A Corporate Strategy Decision Supporting System: A Balanced Scorecard Approach

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Abstract

There are many types of evaluation systems to measure corporation performance and set up business strategy. The selection of the evaluation method plays a great part in making important circumstances and conditions for its corporation. From this perspective, we suggest criteria for financial and non-financial assessment items based on Kaplan & Norton's BSC model by calculating the relative priority weights for standardized assessment items. The standardization of the assessment items determined by analyzing existing theories, and the relative priority weights were investigated by interviews with management consultants. The AHP method is adopted to calculate priority weights. A research model is built in order to evaluate each performance index according to the corporate life cycle. Then we took a survey, and developed a system using these relative priority weights as a result. Our prototype helps analyze a company's business performance by comparing relative weights in the order of importance. Furthermore, our system can be applied according to corporate life cycle stages.

1. Introduction

Currently, corporations have various types of evaluation systems. Accurate evaluation of their outcome and performance is required by the management. Until now, empirical or intuitive evaluation methods have been used, depending on subjectivity or objectivity based on the fair criterion of the corporation. The selection of evaluation items which should be used creates important circumstances and conditions for the corporation. The management of systematic outcome for evaluation is performed through these selected items. In a short-term evaluation system, the managers and employees can improve profitability and productivity based on rational and objective decisions on compensation. In a long-term evaluation system, personal goals can be properly harmonized with organizational achievement, and competitive power is increased through systematic activation of the system.

Sales and profit goals were used as the items of evaluation (Ittner & Larker, 1997). Korean corporations selected extended growth strategy that puts explicit importance on the sales amount; the emphasis was mainly on quantitative financial evaluation. But, the evaluation system mentioned above caused many problems, because the system based on the sales amount and profit were still in use without changing company growth strategy (Ittner & Larker, 1998). Moreover, as the knowledge management paradigm appears, many scholars and corporations have been studying an actual knowledge-based classification system and its method of application (Bontis, 1998). We may name the knowledge management theory introduced by Skandia Navigator as a typical example (Edvinsson and Malone, 1997; Sveiby, 1997; Kaplan and Norton, 1992). Strategic management accounting, strategic cost accounting and non-financial evaluation were suggested as the inductive method of the evaluation systems for those systems mentioned above. Especially, Kaplan & Norton (1996) suggested the Balanced Scorecard (BSC) that gives corporate managers strategic and corporative vision as the substitution for the conventional finance evaluation method.

Among non-financial evaluation criteria, customer satisfaction, internal business process, and organizational innovation are included in the Balanced Scorecard. But, comparing the actual performance results seems to be difficult, when we use these non-financial evaluation criteria. Thus, we suggest general criteria for each evaluation index based on the BSC evaluation system, then induce the aggregated evaluation results by calculating the priority weight of each index. The Analytic Hierarchy Process (AHP) method was used to calculate the priority weights.

In this paper, we suggest the criteria for financial and non-financial assessment items for the BSC model by calculating the relative priority weight for these assessment items. Relative priority weights were investigated by interviews with managers in various corporations. Then we have found relative priority weights are different for the each stage of the corporate life cycle mentioned by Danny Miller & Peter H. Friesen (1984). Based on this result, we develop a new system according to the classified BSC perspective. Our proposed system will help corporate planners set up their strategy under each stage of the corporate life cycle.

2. Existing Taxonomy

The studying for knowledge-assets assessment by scholars such as Hall (1922), Kaplan & Norton (1992), Saint-Onge (1996), Roos & Roos (1997), Sveiby (1997), Edvinsson & Malone (1997), Brooking (1997), Harvey & Lusch (1998) is ongoing. According to Hall (1992), intangible resources can shape competitive advantage by creating influence in four different types of distinctive capacity. Detailed classification is made by consulting the comparative advantage and capacity through Coyne's research. Kaplan & Norton's BSC (1992) evaluation system is comprised of four factors to assess the inside and outside of a corporation with diversity: the financial, customer, internal business process and learning & growth perspectives. Saint-Onge (1996) introduced and defined customer assets, human assets, and structural assets. Stewart (1997) improved the taxonomy of Saint-Onge with great interest and care. Roo (1997) was the first person to introduce Knowledge-asset index. It has proven its efficiency as a detailed index to define the corporate knowledge asset by Edvisson during the same year. Roo & Roo presented the entire guideline for assessing the knowledge-assets. In this way, the method of classifying knowledge assets and the priority weight can be determined by the corporate strategy and the characteristics of business. Roo's major contribution was the finding of a relationship between long-term business strategy and its critical success factors, and the developing of the knowledge-asset index.

Edivisson & Malone (1997) created the knowledge-asset taxonomy for Skandia Navigator, which was used, in earlier times. Particularly, they emphasized the role and importance of each customer's asset for creating corporate value and the index that can assess customer relations. But, they put too much importance on account book value, only focusing on the measurement itself, which made their measurement method fragmentary (Huseman and Goodman,1999). Sveiby (1997) assigned knowledge assets into three categories: capacity, internal structure and external structure. Then he introduced growth/innovation, efficiency and stability for a specified measuring index for each categorized knowledge asset. He called this index the intangible asset monitor. It seemed to Brooking (1997) that knowledge asset was composed of market assets, human oriented assets, intellectual titles and infrastructure assets. Harvey & Lusch (1998) divided knowledge assets into the asset and liability notation similar to tangible assets. In the 1990s, Kaplan & Norton (1996) introduced a concept called the Balanced Scorecard. The Balanced Scorecard supplemented traditional financial measures with criteria that measured performance from three additional perspectives-the perspectives of customers, internal business processes, and learning and growth. Therefore, it enabled companies to track financial results while simultaneously monitoring progress in building the capabilities and acquiring the intangible assets they would need for future growth. In this paper, we put the actual measuring index together, standardizing four perspectives by Kaplan & Norton as the framework. Then, we deduced five measuring index criteria for each perspective. Table 1 explains this.

3. Calculating BSC Priority Weight Using AHP

When we measure something with respect to a property, we usually use some known scale for that purpose. This paper is on how the AHP derives relative scales using judgment or data from a standard scale, and how to perform the subsequent arithmetic operation on such scales avoiding useless number crunching (Saaty, 1977; 1990). The judgments are given in the form of paired comparisons. One of the uses of a hierarchy is that it allows us to focus on the form of paired comparison. The most effective way to concentrate judgment is to take a pair of elements and compare them on a single property without concern for other properties or other elements. This is why a paired comparison in combination with the hierarchy structure is so useful in deriving measurements. According to Saaty's original proposal, a complex system is decomposed into a subsystem and represented in the hierarchical form. The element at the highest level is called the goal. The elements at each level are the critical factors. The elements at the bottom level are the alternatives. In this way, AHP organizes the basic rationality of the priority setting process by breaking down a multi-element complex system into its smaller constituent parts called components (or levels). The process setting can be divided into three phases: system structuring, pairwise comparison and priorities synthesis. In this paper, we investigate weights investigated by interviews with management consultant to calculate the relative priority for these measuring indexes. Then, the AHP method is employed for calculating priority weights. As a result, a two-leveled hierarchical scheme is produced. To recognize the importance of the BSC method, at the 1st level, the hierarchy consists of four criteria: the financial perspective, customer perspective, internal business process perspective, and learning & growth perspective. At one level lower (the 2nd level), the measures include performance criteria such as revenue growth, investment, unit cost, and so on. The Expert Choice software makes a significant contribution toward calculating priority weights for the BSC.

[Table 1. Performance Measures]

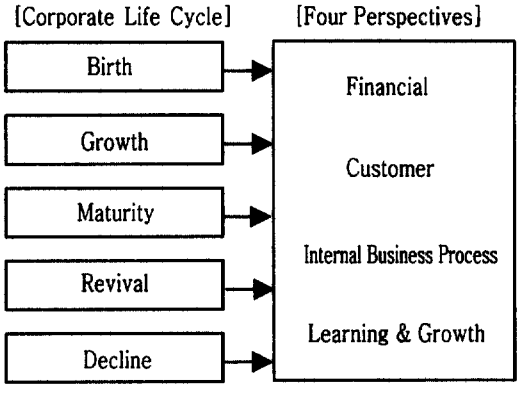
Perspective	Definition	Measures	References
Financial	The financial perspective defines the financial performance expected from the strategy, it serves as the ultimate targets for the objectives and measures of the other entire assets.	Revenue growth	(1),(4),(5),(7),(8),(17),(19),(22) (23),(26),(28),(29),(37)
		Investment	(2),(3),(5),(8),(15),(19)
		Profitability	(1),(2),(3),(4),(5),(7),(8),(13) (14),(16),(17),(19),(20),(22),(23) (29)
		Asset utilization	(1),(3),(5),(8),(19),(20)
		Unit cost	(2),(3),(4),(5),(8),(9),(14),(18) (19),(20),(28),(29),(39),(42),
Customer	The customer perspective enables companies to align their core customer outcome measures to targeted customers and market segments. It also enables them to identify and measure, explicitly, the value propositions they will deliver to targeted customers and market segment.	Customer profitability	(1),(4),(5),(14),(19),(36),(40) (42)
		Customer acquisition	(4),(5),(6),(8),(10),(15),(17) (19),(20),(26),(29),(36),(39)
		Customer retention	(2),(8),(10),(19),(31),(33)
		Customer satisfaction	(4),(5),(8),(15),(16),(17),(18) (19),(20),(23),(26),(29),(30) (36),(37),(38),(39),(42)
		Market share	(1),(5),(7),(8),(10),(15),(19) (28),(29),(37),(38)
Internal Business Process	This category typically covers statements about the scope, equipment and efficiency of the business activities.	Product/service development	(3),(4),(5),(8),(9),(10),(11),(12) (16),(17),(18),(19),(20),(22) (24),(28),(29),(39),(42)
		Market identification	(5),(17),(20)
		Customer management	(3),(5),(8),(10),(16),(17),(20) (23),(29)
		Operation process	(1),(4),(5),(8),(10),(11),(14) (19),(29),(33),(39),(41),(42)
		Environment	(1),(14),(21),(22),(37),(41)
Learning and Growth	The learning and growth perspective defines the intangible assets needed to enable organizational activities and customer relationships to be performed at ever-higher levels of performance.	Skill	(5),(8),(9),(10),(11),(12),(14) (19),(23),(24),(32),(33),(36) (38),(39),(42)
		Knowledge sharing	(5),(10),(17),(19),(20),(24),(25) (29),(30),(31)
		Infrastructure	(8),(19),(33),(38)
		Applications	(1),(4),(5),(8),(15),(16),(17) (19),(23),(24),(29)
		Organizational culture	(2),(3),(5),(6),(9),(10),(16),(17) (18),(22),(23),(36),(37),(39)

The sub criteria are not depicted for simplicity. As a company evolves, the hierarchy can be adjusted accordingly.

4. The Corporate Life Cycle Model

We established a research model in order to evaluate four different performance indexes according to the corporate life cycle (Figure 1). Table 2 explains each definition of corporate life cycle stage. We used corporate life cycle mentioned by Miller (1984) to generate a conceptual topology of the stages of organizational life. Our aim to establish whether the typology could be used to predict inter-stage differences in each classified BSC perspective.

[Figure 1. Corporate Life Cycle Model]



[Table 2. Definitions of Corporate Life Cycle Stages]

Birth	Firm has an informal structure, and is dominated by the owner-manager.
Growth	Sales growth greater than 15%, functionally organized structure, early formalization of policies.
Maturity	Sales growth less than 15%, more bureaucratic organization.
Revival	Sales growth greater than 15%, diversification of product-lines, divisionalization, use of sophisticated controls and planning systems.
Decline	Demand for products levels off, low rate of product innovation, profitability starts to drop off.

5. Model Validation

We formulated hypotheses in order to examine whether each corporate life cycle stage is induced by the research model above. Table 3 shows Hypotheses that mean values of the performance index have statistically significant differentiation according to the five corporate life cycle stages.

[Table 3. Hypotheses I]

H I-1	There is a statistical differentiation in the mean values of the relative importance of the Financial Perspective according to each stage of corporate life cycle.
H I-2	There is a statistical differentiation in the mean values of the relative importance of the Customer Perspective according to each stage of corporate life cycle.
H I-3	There is a statistical differentiation in the mean values of the relative importance of the Internal Business Perspective according to each stage of corporate life cycle.
H I-4	There is a statistical differentiation in the mean values of the relative importance of the Learning & Growth Perspective according to each stage of corporate life cycle.

Table 4 shows the hypotheses explaining that the mean values of each stage of the corporate life cycle has statistically significant differentiation.

6. Sampling and Data Collection

The 75 corporate data samples for this study was drawn at random from the Korea Business Directory by the Korea Chamber of Commerce & Industry. The researcher personally visited the companies in the list to draw their aggressive participation out. We examined the consistency ratio provided by Expert Choice. According to Satty (1990).

[Table 4. Hypotheses II]

H II-1	The birth stage in the corporate life cycle has a statistical differentiation in the mean values of the four BSC perspectives.
H II-2	The growth stage in the corporate life cycle has a statistical differentiation in the mean values of the four BSC perspectives.
H II-3	The maturity stage in the corporate life cycle has a statistical differentiation in the mean values of the four BSC perspectives.
H II-4	The revival stage in the corporate life cycle has a statistical differentiation in the mean values of the four BSC perspectives.
H II-5	The decline stage in the corporate life cycle has a statistical differentiation in the mean values of the four BSC perspectives.

The questionnaire using the AHP method is accepted in the inconsistency ratio less the 0.1. To prevent an improper inconsistency ratio (higher than 0.1) of the questionnaire, our researchers informed the companies of the importance of that consistency.

7. Results and Findings

In order to verify Hypothesis I, we ran the one-way ANOVA model, and examined the mean value difference among corporate life cycle stages. Table 5 shows the results.

[Table 5. One-Way ANOVA result for Hypotheses I]

		Sum of Squares	Df	Mean Squares	F	Sig
Finance	Between Groups	0.395	4	9.867E-02	2.804	0.032
	Within Groups	2.498	71	3.518E-02		
	Total	2.893	75			
Customer	Between Groups	2.002E-02	4	5.004E-03	0.140	0.967
	Within Groups	2.531	71	3.565E-02		
	Total	2.551	75			
Internal	Between Groups	0.177	4	4.437E-02	3.880	0.007
	Within Groups	0.812	71	1.144E-02		
	Total	0.990	75			
L &G	Between Groups	0.583	4	0.146	6.697	0.000
	Within Groups	1.545	71	2.176E-02		
	Total	2.128	75			

The Table indicates that [H I-1], [H I-3], [H I-4] have statistically significant F-values in the 5% significant level. So, we could adopt [H I-1], [H I-3], [H I-4]. Also, we ran the one-way ANOVA model to verify Hypothesis H. Table 6 shows the results.

[Table 6. One-Way ANOVA result for Hypotheses II]

		Sum of Squares	Df	Mean Squares	F	Sig
Birth	Between Groups	0.624	3	0.208	8.788	0.000
	Within Group	0.852	36	2.366E-02		
	Total	1.476	39			
Growth	Between Groups	0.895	3	0.298	10.094	0.000
	Within Group	1.177	60	2.956E-02		
	Total	2.668	63			
Maturity	Between Groups	2.032	3	0.377	26.122	0.000
	Within Group	2.801	108	2.594E-02		
	Total	4.833	111			
Revival	Between Groups	0.925	3	0.308	11.853	0.000
	Within Group	1.144	44	2.600E-02		
	Total	2.069	47			
Decline	Between Groups	1.123	3	0.374	16.520	0.000
	Within Group	0.816	36	2.267E-02		
	Total	1.939	39			

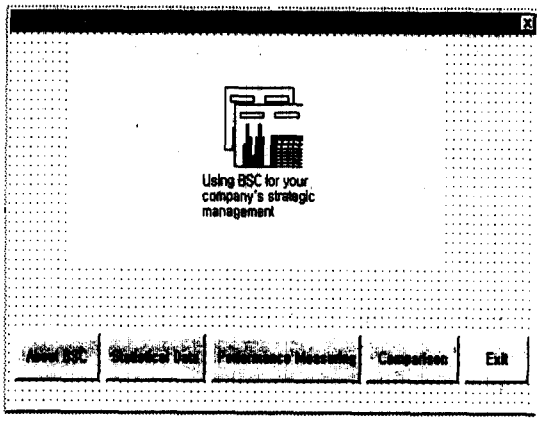
The Table indicates that [H II-1], [H II-2], [H II-3], [H II-4], [H II-5] have statistically significant F-values in the 5% significant level. Thus, we could adopt [H II-1], [H II-2], [H II-3], [H II-4], [H II-5]. We ran the Dunkan analysis in order to examine mean differences between each index of the BSC perspectives and each stage of the corporate life cycle. Also, we calculated relative priority weights for sub criteria indexes of the BSC perspectives aggregated from questionnaire to rank them. As a result, some meaningful conclusions were induced. First, the Learning & Growth perspective has the highest priority weight in the birth stage of the corporate life cycle (by the Dunkan Analysis). Second, the Financial perspective has the highest priority weight in the decline stage in the corporate life cycle (by the Dunkan Analysis). Third, the Internal business process perspective has the relatively high priority weight at the maturity stage comparing to other stages of the corporate life cycle (by the Dunkan Analysis). Fourth, the Internal business process has relatively low priority weight in all stages. Fifth, the Sub-criteria indexes have different values according to each stage of the corporate life cycle. For example, organization culture– the sub criteria of Learning & Growth perspective– has a relatively high priority weight, which reflects the shrunken organizational atmosphere in the decline stage of the corporate life cycle.

8. Developing A Corporate Strategy Decision Supporting System

As mentioned above, we entered appropriate data from the survey of more than 75 firms. Based on the gathered data, we developed a system according to classified BSC perspectives. The system shows various kind of measuring index values of the industry. These indexes have relative weights. By the help of the developed system, corporate strategy planners can analyze their corporate strategy by comparing relative weights in the order of importance. Also, they can understand what kind of situation their company is in, because each measuring index in this system shows the mean, maximum, and minimum value of the same industry. As we continue consulting corporations, new data is also accumulating so that our system can progress as a better corporate solution provider. This system's main functions are composed of four areas: explanation of the BSC, accumulated statistical data including performance measurements, comparison with other companies' performance and strategic decision guide lines for managers.

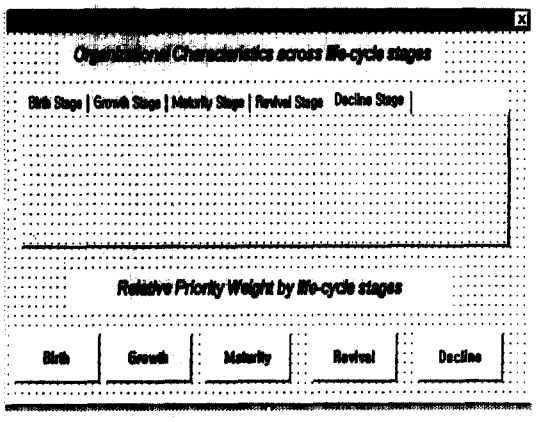
With the increasing popularity of the Balanced Scorecard management approach, there has been a diverse spectrum of software solutions that are being marketed under the guise of an enterprise system for delivering the Balanced Scorecard to everyone's desktop. Unfortunately, the realty is that these are typically either EIS applications providing high-level visual graphical representations of some key high-level indicators or generic performance measuring tools. However, our system helps managers to decide corporate strategy by comparing other companies' strategy and performance. Also this system provides some management guideline with several specified performance indicators.

[Figure 2. Main Menu]



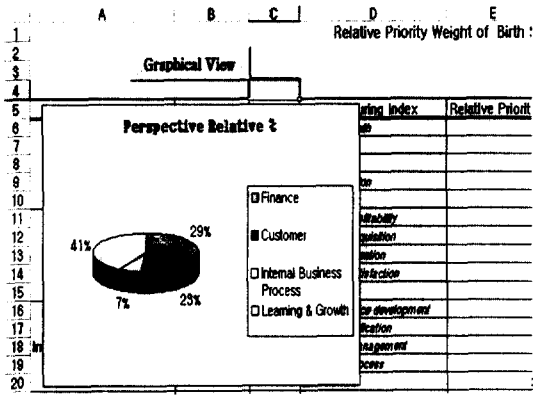
As you see from the figure 2, this menu helps managers to understand the Balanced Scorecard clearly before their strategic decisions and helps to start the system.

[Figure 3. Selection of Corporate Life Cycle Stages for Entering Statistical Data]



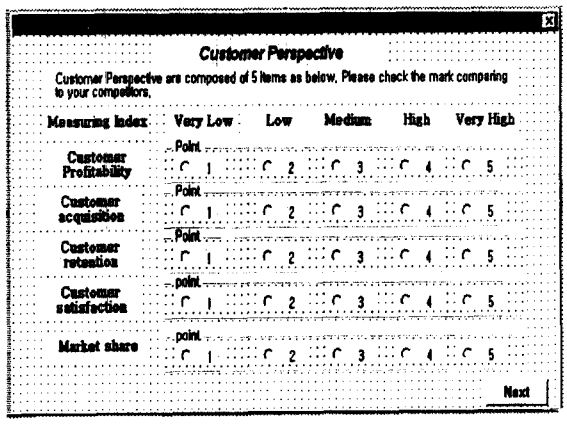
A user can choose the corporate life cycle stages (Figure 3).

[Figure 4. Statistical Data Presentation]



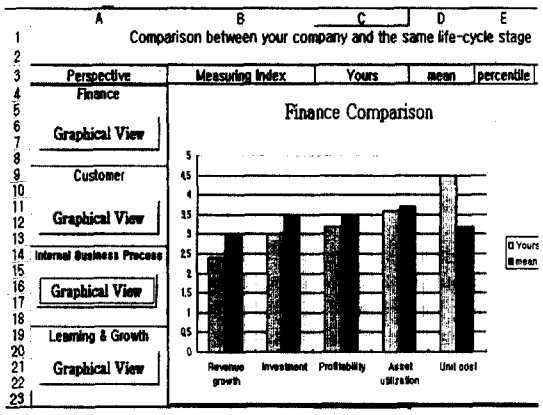
Currently, this system provides only life-cycle stages as an influential factor. However, in the near future, we will add more influential factors for more sophisticated decision support. If a user chooses the birth stage among the five life-cycle stages, he or she is able to see the statistical figures with a graphical presentation (Figure 4).

[Figure 5. Performance Measurement Menu]



A user inputs his or her company's performance data for the four perspectives-the financial perspective, customer perspective, internal business process perspective, learning & growth perspective (Figure 5). Our system can provide the accumulated performance results of other companies. A user can compare his or her company's perceived performance and the Key Performance Index' relative importance for each of the four perspectives and 20 measuring indexes with other companies (Figure 6).

[Figure 6. Comparing Performance and Importance]



9. Conclusion

Many companies are using many types of financial and non-financial evaluation systems to measure the corporate performance. The selection of appropriate evaluation methods among the above methods plays a great part in making important circumstances and condition for the corporation. Kaplan & Norton (1996) suggested the Balanced Scorecard that gives corporate managers strategic and corporative vision as a substitute for the conventional finance evaluation method. However, comparing the actual corporate performance results seems to be difficult when we use these financial and non-financial evaluation criteria. Thus, we suggested 20 criteria for each evaluation index based on the BSC concept, then induced the aggregated evaluation result by calculating the priority weight of each index. The Analytic Hierarchy Process method was adopted to calculate the priority weights. Then we suggested a corporate life cycle model. A corporate strategy decision support system was built on the basis on this model. This system's main functions are composed of four areas: explanation of the BSC, accumulated statistical data including performance measurements, comparison with other companies' performance and relative importance data and strategic decision guidelines for managers. With the help of the system, corporate strategy planners can analyze and build the corporate strategy by comparing relative weights in the order of importance.

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