• New Market Exploitation • Replacement • Business Cooperation
IV	Following	low	low	• New Technology Development • Following Policy • Imitation



〈Figure 5-1〉 Site map of WITV system

The results of technology valuation are essential for successful technology development plan, technology trade, and investment. The activity of technology valuation has many variables to be considered and requires wide range of data, experiences, and special knowledge, thus technology developers, companies, concerned parties in technology trade, and investors find it difficult to approach technology valuation. Valuation experts use their accumulated special knowledge and experiences selectively for the technology valuation. They request necessary information from the client or they apply valuation model with reference to the past data. The process of technology valuation belongs to the domain of semi-structured problem. Valuation problem might be effectively managed through DSS.

WITV system, which is designed to support end-users, provides the results of technology valuation. The main purpose of WITV is to provide additional information and to offer results of valuation whenever they want.

The structure of WITV system is composed of four categories according to function, such as introduction, valuation, help, and bulletin board. The site map of WITV system is as shown in the <Figure 5-1>.

Ⅵ. Conclusion

For the new technology valuation method, we carried out establishment of theoretical classification system, development of the technology valuation attractiveness model (TVAM), experiment of the model, presentation of the strategy to improve technology value, and construction of the web-based interactive technology valuation system.

TVAM searches for the statistical relationship between the PBR and the competitiveness of technology. In this study, the variables for technology

value are classified into four dimensions, divided with spatial and time dimension, which in turn, are integrated into two variables as the Intrinsic Value of Technology (IVT) and the Extrinsic Value of Technology (EVT). These two becomes the basis for the calculation of Technology Value Attractiveness (TVA) forged in relationship with relative value of Price-to-Book value Ratio (PBR). The experiment of TVAM for the IT companies on KOSDAQ shows very high relationship with an R-square of 0.644.

TVA is also used as a ground for technology strategy to increase the technology value, which in turn, can be used as the criteria for investment and selection for R&D. The findings in this study present the TVA matrix and the Technology Value Strategy based on IVT and EVT. Differentiating strategy, leader strategy, exploitation strategy, and follower strategy were the presented strategy models suggesting various policies toward improving and maintaining the technology value.

The Web-based Interactive Technology Valuation (WITV) system is constructed to support decision making on technology valuation. It is composed of six main modules including input module for basic data, technology valuation module, and what-if analysis module. It also includes the function that offers strategic suggestions to improve the technology value by using results of the comparative study done for the IT industry.

Finally, this TVAM can be applied to business practically as follows; 1) valuation on technical introduction and royalty, such as the necessity of the technology, the possibility to introduce, the development cost of the supplier, the potential profit, risk, possibility to succeed, the infra-structure and capability of the company introduced. 2) features of technology value influence, such as profit from technology, market share, competition strength, environmental characteristic, technical barrier, ROI 3) selection and valuation of R&D, such as asset value of technology, effectiveness of technical transfer, market attractiveness, competitive position, exit/entrance barrier, 4) valuation on technology innovation, such as development cost, probability of success, expected profit, and 5) technology investment, such as ability to keep profit, commercialization cost, R&D cost.

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Analysis of Technology Value Strategy using Technology Valuation System

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Abstract

Increasing number of transactions and investments in technology has sparked a growing interest in technology valuation. However, it has not been easy to come up with an objective valuation of technology due to variance in technology value and specialty of technology valuation. The main objective of this paper lies in the development of a new system for technology valuation, Web-based Interactive Technology Valuation (WITV) system, which valuate the technology and analyze the technology value strategy. WITV system uses the Technology Valuation Attractiveness Model (TVAM). TVA is composed of the Intrinsic Value of Technology (IVT) and the Extrinsic Value of Technology (EVT). This paper experiment the feasibility of the TVA Model and WITV System by conducting an empirical study on small & medium sized manufacturing companies in IT industry, registered on KOSDAQ.

In this study, the potential value is defined as the technology value. It is represents the expected profit appraised by the market under the competitiveness of technology and the growth of the market. TVA is measured as the index to forecast the Price-to-Book value Ratio (PBR), which is the proxy variable for the potential value of the technology.

The results identify the feasibility of the TVAM through a high correlation between the TVA and the PBR.

Keywords: ***Technology value, Valuation, Technology value attractiveness, Strategy matrix, Technology valuation system***

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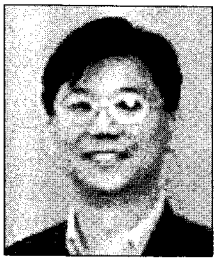

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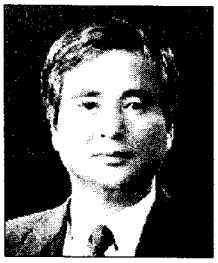
현재 용인송담대학 인터넷경영정보과 교수로 재직 중이다. 고려대학교에서 경영과학 및 경영정보시스템 전공으로 박사학위를 취득하였다. 한국기술거래소, 대한상공회의소 검정사업단, 한국산업인력공단 등의 자문위원으로 활동 중이다. 주요 관심분야는 기술가치 평가, 인터넷 비즈니스 전략, ERP 등이다.



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