METHOD OF TECHNOLOGY VALUATION

Technical Field

The present invention relates to a method of technology valuation, and more particularly, to a method of technology valuation by which a business insolvency risk of a target technology and an environmental risk are reflected so as to utilize technology valuation results in a credit loan, credit guarantee, and investment or the like so that systematic risk management is possible and insolvency probabilities by year according to grades and management results can be predicted.

Background Art

Generally, technology valuation can be largely categorized into technology ability valuation and technology value valuation. Technology ability valuation can be categorized into technology grade valuation and technology ability valuation. Firstly, technology grade valuation is to valuate business possibility of technology by percentage or grade. Technology ability valuation is to valuate the overall technology ability of an enterprise and to collectively valuate an individual technology level, a technology manpower, intellectual property rights, and research facilities or the like. Technology value valuation is to convert value of individual technology into money so as to calculate a technology trade price or a security value of an intellectual property.

Here, grade valuation methods of technology include a scoring model, a profile model, and a checklist model or the like. In the scoring model, scores are given to each valuation point of technology ability and weight is applied to each valuation point according to importance between valuation points so as to valuate technology grades. In the profile model, valuation factors are represented in a figure and advantages and there is an advantage for rapidly grasping

disadvantages of corresponding technology. In the checklist model, check points to be necessarily checked are set, cut-off criteria are set and then, it is checked whether all of check points satisfy predetermined criteria values.

In such conventional technology valuation models, each valuation factor is determined, scores (importance) is given to each valuation factor, and technology is valuated by score or grade. Here, a business insolvency risk is not considered and thus, there are limitations in utilizing technology valuation results as technology finance such as a credit loan, investment or the like.

In addition, in conventional technology valuation methods, an insolvency risk of an enterprise due to an economic environment or an economic factor is not reflected and thus, the reliability of the valuation is not high.

Furthermore, in conventional technology valuation methods, there are limitations in which the progress of enterprise insolvency fluctuation cannot be shown, and there are no models in which similar technology valuation examples of the past enterprises are analyzed and management results of a new enterprise can be predicted.

Under the circumstances, the Korean government announced 「Overall Countermeasures for Strengthening Small and Medium Business Competitiveness」 on July, 2004. As a result, improvements in public trust technology grade and an authentication system for use in various purposes, such as induction of a technology valuation model having an improved shape for valuating validity of more developed technology business and construction of grade setting methods considering an insolvency loss due to technology commercialization, are needed.

Disclosure of the Invention

The present invention provides a method of technology valuation by which an environmental risk due to an economic environment and an economic factor and a technology commercialization risk are reflected.

The present invention also provides a method of technology valuation by which exclusive technology valuation points are reconstructed based on significance analysis results of literature inquiry and the past technology valuation index, a balance matrix method is induced to improve objectivity, neutrality, and subsidiarity of check points by point so that the reliability of valuation index and application method is verified.

The present invention also provides a method of technology valuation by which the progress of enterprise insolvency fluctuation according to time can be shown.

The present invention also provides a method of technology valuation by which similar technology valuation examples of the past enterprises are analyzed and results of a new enterprise can be predicted.

The present invention also provides a method of technology valuation by which public trust technology valuation authentication grades for use in various purposes, such as technology transfer, technology trade, and technology finance (financing and investment) or the like, are provided so as to constitute conditions for revitalizing technology finance support for innovation-leading small and medium business.

According to an aspect of the present invention, there is provided a method of technology valuation, the method including: obtaining risk grades for giving grades by scoring probabilities (superior probabilities or insolvency probabilities) calculated by a logit model, so as to reflect business insolvency possibility of technology to be valuated; obtaining technology grades for giving grades according to scores calculated by a weight scoring model so as to reflect technology ability, business

possibility, and marketability of technology to be valuated in the computer; and obtaining technology valuation authentication grades in which grades are collectively given by a matrix in which the risk grades and the technology grades are set to an X-axis and an Y-axis, respectively.

The method may further include calculating insolvency probabilities by year according to grades using a life data analysis model (a survival analysis model).

The method may further include predicting management results by CBR (case-based reasoning).

The method may be applied to a technology valuation model valuated by a plurality of valuation indices respectively indicative of four points including owner's technology capability, technology ability, marketability, business possibility, and profitability.

The calculating of the scores according to each technology valuation point (small point) used to obtain the risk grades, the technology grades, and the technology valuation authentication grades in the obtaining of the risk grades and the obtaining of the technology grades may include: inputting valuation contents of detail check points according to valuation points; and calculating scores according to each technology valuation point (small point) by valuation contents of detail check points according to each technology valuation point (small point).

Valuation contents input to detail check points according to each technology valuation point (small point) may include metric valuation points valuated by values automatically calculated by respective systems, check valuation points valuated by the number of checked points, and valuer valuation points for giving grades according to valuation methods.

The calculating of the scores according to each technology valuation point (small point) may include calculating detail check points according to each technology valuation point (small point) by a 5x5 balance matrix or a 5x5x5 balance matrix.

The calculating of the risk scores in the obtaining of the risk grades may include: calculating logit scores for reflecting business insolvency risks, from technology valuation results; calculating environment scores for reflecting environment risks of technology (enterprise) to be valuated; and obtaining risk scores by combining the logit scores and the environment scores at a predetermined ratio.

The calculating of the logit scores and the environment scores may include: calculating technology valuation score factor variables; calculating economic index factor variables; calculating enterprise status variables; determining logit model input values using basic calculation values obtained in each step; calculating logit scores by inputting the technology valuation score factor variables to a logit function 1 and by calculating superior probabilities; and calculating environment scores by inputting the economic index factor variables and the enterprise status variables to a logit function 2 and by calculating superior probabilities.

The obtaining of the technology grades may include calculating technology scores by giving weight the technology scores according to valuation points by a weight scoring model.

The obtaining of the technology valuation authentication grades may include giving authentication grades by matrix valuation criteria based on risk grades by a logit model and technology grades by a weight scoring model.

The calculating of the insolvency probabilities by year by the life data analysis model (survival analysis model) may include: calculating survival probabilities (XB) through input variables and coefficients; and calculating expectancy life (or insolvency probabilities) according to time by reflecting the survival probabilities.

The predicting of the management results by CBR may include: calculating scores according to technology valuation points; measuring an Euclidean distance; extracting an enterprise in which the Euclidean

distance is minimum by a predetermined number; and predicting results of an enterprise by CBR by extracting results of the extracted enterprise.

According to another aspect of the present invention, there is provided a method of technology valuation. A matrix diagram and an explanation part are presented for technology valuation in various viewpoints. Characteristics of an enterprise are represented by drafting a KTCP matrix which includes a diagram part and an explanation part in a computer and in which technology ability, business possibility, technology business possibility, and risk grade variables are set as an X-axis or an Y-axis.

The drafting of the KTCP matrix may include: selecting each variable of technology valuation risk grades, technology grades, and technology ability variables; calculating risk grades, technology grades, and finance stability grades; calculating scores of technology ability, business possibility, and technology business possibility; drafting a matrix table according to the calculated scores; and constructing a matrix diagram part based on the drafted matrix table.

Brief Description of the Drawings

FIG. 1 illustrates the concept of a method of technology valuation according to an embodiment of the present invention.

FIG. 2 is a flowchart for calculating valuation grades according to technology valuation points according to the present invention.

FIG. 3 is a flowchart for calculating risk scores (a logit model) for obtaining risk grades according to the present invention.

FIG. 4 is a flowchart illustrating a method of predicting management results.

FIG. 5 shows a screen for explaining a diagram part and an explanation part of a KTCP matrix.

FIG. 6 is a flowchart for constructing the KTCP matrix.

FIG. 7A illustrates a KTCP matrix for illustrating technology valuation grades.

FIG. 7B illustrates a KTCP matrix for illustrating management result prediction.

FIG. 7C illustrates a KTCP matrix for explaining technology ability versus business possibility.

FIG. 7D illustrates a KTCP matrix for explaining technology ability versus marketability.

FIG. 7E illustrates a KTCP matrix for explaining marketability versus business possibility.

FIG. 7F illustrates a KTCP matrix for explaining finance safety versus technology business possibility.

FIG. 8A is a receipt management screen in a technology valuation receipt step.

FIG. 8B is a receipt details input screen in the technology valuation receipt step.

FIG. 8C is an input screen of enterprise overview.

FIG. 8D is a representative situation input screen.

FIG. 8E is a financial statement input screen.

FIG. 8F is an economic environment index data management screen.

FIG. 8G is a valuation sheet cover generation screen.

FIG. 8H is a screen on which 45 data are inputted and a valuation table is drafted.

FIG. 8I is a valuation point grade giving screen of a metric point example 1.

FIG. 8J is a valuation point grade giving screen of a metric point example 2.

FIG. 8K is a valuation point grade giving screen of a check point example.

FIG. 8L is a valuation point grade giving screen of a valuer valuation point example.

FIG. 8M is a screen showing a balance matrix.

FIG. 8N is a screen showing score calculation results.

FIG. 8O shows the step of displaying valuation results, which show technology valuation grades, result analysis, and expectancy life calculation results.

FIG. 9 is a graph comparing business insolvency prediction powers of a conventional method of technology valuation in which risk grades of technology are not reflected and the method of technology valuation according to the present invention.

Best mode for carrying out the Invention

Hereinafter, a method of technology valuation according to an exemplary embodiment of the present invention will be described in detail with reference to the attached drawings.

FIG. 1 illustrates the concept of a method of technology valuation according to an embodiment of the present invention. The method of technology valuation includes: obtaining risk grades (S123); obtaining technology grades (S125); obtaining technology valuation authentication grades (S129); obtaining insolvency probabilities by year according to grades (S133); and predicting management results (S135).

Valuation grades of the method of technology valuation according to the present invention are categorized into risk grades (S123), technology grades (S125), and technology valuation (authentication) grades (S129).

The risk grades (S123) are technology-based enterprise risk grades for checking a business insolvency risk of an enterprise based on corresponding technology by statistically analyzing commercialization conditions of technology expected to be commercialized or in progress, technology ability, and related matters and simultaneously, for

synthesizing economic environment factor or the like that may affect business promotion of an enterprise. In the risk grades (S123), superior or inferior probabilities calculated by a logit model are scored and grades are given to the scores according to predetermined criteria and are indicated by 10 grades (aaa - d), so as to reflect a business insolvency risk of an enterprise (technology) to be valuated.

The technology grades (S125) are technology-based grades for calculating business success possibility of an enterprise based on corresponding technology and technology innovation capability by collectively checking technology ability, business possibility, and marketability or the like of technology expected to be commercialized or in progress. In the technology grades (S125), predetermined criteria are applied to scores calculated by a weight scoring model and grades are given to the scores and are indicated by 10 grades (V1 – V10), so as to reflect technology ability, business possibility, and marketability or the like of an enterprise (technology) to be valuated.

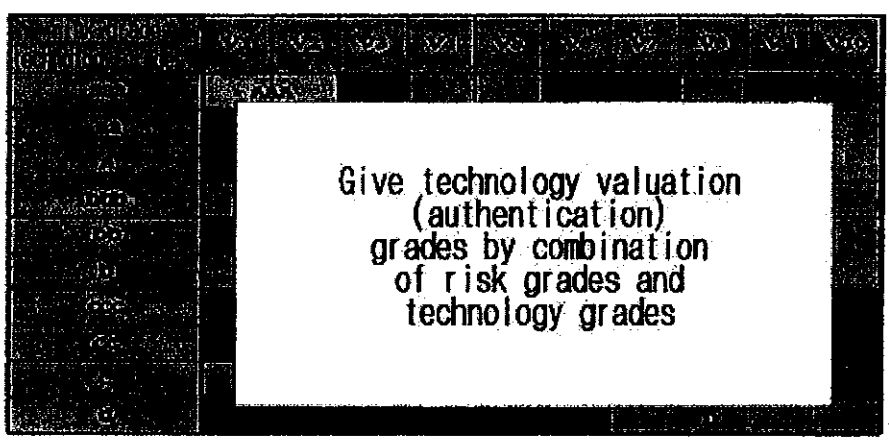
In the technology valuation (authentication) grades (S129), the risk grades and the technology grades are collectively checked by a matrix and grades are given to the checked risk grades and technology grades and are indicated by 10 grades (AAA - D).

Table 1

Classification / Grades	Most superior	Very superior	Superior	Good	Above the average	Average	Below the average	In-sufficient	In-ferior	Very inferior
Risk grades	aaa	aa	a	bbb	bb	b	ccc	cc	c	d
Technology grades	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10
Technology valuation (authentication grades)	AAA	AA	A	BBB	BB	B	CCC	CC	C	D

Here, the risk grades (S123) and the technology grades (S125) are grades given by predetermined criteria according to risk scores and technology scores calculated by each model. The technology valuation (authentication) grades (S129) are collectively checked by the matrix in which the risk grades and the technology grades are set to an X-axis and an Y-axis, respectively, and are given, and results thereof are shown in Table 2.

Table 2



Hereinafter, a method of obtaining risk grades, technology grades, and technology valuation authentication grades will be described using the method of technology valuation according to the present invention.

Technology valuation points used to obtain the risk grades, the technology grades, and the technology valuation authentication grades in the present method of technology valuation are shown in Table 3. The technology valuation points has a hierarchical structure including large · medium · small points and detail check points. Scores (grades) according to technology valuation points (small points) are calculated based on the valuation results of the detail check points, and scores (grades) of the technology valuation points (small points) are utilized as input variables for calculating the risk grades and the technology grades.

Table 3

Large points	Medium points	Small points	Detail check points	Valuation methods
Owner's technology capability etc.	Technology management capability (owner)	Technology experience level	-Owner's technology experience level -Technology management strategy	Metric valuation Check valuation
		Technology knowledge level	-Owner's technology knowledge level -Owner's technology understanding	Valuer valuation Valuer valuation
		Management capability	-Technology man power management -Crisis management -Management will and business ability	Check and metric valuation Checkvaluation Check valuation
		Management human configuration and team work	-Educational background and carrier of management -Capital participation -Relationship with representative and team work	Valuer valuation Valuer valuation Check valuation
Technology ability	Research development capability (resources and finances)	Technology development promotion capability (human resources)	-Organization of whole responsibility for development -Superior development man power rate	Valuer valuation Metric valuation
		Technology · research development investment situations (material resources)	-Technology and authentication results -Core technology possession situations -Research development investment ratio	Metric valuation Metric valuation Metric valuation
	Excellence of technology (product) (pure technology point view)	Technology innovation (leading) capability	-Discrimination of technology -Imitation difficulty -Position on life cycle of technology	Valuer valuation Valuer valuation Valuer valuation
		Technology completeness	-Completeness of technology -Independence of technology -Coincidence with business strategy	Valuer valuation Valuer valuation Valuer valuation

		Technology expandability	-Technology ripple effect inside· outside enterprise -Application and expandability of technology	Check valuation Valuer valuation
Marketability	Marketability of technology (product)	Competition situations	-Market structure -Competition situations (competition strength) in the same industry -Entry of market	Valuer valuation Check valuation Check valuation
		Market formation	-Scale of market -Growth rate of market -Restrictions/encouragement factors such as law and regulations etc.	Valuer valuation Valuer valuation Valuer valuation
		Competitive product	-Recognition -Market share -Comparison superiority with replacement	Check valuation Vlauer valuation Check valuation
Business possibility and profitability	Productivity of technology (product)	Commercialization capability of technology and productivity	Production facility acquisition facilitation -Production man power acquisition facilitation -Material and component supply facilitation	Valuer valuation Valuer valuation Check valuation
	Management capability	Management capability (capital, management, investment)	-Capital supply capability -Added value creation capability -Optimum level of investment scale	Valuer valuation Metric valuation Valuer valuation
	Business capability of technology (product)	Marketing capability	-Validity of sales plans -Variety and stability of sales places -Marketing man power acquisition	Check valuation Valuer valuation Valuer valuation
	Profitability	Profit creation capability	-Sale growth rate -Sales current account profitability	Metric valuation Metric valuation
		Profit prospect	-Withdrawal possibility in comparison with investment -Investment profitability	Valuer valuation Metric valuation

FIG. 2 is a flowchart for calculating valuation grades according to technology valuation points according to the present invention. As illustrated in FIG. 2, a user logs in a technology valuation table (S201)

and inputs valuation contents of detail check points according to technology valuation points (small points) (S203).

The input valuation contents are categorized into metric valuation points, check valuation points, and valuer valuation points according to valuation methods.

The metric valuation points are valuated by values obtained by automatically calculating using a system by utilizing separately-input enterprise data such as enterprise overview data and enterprise financial affair data or the like. Since the metric valuation points are automatically calculated using the system, it is very important to check whether input of data is omitted or not.

The metric valuation points include valuation points by sizes (levels) of corresponding calculation values and valuation points by levels in comparison with averages (average rates according to business or the like) in the same industry.

Calculation methods according to points are shown in FIG. 4.

Table 4

Metric valuation points (check points)			
Check points	Input values	Output values	Calculation methods
Education training cost of technology man power management	Direct input -education training cost -	-Education training input value -Average education training cost of corresponding business	-Valuer calculates education training cost on valuation screen (Pop-Up) and input it
Superior development man power rate	Direct input -the number of man power of whole responsibility for development Automatic input -the number of superior development man power	-Superior development man power rate	- Valuer inputs the number of man power of whole responsibility for development on valuation screen (Pop-Up) and automatically calculates the number of superior development man power by taking it from technology man power management
Technology	Direct input		

development and prizewinning (authentication) results	-the number of corresponding results	-Conversion total scores	- If valuer inputs the number of corresponding results on valuation screen (Pop-Up), valuer gives weight by weight according to results and automatically calculates the sum thereof
Core technology possession situations	Same as above	Same as above	Same as above
Technology research development investment situations	-Development cost of balance sheet (term before last, previous term, current term) -Current account development cost of profit and loss statement (previous term, current term) -Development cost depreciation amount of profit and loss statement (previous term, current term) -Current account development cost of manufacturing cost detailed statement (previous term, current terma0 -Sales (previous term, current term) -Total assets (previous term, current term)	-Research development investment rate in comparison with sales (total assets) -Average research development investment rate in the same business	
Added value creation capability	- Current term financial statements	-Corresponding added value rate -Average added value rate of corresponding business	-Automatically calculate by utilizing input enterprise financial data *It is checked whether financial statements are input or not, and if omitted, valuer inputs financial statements and then performs valuation
Sale growth rate	- Three-year (current term, previous term, term before last) financial statements	-Increase rate of corresponding sales -Average added value rate of corresponding business	

Sales current account profitability	-One-year (current term) financial statements	-Corresponding rate -Average sales current account profitability of corresponding business	
Investment profitability	- One-year (current term) financial statements	-Corresponding rate -Average investment profitability of corresponding business	

In the check valuation points, a valuer checks check points presented as valuation criteria and performs automatic valuation by the number of checked points.

Check valuation point situations are shown in Table 5.

Table 5

Check valuation points (check points)			
Check points	Input values	Output values	Calculation methods
Technology management strategy	Check	-The number of checked cases	-Valuer counts the number of checked points on valuation screen (Pop-Up) and performs valuation by the number of checked cases
Technology man power management	Same as above	Same as above	Same as above
Crisis management capability	Same as above	Same as above	Same as above
Management will and business ability	Same as above	Same as above	Same as above
Relationship with representative and team work	Same as above	Same as above	Same as above
Technology ripple effect inside· outside enterprise	Same as above	Same as above	Same as above
Competition situations (competition strength) in the same industry	Same as above	Same as above	Same as above

Entry of market	Same as above	Same as above	Same as above
Recognition	Same as above	Same as above	Same as above
Comparison superiority with replacement	Same as above	Same as above	Same as above
Material and component supply facilitation	Same as above	Same as above	Same as above
Validity of sales plans	Same as above	Same as above	Same as above

Objects of valuer valuation points are valuation points excluding metric and check valuation points. In the valuer valuation points, a valuer gives arbitrary grades by valuation criteria presented on a valuation screen (Pop-Up) and performs valuation.

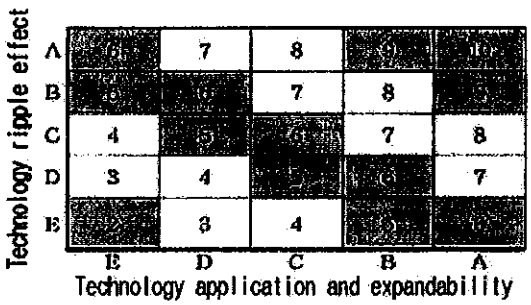
Methods of valuer valuation according to valuation points are summarized into the above-described Table 3.

The valuer inputs valuation contents of detailed check points according to technology valuation points (small points) using the above-described valuation methods (S203) and then, it is checked whether input points are omitted or not (S205), and if omitted points exist, the user inputs the omitted points (S207).

If all of detailed check points are input, scores (grades) according to technology valuation points (small points) are automatically calculated using a 5x5 balance matrix or a 5x5x5 balance matrix according to the number of detailed check points by technology valuation points (small points) (S209).

An example of calculation using the 5x5 balance matrix is shown in Table 6.

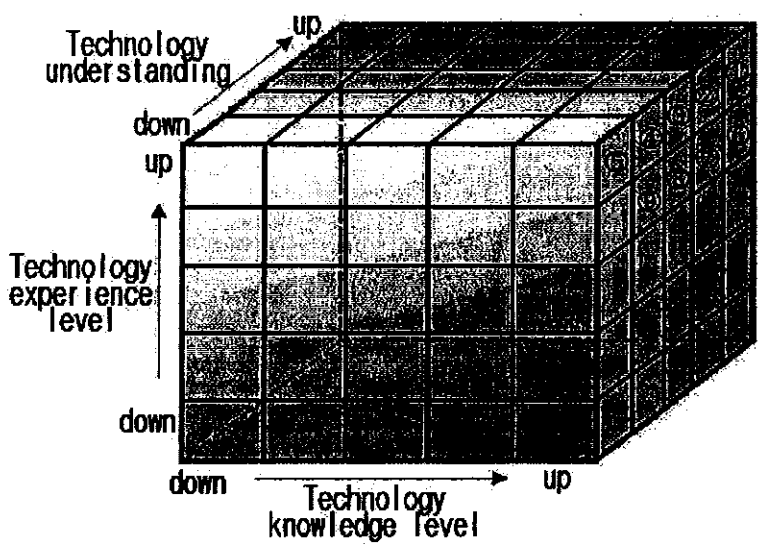
Table 6



Grade	Scores	Count	Probabilities
Grade A	10 scores	1	4%
Grade B	9,8 scores	5	20%
Grade C	7,6 scores	9	36%
Grade D	5,4 scores	7	28%
Grade E	below 3 scores	3	12%

An example of calculation using the 5x5x5 balance matrix is shown in Table 7.

Table 7



Scoring : A=5, B=4, C=3, D=2, E=1

Position	①	②	③	④	⑤	⑥	⑦	⑧	⑨	.....
①Technology professionalism	A	A	A	A	A	A	A	A	A	...
②Technology quantification and education background	A	A	A	A	A	B	B	B	B	...
③Technology understanding	A	B	C	D	E	A	B	C	D	...
Scores	15	14	13	12	11	14	13	12	11	...

Grades	Scores	Count	Probabilities
A	14 – 15 scores	4	3.2
B	11 – 13 scores	31	24.8
C	8 – 10 scores	55	44.0
D	5 – 7 scores	31	24.8
E	3 – 4 scores	4	3.2
Sum		125	100.0

FIG. 3 is a flowchart for calculating risk scores (a logit model) for obtaining risk grades according to the present invention. A risk prediction model is established by applying technology valuation data valuated by a technology valuation table to the logit model.

As a procedure for calculating logit scores for obtaining risk grades, firstly, it is checked whether valuation input of detailed check points according to technology valuation points (small points) is omitted or not (S301). This operation is to automatically check whether scoring of valuation points is omitted and input of other input variables is omitted. As the checked result, if input of valuation scores is omitted, points are supplemented (S303).

Next, technology valuation score factor variables are calculated by function equation by utilizing scores (grades) according to valuation-inputted technology valuation points (small points) (S305).

Table 8

Factor variable	Function equation
F1	$=\widehat{P1}*\widehat{A1.1} + \widehat{P2}*\widehat{A1.2} + \cdots + \widehat{P16}*\widehat{A1.16}$
⋮	⋮
F12	$=\widehat{P1}*\widehat{A12.1} + \widehat{P2}*\widehat{A12.2} + \cdots + \widehat{P16}*\widehat{A12.16}$

- $\widehat{Pn}$(standardization of technology valuation points (small points)) $= \frac{Pn - \overline{P_n}}{\sigma_{P_n}}$

P_n : actual grade valuation scores (input values) of technology valuation points (small points)

$\overline{P_n}$: average (DB) of technology valuation points (small points)

σ_{P_n} : standard deviation (DB) of technology valuation points (small points)

n = 1, 2, ···, 16

- $\widehat{A1.1}$, $\widehat{A1.2}$, ···, $\widehat{A1.16}$

linear equation coefficient (DB) of 16 technology scores for calculating factor 1 (factor variable 1)

If calculation of factor variables is completed (S305), economic index factor variables are calculated by function equation by utilizing a separately-stored economic index (S307).

The list of economic index variables is shown in Table 9.

Table 9

management environment index (entire)	y=1	L1_ECO1	L3_ECO1	L6_ECO1
small and medium manufacturing industry business condition index	y=2	L1_ECO2	L3_ECO2	L6_ECO2
prior synthetic index	y=3	L1_ECO3	L3_ECO3	L6_ECO3
enterprise business condition actual inspection index	y=4	L1_ECO4	L3_ECO4	L6_ECO4
synthetic stock price index	y=5	L1_ECO5	L3_ECO5	L6_ECO5
manufacturing industry average operation rate index	y=6	L1_ECO6	L3_ECO6	L6_ECO6
customer price index	y=7	L1_ECO7	L3_ECO7	L6_ECO7
national profitability	y=8	L1_ECO8	L3_ECO8	L6_ECO8
exchange rate won to U.S. dollar	y=9	L1_ECO9	L3_ECO9	L6_ECO9
y-th variable of t-term		$L_t_ECO_y$		

Here, economic index factor variable calculation equation is $ECO_n = \sum(L_\overline{ECO_y} * F_{n,y})$

(ECO_n : economic factor variable (n=1,2,3,4)

$L_\overline{ECO_y}$(standardization of y-th variable of t-term) = $\frac{L_ECO_y - \overline{L_ECO_y}}{\sigma_{L_ECO_y}}$

$F_{n,y}$: factor coefficient of y-th economic variable of t-term with respect to n-th economic factor variable)

Next, enterprise status variables are calculated (S309).

The list of variables for calculating enterprise status variables is shown in Table 10, and the enterprise status variables are obtained by separately-input enterprise data.

Table 10

Point name	Variable name	Reference method for calculating variables
Registered corporation	X7Y	Regular survey – enterprise overview – enterprise form (registration)
External auditor	X9Y	Regular survey – enterprise overview – enterprise form (external auditor)
Venture	X26Y	Regular survey – enterprise overview – enterprise form (venture)
Inno-Biz	X43Y	Data management – technology complimentary/innovation leading enterprise (code 60)
Starting enterprise	TYPE1	Regular survey – enterprise overview – enterprise within 3 years from business starting date
Software business	SW	Regular survey – enterprise overview – business classification

In the enterprise status variables, both input error or input omission exist when a valuer inputs regular survey and data management DB. Thus, the valuer outputs the list of enterprise status variables on a screen (Pop-Up) before calculating final scores, so as to re-confirm the enterprise status variables (S311).

Next, a basic calculation value and a logit model input value are determined and are stored (S313).

Subsequently, technology valuation score factor variables are input to the logit model and a logit score 1 is obtained (S315), and a superior probability (score) is calculated (S317) so as to obtain a logit score (S319).

Points and variable names for calculating logit scores are shown in Table 11.

Table 11

Point name	Variable name
Technology score factor variable 1	F1
Technology score factor variable 2	F2
Technology score factor variable 3	F3
Technology score factor variable 4	F4
Technology score factor variable 5	F5
Technology score factor variable 6	F6
Technology score factor variable 7	F7
Technology score factor variable 8	F8

Technology score factor variable 9	F9
Technology score factor variable 10	F10
Technology score factor variable 11	F11
Technology score factor variable 12	F12
Preparatory variable	Industry
Segment	Intercept

A superior probability (score) is calculated by equation (S317).

$$f(x) = \frac{1}{1+e^{-x}} \quad (x = \text{LOGIT SCORE})$$

and if the score is calculated, a logit score is calculated by equation logit score = score x 100 (S319).

Points and variable names for calculating environment scores are shown in Table 12, and logit score 2 is calculated like the above-described procedure of obtaining logit scores (S321), and a score is obtained (S323) and then, an environment score is obtained (S325).

Table 12

Point name	Variable name
Economic index factor variable 1	E001
Economic index factor variable 2	E002
Economic index factor variable 3	E003
Economic index factor variable 4	E004
KOSDAQ registration	X7Y
External auditor enterprise	X9Y
Venture	X26Y
Inno-Biz enterprise	X43Y
Starting business	TYPE1
Software business	SW
Segment	Intercept

If the logit score and the environment score are obtained, a risk score is obtained by equation (risk score = logit score x 0.95 + environment score x 0.05) (S327).

If the risk score is obtained, risk grades are calculated, as illustrated in FIG. 1 (S123).

Next, technology grades are obtained using a weight scoring model (S125). Here, a method of obtaining technology scores by technology valuation points (small points), as illustrated in Table 13.

Table 13

Valuation points			Weight (A)	Valuation grades	Grade Score (B)	Score according to points (A>B/5)	Technology valuation score
Large points	Medium points	Small points					
Owner's technology capability etc.	Technology management capability (owner)	Technology experience (knowledge) level	12	A	5	12.0	
		Management capability	8	B	4	6.4	
		Human configuration of management etc.	6	C	3	3.6	
Technology ability	Research development capability	Technology development promotion capability	5	D	2	2.0	
		Technology research development investment	5	E	1	1.0	
	Excellence of technology (product)	Technology innovation (leading) capability	5	B	4	4.0	
		Technology completeness	7	A	5	7.0	
		Technology expandability	4	B	4	3.2	
Marketability	Marketability of technology (product)	Competition situations	5	D	2	2.0	
		Market formation	3	A	5	3.0	65.6
		Competitive product	7	B	4	5.6	
	productivity of technology (product)	Commercialization capability and productivity of technology	6	C	3	3.6	

	Management capability	Management capability (capital, management, investment)	10	D	2	4.0	
	Business capability of technology (product)	Marketing capability	10	E	1	2.0	
	Profitability	Profit creation capability	3	A	5	3.0	
		Profit prospect	4	B	4	3.2	
Sum			100			65.6	

Weights according to valuation points are discriminately applied by reflecting characteristics according to business.

If the technology score is determined by the weight scoring model, technology grades are given by the following valuation criteria (S125).

Scores	90 or larger	85 or larger	80 or larger	75 or larger	70 or larger	65 or larger	60 or larger	55 or larger	50 or larger	below 50
Grades	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10

(where, technology grades are indicated by capitals "V1 – V10".)

If the risk grades (S123) by the logit model and the technology grades (S125) by the weight scoring model are calculated, an operation of finally giving technology valuation authentication grades according to matrix valuation criteria based on the risk grades and the technology grades will be described (S129).

Technology valuation authentication grade calculation depends on grade valuation by matrix, as shown in Table 2.

Next, an operation of calculating insolvency probabilities by year according to grades will be described by a life data analysis model (a survival analysis model) (S133). In the operation, insolvency probabilities by year (expectancy life) according to technology valuation authentication grades are calculated by using valuation results of a technology valuation table as input variables.

Life (survival) data is comprised of data having a period from a predetermined starting point to an occurrence time of an accident, for example, data having a period from a credit guarantee (loan) time according to technology valuation and valuation results to time when an accident of enterprise insolvency (commercialization failure) occurs. The time is referred to as a survival period.

In life data analysis (survival analysis), the survival period is analyzed, survival probabilities and a risk rate after time t of a technology valuation and credit guarantee (loan) enterprise are obtained, and an expectancy life of an enterprise to be valuated is measured, so as to provide additional information such as progress of fluctuation of a business insolvency rate by technology valuation grades according to time.

The list of input variables for calculating survival probabilities of a life data analysis model is shown in Table 14.

Table 14

Point name	Variable name	Coefficient
Technology score factor variable 1	F1	
Technology score factor variable 2	F2	
Technology score factor variable 3	F3	
Technology score factor variable 4	F4	
Technology score factor variable 6	F6	
Technology score factor variable 8	F8	
Technology score factor variable 9	F9	
Technology score factor variable 11	F11	
Economic index factor variable 1	E001	
Economic index factor variable 3	E003	
KOSDAQ registration	X7Y	
External auditor enterprise	X9Y	
Venture	X26Y	
Inno-Biz enterprise	X43Y	
Starting business	TYPE1	
Software business	SOFTWARE	
Segment	Intercept	

Table 15 shows an example of the list of parameters for calculating expectancy life according to time (t).

Table 15

Point name	Variable name	Value
Scale parameter	scale	0.5057451
Weibull shape	weibull	1.97728081
One-year expectancy life	y_12	12
Two-year expectancy life	y_24	24
Three-year expectancy life	y_36	36
Four-year expectancy life	y_48	48
Five-year expectancy life	y_60	60

In a method of calculating expectancy life (or insolvency probabilities) by year using the variables, ① survival probabilities (XB) are calculated by linear equation of input variables and coefficients, and ② expectancy life (or insolvency probabilities) according to time is calculated.

* One-year expectancy life = EXP(-EXP(-XB) * weibull) * $y_12^{weibull}$)
* Two-year expectancy life = EXP(-EXP(-XB) * weibull) * $y_24^{weibull}$)
* Three-year expectancy life = EXP(-EXP(-XB) * weibull) * $y_36^{weibull}$)
* Four-year expectancy life = EXP(-EXP(-XB) * weibull) * $y_48^{weibull}$)
* Five-year expectancy life = EXP(-EXP(-XB) * weibull) * $y_60^{weibull}$)

※ Insolvency probability = 1 – expectancy life

An example of expectancy life (insolvency life) estimation by year is shown in FIGS. 8 through 15.

Next, an operation of predicting management results based on case-based reasoning (CBR) (S121) will be described (S135).

CBR is the process of solving new problems based on the solutions of similar past problems. The past technology valuation cases that are similar to enterprise (technology) being currently valuated are extracted by applying the analysis method, and management results of a similar technology valuation case enterprise are analyzed to extract management results of a corresponding enterprise (technology).

FIG. 4 is a flowchart illustrating a method of predicting management results, and stepwise calculation methods will be described with reference to FIG. 4.

Firstly, scores according to technology valuation index are calculated (S401). Here, scores calculated by a technology valuation table are utilized.

Next, an Euclidean distance is measured (S403). The Euclidean distance is an index indicative of scale of similarity and is obtained by square root with respect to square sum of a distance between a technology valuation small point criteria score and a score of an enterprise to be compared (the past scoring case), as shown in the following equation.

$$\text{Euclidean distance} = \sqrt{\sum_{n=1}^{16}((\hat{P}_n - P_n)^2 \times W_n)}$$

$\hat{P}_n$: score of enterprise to be compared (the past scoring case)

P_n : score of enterprise to be valuated

W_n : weight

$n = 1, 2, \cdots, 16$

※ Calculating the Euclidean distance with respect to each enterprise to be compared (the past scoring case)

Next, the Euclidean distance is measured and 10 cases of enterprises in which the Euclidean distance is minimum, that is, 10 cases of enterprises having the highest similarity are extracted (S405), and results of 10 enterprises such as growth rate, profitability, and activity or the like are extracted (S407).

Valuation results by CBR with respect to the enterprise to be valuated are accumulated on the enterprise to be compared (the past scoring case) and are utilized as the enterprise to be compared. As described above, the risk grades, the technology grades, the technology

valuation authentication grades, the insolvency probabilities by year according to grades, and prediction of management results according to the present invention have been described.

When the technology valuation results using the method of technology valuation of the present invention are analyzed in various viewpoints such as risk grades, technology ability, and business possibility or the like and are indicated on a two-dimensional diagram (hereinafter, referred to as a 'KTCP matrix'), the utility thereof can be increased. Thus, a method of drafting such a KTCP matrix and utility will now be described.

FIG. 5 shows a screen for explaining a diagram part and an explanation part of the KTCP matrix. As illustrated in FIG. 5, the KTCP matrix is a technology valuation and consulting matrix in which technology ability and business possibility, technology · business possibility, and risk grade variables used in a technology valuation model are set to an X-axis and an Y-axis, respectively and which represents characteristics of an enterprise as one diagram.

The diagram part classifies technology ability and business possibility of an enterprise to be valuated and risk view point valuation results into predetermined grades and then represents the grades on the matrix.

The explanation part combines · constructs the matrix in various viewpoints and then automatically outputs an explanation of each matrix.

Technology ability used as an index of the KTCP matrix is to collectively valuate technology development promotion capability, investment and infra for technology development, innovation, completeness, and expandability of technology. Business possibility is to collectively valuate market situations and competitive power of possessed technology (product), commercialization capability, and marketing capability or the like.

FIG. 6 is a flowchart for constructing the KTCP matrix. The KTCP matrix is constructed by operations: selecting variables (S601), calculating risk grades, technology grades, and finance stability grades (S603); calculating technology ability, business possibility, and technology · business possibility scores (S605); setting sections of scores according to variables (S607), drafting a matrix table (S609), and constructing a matrix diagram part (S611).

In the selecting of variables (S601), each of technology valuation risk grades, technology grades, and technology ability variables are selected. The technology valuation risk grades use technology-based risk grades calculated by a technology valuation model, and the technology grades are scores or grades calculated by a scoring method with respect to the entire valuation points of the above-described technology valuation index.

The technology ability variables include technology ability valuation points of the technology valuation index, as shown in Table 17.

Table 17

Large points	Medium points	Small points
Owner's technology capability etc.	Technology management capability	Technology experience (knowledge) level
		Management capability
		Management human construction and team work
Technology ability	Research development capability	Technology [illegible] development promotion capability
		Technology research development investment situations
	Excellence of technology (product)	Technology innovation (leading) capability
		Technology completeness
		Technology expandability
Marketability	Marketability of technology (product)	Competition situations
		Market formation

		Competitive product
Business possibility and profitability	Productivity of technology (product)	Commercialization capability of technology and productivity
	Management capability	Management capability
	Business capability of technology (product)	Marketing capability
	Profitability	Profit creation capability
		Profit prospect

Marketability variables include marketability valuation points of the technology valuation index, as shown in Table 18.

Table 18

Large points	Medium points	Small points
Owner's technology capability etc.	Technology management capability	Technology experience (knowledge) level
		Management capability
		Management human construction and team work
Technology ability	Research development capability	Technology development promotion capability
		Technology · research development investment situations
	Excellence of technology (product)	Technology innovation (leading) capability
		Technology completeness
		Technology expandability
Marketability	Marketability [illegible] technology (product)	Competition situations
		Market information
		Competitive product
Business possibility and profitability	Productivity of technology (product)	Commercialization capability of technology and productivity
	Management capability	Management capability
	Business capability of technology (product)	Marketing capability
	Profitability	Profit creation capability
		Profit prospect

The following Table 19 shows business possibility ① variables.

Table 19

Large points	Medium points	Small points

Owner's technology capability etc.	Technology management capability	Technology experience (knowledge) level
		Management capability
		Management human construction and team work
Technology ability	Research development capability	Technology development promotion capability
		Technology · research development investment situations
	Excellence of technology (product)	Technology innovation (leading) capability
		Technology completeness
		Technology expandability
Marketability	Marketability of technology (product)	Competition situations
		Market formation
		Competitive product
Business possibility and profitability	Productivity of technology (product)	Commercialization capability of technology and productivity
	Management capability	Management capability
	Business possibility of technology (product)	Market adaptability
	Profitability	Profit creation capability
		Profit prospect

The following Table 20 shows business possibility ② variables.

Table 20

Large points	Medium points	Small points
Owner's technology capability etc.	Technology management capability	Technology experience (knowledge) level
		Management capability
		Management human construction and team work
Technology ability	Research development capability	Technology development promotion capability
		Technology · research development investment situations
	Excellence of technology (product)	Technology innovation (leading) capability
		Technology completeness
		Technology expandability
Marketability	Marketability of technology (product)	Competition situations
		Market formation

Business possibility and profitability	Productivity of technology (product)	Competitive product
	Management capability	Management capability
	Business capability of technology (product)	Marketing capability
	Profitability	Profit creation capability
		Profit prospect

Technology · business possibility variables include technology ability and business possibility valuation points of the technology valuation index, as shown in the following Table 21.

Table 21

Large points	Medium points	Small points
Owner's technology capability etc.	Technology management capability	Technology experience (knowledge) level
		Management capability
		Management human construction and team work
Technology ability	Research development capability	Technology development capability
		Technology research development investment situations
	Excellence of technology (product)	Technology innovation (leading) capability
		Technology competitiveness
		Technology exchangeability
Marketability	Marketability of technology (product)	Competition situations
		Market formation
		Competitive product
Business possibility and profitability	Productivity of technology (product)	Commercialization capability of technology and productivity
	Management capability	Management capability
	Business capability of technology (product)	Marketing capability
	Profitability	Profit creation capability
		Profit prospect

Finance grades that utilize a finance model of an enterprise credit valuation system are utilized as finance stability variables.

If the selecting of variables is completed, risk grades, technology grades, and finance stability scores (grades) are calculated (S603).

The risk grades are technology-based risk grades calculated by the above-described technology valuation model.

The technology grades are calculated by the above-described technology valuation model.

The finance stability scores (grades) are calculated by a finance model of an enterprise credit valuation system.

Next, scores of technology ability, business possibility, and technology · business possibility are calculated (S605).

Scores according to each field (variable) are converted into 100 perfect scores and are calculated by the following equation using a scoring model by a scoring method.

Equation



Perfect scores by each variable

Classification	General/design/bio/environment		Software		Dotcom	
	Other enterprises	Starting enterprise	Other enterprises	Starting enterprise	Other enterprise	Starting enterprise
Technology ability	26	26	32	31	26	26
Marketability	15	17	15	17	15	17
Business possibility ①	33	26	27	21	33	26
Business possibility ②	40	33	34	28	40	33
Technology · business possibility	66	59	66	59	66	59

If scores are calculated, in order to construct a diagram part, firstly, scores (grades) according to variables are classified into 6 sections and sections are set (S607).

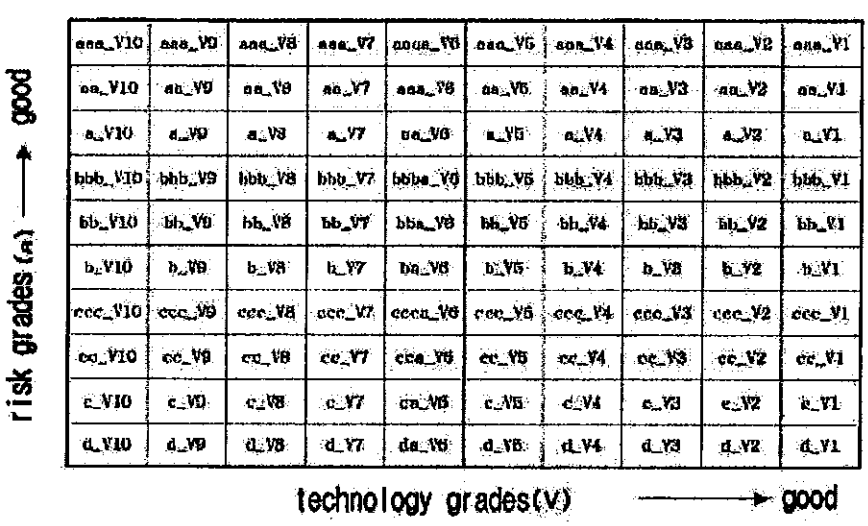
Classification	Scores	Definition	Section name
Technology ability Business possibility ① Business possibility ② Marketability Technology · business possibility	82 or higher	Very excellent	A
	74 or higher	Excellent	B
	66 or higher	Good	C
	58 or higher	Above the average	D
	50 or higher	Below the average	E
	below 50	Insufficient	F
Technology valuation risk grades Technology grades Finance grades	AAA(V1), AA(V2)	Very excellent	A
	A(V3), BBB(V4)	Excellent	B
	BB(V5), B(V6)	Above the average (common level)	C
	CCC(V7)	Below the average (slightly insufficient)	D
	CC(V8), C(V9)	Bad	E
	D(V10)	Very bad	F

※ Risk grade versus technology grade matrix is configured as 10 x 10.

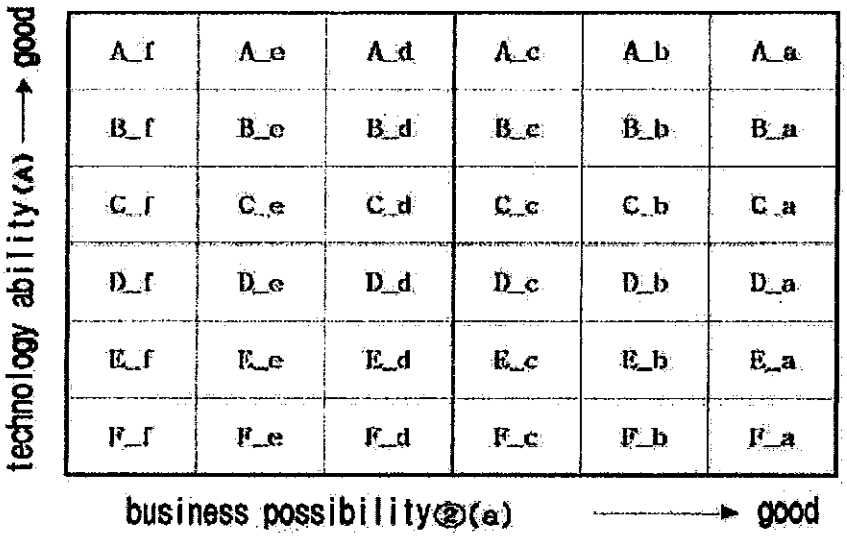
Next, a matrix table is drafted by the calculated scores (S609).

<Matrix construction>

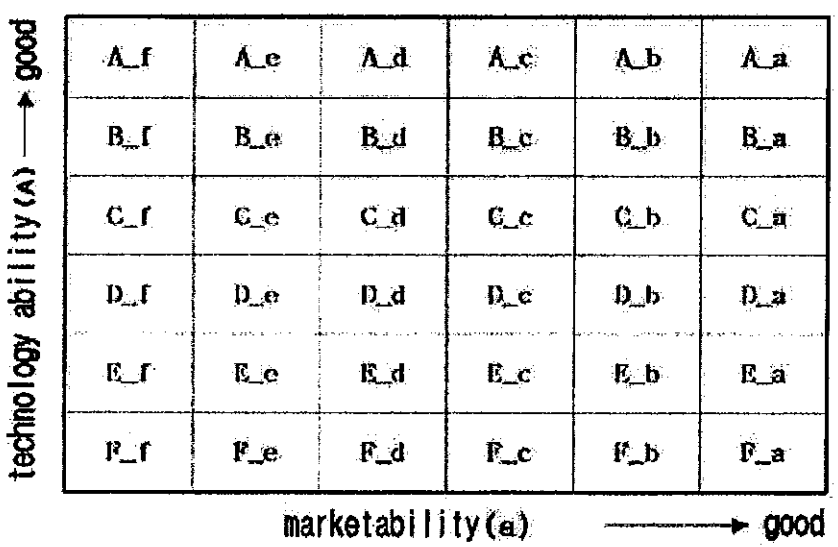
• Risk grade vs. technology grade matrix (10x10)

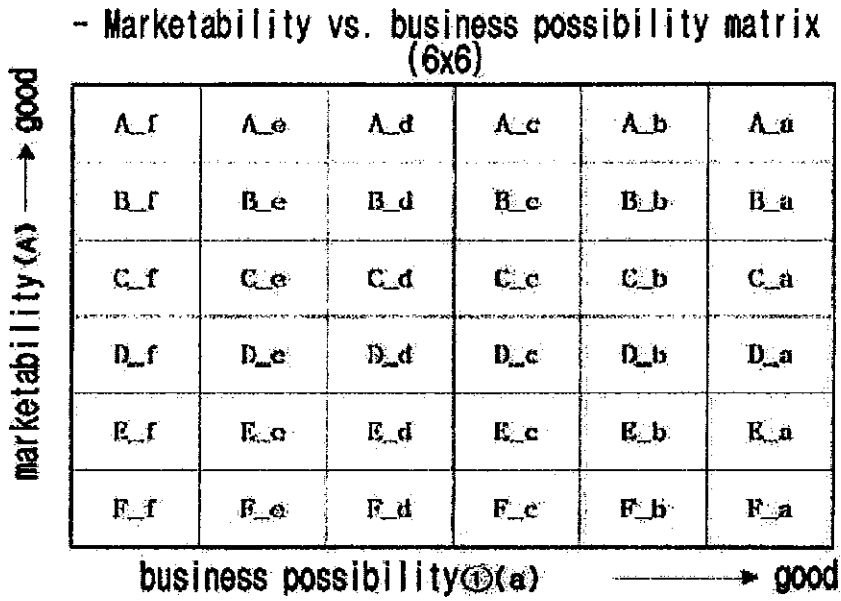


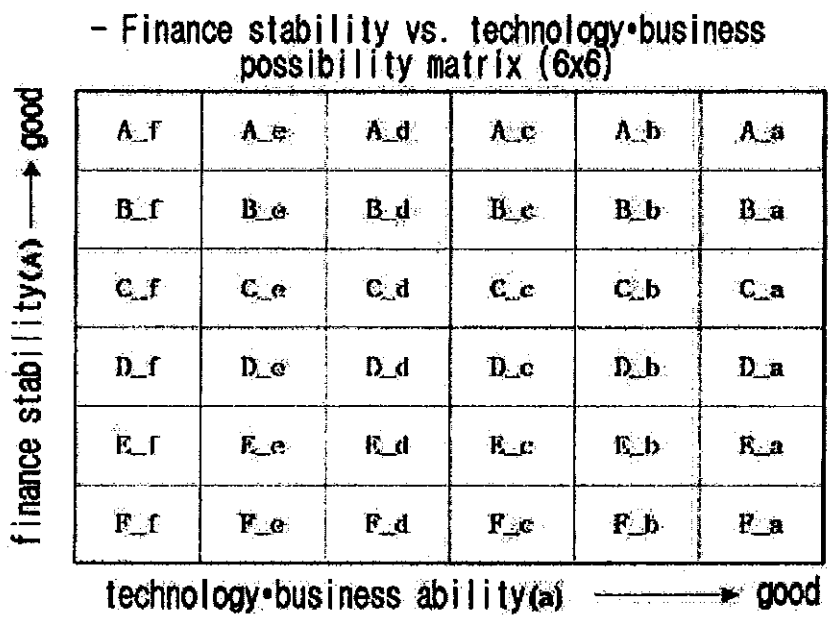
- Technology ability vs. business possibility matrix (6x6)



- Technology ability vs. marketability matrix (6x6)







Last, a matrix diagram part and an explanation part are constructed (S611).

FIG. 7A shows a KTCP matrix illustrating technology valuation grades. Technology grades are set to an X-axis and risk grades are set

to an Y-axis. The technology valuation grades is to valuate commercialization possibility as grades based on technology power, technology development situations, and commercialization capability in relation to technology to be valuated, and the risk grades is to valuate further expected insolvency possibility of an enterprise as grades by using a risk valuation model when promoting technology business in consideration of environment of an enterprise to be valuated.

FIG. 7B shows a KTCP matrix illustrating management result prediction. In case of technology-based business, in particular, in case of small and medium business, various management result cases of technology enterprises are analyzed considering that there are many difficulties in further management result prediction when a small and medium enterprise is compared with an existing traditional enterprise, and further three-year management results of a technology enterprise are predicted. The management results are calculated based on four finance indices such as profitability, growth rate, stability, and activity, and the higher grades are, the better results are predicted.

FIG. 7C shows a KTCP matrix illustrating technology ability versus business possibility. Technology contents and technology levels are compared with commercialization capability, marketing situations, and further profit prospect of technology on a matrix.

FIG. 7D shows a KTCP matrix illustrating technology ability versus marketability. Technology contents and technology levels are compared with market scale, growth prospect, and competition situations of technology on a matrix.

FIG. 7E shows a KTCP matrix illustrating marketability versus business possibility. Market Technology contents and technology levels are compared with market scale, growth prospect, and competition situations of technology are compared with commercialization capability, marketing situations, and further profit prospect of technology on a matrix.

FIG. 7F shows a KTCP matrix illustrating finance stability versus technology · business possibility. Future growth prospect (technology business · possibility) such as technology ability, business possibility, and profitability of technology, is compared with short-term finance stability of a valuation time of an enterprise on a matrix.

Next, screens on a computer to which the method of technology valuation according to the present invention is actually applied, will now be described. Each screen will be described according to valuation order of the present invention.

FIG. 8A is a receipt management screen in a technology valuation receipt step.

FIG. 8B is a receipt details input screen in the technology valuation receipt step.

FIGS. 8C through 8F show steps of inputting enterprise data. In detail, FIG. 8C is an input screen of enterprise overview (business type, business carrier, registration, external auditor, and venture or the like), FIG. 8D is a representative situation input screen, FIG. 8E is a financial statement input screen, and FIG. 8F is an economic environment index data management screen.

FIGS. 8G through 8O show steps of inputting valuation data. In detail, FIG. 8G is a valuation sheet cover generation screen, FIG. 8H is a screen on which 45 data are inputted and a valuation table is drafted, FIG. 8I is a valuation point grade giving screen of a metric point example 1, FIG. 8J is a valuation point grade giving screen of a metric point example 2, FIG. 8K is a valuation point grade giving screen of a check point example, FIG. 8L is a valuation point grade giving screen of a valuer valuation point example, FIG. 8M is a screen showing a balance matrix, FIG. 8N is a screen showing score calculation results, and FIG. 8O shows the step of displaying valuation results, which show technology valuation grades, result analysis, and expectancy life calculation results.

As described above, an exemplary embodiment of the method of technology valuation according to the present invention is implemented according to a program in which the present invention is embodied by data that are made as database in all computers.

Industrial Applicability

In the method of technology valuation having the above structure according to the present invention, technology excellence, business possibility, and marketability with respect to technology to be valuated can be reasonably valuated, technology-based business insolvency risks are simultaneously measured and evaluation results are presented such that finance (guarantee, loans and investments etc.) supports for technology development and a commercialization enterprise can be facilitated.

In addition, according to the present invention, business insolvency risks calculated through statistical analysis method (a logit model) are reflected on valuation grade calculation and a prediction power of business insolvency can be reinforced.

FIG. 9 is a graph comparing business insolvency prediction powers of a conventional method of technology valuation in which risk grades of technology are not reflected and the method of technology valuation according to the present invention. As illustrated in FIG. 9, business insolvency risks are not considered in the conventional method of technology valuation so that similarity of business insolvency rate prediction by grade according to technology valuation grade variation is lowered. However, in the method of technology valuation according to the present invention, business insolvency rates that are close to higher grades are low and higher business insolvency rates are shown as business insolvency rates are close to lower grades. Thus, a business insolvency rate prediction by grade is remarkably improved.

Furthermore, expected loss risks according to technology valuation grades are presented so that systematic risk property management is possible.

Furthermore, the correlation between management results of an enterprise and valuation data can be grasped by inducing a statistical analysis method.

Furthermore, a continuous valuation system for improving the reliability of a construction model can be upgraded through regular feedback system construction.

Furthermore, according to the present invention, environment risks caused by economic environment and economic factors or the like can be reflected on technology valuation.

Furthermore, according to the present invention, the progress of fluctuation of enterprise insolvency according to time can be reflected on technology valuation.

Furthermore, according to the present invention, finance and data of the past enterprise are analyzed and results of a new enterprise can be predicted.

What is claimed is:

1. A method of technology valuation comprising:

obtaining risk grades by calculating scores according to each technology valuation point (small point) based on a plurality of input technology valuation points, so as to reflect business insolvency possibility of technology to be valuated in a computer and by calculating risk scores by a logit model using scores according to technology valuation points (small points);

obtaining technology grades according to scores by calculating scores by a weight scoring model using scores calculated according to the technology valuation point (small point) so as to reflect technology ability, business possibility, and marketability of technology to be valuated in the computer; and

obtaining technology valuation authentication grades in which grades are collectively given by a matrix in which the risk grades and the technology grades are set to an X-axis and an Y-axis, respectively.

2. The method of claim 1, after the obtaining of the technology valuation authentication grades, further comprising calculating insolvency probabilities by year using a life data analysis model according to the technology valuation authentication grades by setting scores of the technology valuation points as input variables.

3. The method of claim 1 or 2, after the obtaining of the technology valuation authentication grades, further comprising predicting management results by CBR (case-based reasoning) based on the scores calculated with respect to the technology valuation points.

4. The method of claim 1, the method being applied to a technology valuation model valuated by a plurality of valuation indices respectively indicative of four points including owner's technology

capability, technology ability, marketability, business possibility, and profitability.

5. The method of claim 1, wherein the calculating of the scores according to each technology valuation point (small point) in the obtaining of the risk grades and the obtaining of the technology grades comprises:

inputting valuation contents of detail check points according to valuation points; and

calculating scores according to each technology valuation point (small point) by valuation contents of detail check points according to each technology valuation point (small point).

6. The method of claim 5, wherein valuation contents input to detail check points according to each technology valuation point (small point) include metric valuation points valuated by values automatically calculated by respective systems, check valuation points valuated by the number of checked points, and valuer valuation points for giving grades according to valuation methods.

7. The method of claim 5, wherein the calculating of the scores according to each technology valuation point (small point) comprises calculating detail check points according to each technology valuation point (small point) by a 5x5 balance matrix or a 5x5x5 balance matrix.

8. The method of claim 1, wherein the calculating of the risk scores in the obtaining of the risk grades comprises:

calculating logit scores;

calculating environment scores; and

obtaining risk scores by combining the logit scores and the

environment scores at a predetermined ratio.

9. The method of claim 8, wherein the calculating of the logit scores and the environment scores comprises:

calculating technology valuation score factor variables;

calculating economic index factor variables;

calculating enterprise status variables;

determining logit model input values using basic calculation values obtained in each step;

calculating logit scores by inputting the technology valuation score factor variables to a logit function 1 and by calculating superior probabilities; and

calculating environment scores by inputting the economic index factor variables and the enterprise status variables to a logit function 2 and by calculating superior probabilities.

10. The method of claim 1, wherein the obtaining of the technology grades comprises calculating technology scores by giving weight the technology scores according to valuation points by a weight scoring model.

11. The method of claim 1, wherein the obtaining of the technology valuation authentication grades comprises giving authentication grades by matrix valuation criteria based on risk grades by a logit model and technology grades by a weight scoring model.

12. The method of claim 2, wherein the calculating of the insolvency probabilities by year comprises:

calculating survival probabilities (XB) through input variables and coefficients; and

calculating expectancy life (or insolvency probabilities) according to time by reflecting the survival probabilities.

13. The method of claim 3, wherein the predicting of the management results by CBR comprises:

calculating scores according to technology valuation points;

measuring an Euclidean distance;

extracting an enterprise in which the Euclidean distance is minimum by a predetermined number; and

predicting results of an enterprise by CBR by extracting results of the extracted enterprise.

14. A method of technology valuation comprising:

a diagram part; and

an explanation part in a computer,

wherein characteristics of an enterprise are represented by drafting a KTCP matrix which includes a diagram part and an explanation part in a computer and in which technology ability, business possibility, technology business possibility, and risk grade variables are set as an X-axis or an Y-axis.

15. The method of claim 14, wherein the drafting of the KTCP matrix comprises:

selecting each variable of technology valuation risk grades, technology grades, and technology ability variables;

calculating risk grades, technology grades, and finance stability grades;

calculating scores of technology ability, business possibility, and technology business possibility;

drafting a matrix table according to the calculated scores; and

constructing a matrix diagram part based on the drafted matrix table.