Building balanced scorecard with AHP analysis

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Abstract **The purpose of this paper is to create a model and to provide an objective indicator for evaluating the achievement of the strategic goals of the company. The AHP clearly identifies the critical success factors that can be implemented into the identification of the different aspects toward the balanced scorecard. It is, therefore, a structural approach in setting up the foundation of the balanced scorecard. Consideration is then given as to how the model presented can be customized to allow companies using this approach to develop and implement their corporate business strategic plan.**

Keywords – **AHP, Balanced scorecard, Strategy, Strategic planning.**

I. Introduction

Since we live in times of complexity and change, making the right decision is important for strategic planning. It is fair to say that every organization and individuals have their unique set of success factors. It is very important that an organization determines its success factors, as well as the competitions'. By linking the success factors with the balanced scorecard, an organization can balance its strategic goals, and optimize the achievement of the strategic goals of its company.

II. Methodology

Professor Robert Kaplan and David Norton developed the balanced scorecard (BSC) in the early 1990s. According to Kaplan and Norton (1996), ``the Balanced Scorecard translates an organization's mission and strategy into a comprehensive set of performance measures and provides the framework for strategic measurement and management" [1].

The "Balanced scorecard" is the framework that enables the organization to implement the strategy successfully, as this approach helps in providing adequate linkages, to enable the organizations to implement complex and intricate activities involved in implementing the corporate strategies and monitor every activities of the firm with the intent to achieve the strategic objectives. It has also been observed that:

The balanced scorecard is a strategic performance management system that links performance to strategy using a multi dimensional set of financial and non-financial performance measures. It focuses on better understanding the causal relationships and links within organizations and the levers that can be pulled to improve corporate governance [2]. Traditionally, most organizations look at their corporate performance by reviewing the financial aspects. However, financial measures alone is not a balanced view of the critical success factors of any organizations, mainly because financial measurements tend to measure the past.

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The strategic content of the company can be grouped under different perspectives, which will cover the entire activity of the firm. Kaplan and Norton introduced four different perspectives through which the firm's entire activity can be integrated.They are:

(1) Financial perspective. It evaluates the profitability element of the strategy.

(2) Customer's perspective. It identifies the targeted market, segments and measures the company's success in these segments.

(3) Internal and business perspective. It focuses on internal operations.

(4) Learning and growth perspective. It identifies the capabilities in which the organization must excel in order to achieve superior internal process that creates value for customers and share holders.

The four perspectives are complete in so far as no additional perspective is required to represent any element of organizational activity that management team might believe worth the focus. Each perspective influences and influenced by the other perspectives.

The financial focus concentrates on traditional return-based efficiency and effectiveness metrics. The customer focus lists metrics about customer satisfaction, business potential and unit growth. The process and development focus provides details about efficiency, outputs, and savings and of future growth. The innovative and learning focus gives information pertaining to employee loyalty, skills and competencies.

Metrics are designed to support strategies. They are carefully selected to help in the performance measurement.

For example, the following can be set of metrics chosen under each perspective, firm as a whole for specified target requirements:

(1) Learning and growth perspective:

- involve the employees in corporate governance;
- inculcate leadership capacities at all levels;
- Training days/ person;
- Level of retention of employees;
- become a customer driven culture.

(2) Internal process perspective:

- improve productivity standards;
- eliminating defects in manufacturing;
- percent of change and adjustments made throughout different development stages
- provide adequate technical knowledge and skill for all the levels of employees;
- Average answer time for deliveries;
- Average answer time for of help desk;
- customer feedbacks to be integrated in the operation.

(3) Financial perspective:

- percent return-on-equity to be achieved;

- percent revenue growth;
- Percentage above or within budget;
- IT expenses per staff member;
- Financial benefits stemming from selling products and services;
- Financial evaluation based on ROI, NPV, IRR, PB;
- percent reduction in production cost; and
- percent reduction in cost of capital.

(4) Customer perspective:

- enhance market share in percent;
- about percent increase in sales;
- obtain competitive pricing;
- increase after sales service outlets in percent;
- increase index of customer satisfaction;
- increase index of user involvement;
- to conduct face-to-face meeting with customers by organizing customer meets.

BSC should capture the change in any one measure, provide insight into the related changes in the perspectives, and hold out the promise of improving a company's prospects of more closely matching its management's plans to its strategic goals and objectives.

III. Balanced Score Model

The balanced score model tries to arrive at a single value for comparing the target performance, the neutral performance and the actual performance of the organization by suitably taking into account the weighting to be assigned to each factor by considering the different factors. These factors are used to create weightings for the parameters selected and a balanced score is arrived.

Thus, the balanced score model, as suggested in this paper will provide information for the decision makers to take appropriate action and concentrate on such measures which would result in the achievement of the strategic needs of the company.

A. Development of balanced score model

Let us now see the development of balanced score model. As discussed earlier, the BSC divides all the activities under four perspectives [3]. The perspectives, the measures under each perspective, the target and actual values of each measure are analyzed in a framework as shown in Fig. 2.

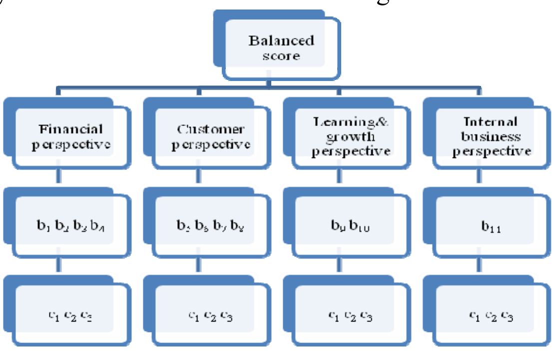

Fig. 2. Framework for calculating the balanced score

The target, neutral and actual performance were calculated using the following method:

Balanced score (target performance)

$$BS(target) = (b_1c_1 + b_2c_1 + b_3c_1 + b_4c_1) + \\ + (b_5c_1 + b_6c_1 + b_7c_1 + b_8c_1 + b_8c_1) + \\ + (b_9c_1 + b_{10}c_1) + (b_{11}c_1) \quad , \qquad (1)$$

Balanced score (neutral performance)

$$BS(neutral) = (b_1c_2 + b_2c_2 + b_3c_2 + b_4c_2) + \\ + (b_5c_2 + b_6c_2 + b_7c_2 + b_8c_2 + b_8c_2) + \\ + (b_9c_2 + b_{10}c_2) + (b_{11}c_2) \quad , \qquad (2)$$

Balanced score (actual performance)

$$BS(actual) = (b_1c_3 + b_2c_3 + b_3c_3 + b_4c_3) + \\ + (b_5c_3 + b_6c_3 + b_7c_3 + b_8c_3 + b_8c_3) + \\ + (b_9c_3 + b_{10}c_3) + (b_{11}c_3) \quad , \qquad (3)$$

There are four levels in the balanced score model.

A. Level 1

The first level is the goal of the model, i.e. balanced score for the alternative.

B. Level 2

This level consists of the financial perspective; customer perspective; internal business process perspective; and learning and growth perspective.

C. Level 3

Each perspective may have factors for measuring organizational performance. To measure each factor the measures are identified. These have been referred to as b_i's (Table I). The weights were calculated using the following method:

$$b_j = {tc_{ij}} \Big/ {\sum_i tc_{ij}} \, , \qquad (4)$$

where, tb_i- transformed score; $\sum tc_{ij}$ – summarized actor's transformed scores for all perspectives [4].

D. Level 4

For each measure, target performance values, neutral performance values and actual performance values are set. These target performance values and neutral performance values are then compared with the actual performance achieved. These have been referred to as c_i's (Table I).

Now, we can frame a general expression considering the entire factors. The expression is framed in such a manner that the factors are converted into consistent, dimensionless indices. The indices were calculated using the following method:

$$tc_{ij} = 8\frac{\max c_{ij} - c_{ij}}{\max c_{ij} - \min c_{ij}} + 1 \qquad (5)$$

when a lower score represents higher performance; and

$$tc_{ij} = 8\frac{c_{ij} - \min c_{ij}}{\max c_{ij} - \min c_{ij}} + 1 \qquad (6)$$

when a higher score represented higher performance.

These indices are used as transformed scores (tc_i) [4]. The relative weighing for each factor is arrived using equation (3).The balanced score is arrived using Eq. (1), (2) and (3) for sample framework is shown in Fig. 2. Comparing these balanced scores of targeted performance, neutral performance and the actual performance, we may be able to say how the company had fared.

TABLE I
FACTORS FOR MEASURING ORGANIZATIONAL PERFORMANCE

Construct	Factors
(1) Financial perspective	Percentage revenue growth (b_1) Percentage above or within budget (b_2) Financial evaluation based on NPV in EUR Cost reduction (b_4)
(2) Customer perspective	Enhance market share by 5 per cent (b_5) Percentage increase in sales (b_6) Increase Index of customer satisfaction (b_7) Increase Index of user involvement (b_8)
(3) Internal business process perspective	Involve the employees in corporate governance (b_9) Training days/ person (b_{10})
(4) Learning and growth perspective	Percentage of change and adjustments made throughout different development stages (b_{11})
Performance	Target performance (c_1) Neutral performance (c_2) Actual performance (c_3)

IV. Balanced score model in an IT industry

In order to illustrate this model using real-time data, information from a leading organization was obtained and the balanced score has been reached. The target, neutral and the actual performance value of the measures mentioned are considered to measure the activity effectiveness of the company.

The company is one IT services organization, with operations in more than 3 countries. Its IT services businesses include IT products.

In our model the four perspectives will have factors for measuring organizational performance. Here, the actual, neutral and targeted values are substituted in the Eq. (4) and Eq. (5). Weightings for each factor are arrived by using Eq.(3). The weightings thus calculated are used to attach importance for the factors in the Table II. All the weightings are shown in Table III. These weightings are multiplied with the transformed scores and summed to arrive at the balanced score using Eq. (1), Eq. (2) and Eq. (3).

V. Results and analysis

For a clear analysis, let us find out the difference between the targeted weighting to that of actual importance given under each of the perspectives as well as under the factors under those perspectives. This is given in Table III.

On the whole, the company's target performance is on the higher side 0,83 as compared to the actual of 0,21 leading to a difference of 0,62. This would mean that the overall performance of the company varies from specified target.

This leads us to discuss the reason(s) for the under performance of the company.

TABLE II
DATA FOR FACTORS FOR MEASURING ORGANIZATIONAL PERFORMANCE

Factors	c_3	c_2	c_1
Percentage revenue growth (b_1)	15%	10%	20%
Percentage above or within budget (b_2)	2%	1%	0%
Financial evaluation based on NPV (b_3)	68990	90000	98650
Cost reduction (b_4)	3%	4%	5%
Percentage enhance market share (b_5)	4%	4%	5%
Percentage increase in sales (b_6)	8%	9%	10%
Increase Index of customer satisfaction (b_7)	7	9,00	9
Increase Index of user involvement (b_8)	6	9,00	9
Involve the employees in corporate governance (b_9)	6	9,00	9
Training days/ person (b_{10})	4	5,00	6
Percentage of change and adjustments made throughout different development stages (b_{11})	5%	2%	1%

$c_{1=}$. Target performance; $c_{2=}$. Neutral performance; $c_{3=}$. Actual performance. $A_i=b_j*tc_{3j}$, Actual performance, $T_i= b_j*tc_{1j}$, Target performance, D_i=Difference=T_i-A_i.

TABLE III
TRANSFORMED SCORES, WIGHTS BY MEASURING ORGANIZATIONAL PERFORMANCE AND ORGANIZATIONAL PERFORMANCE

	tc_3	tc_2	tc_1	b_i	A_i	T_i	D_i	BSD
b_1	0,50	0,00	1,00	0,09	0,04	0,09	0,04	
b_2	1,00	0,67	0,00	0,09	0,09	0,00	-0,09	0,30
b_3	0,00	0,71	1,00	0,10	0,00	0,09	0,09	
b_4	0,00	0,50	1,00	0,09	0,00	0,09	0,09	
b_5	0	0	1	0,06	0,00	0,09	0,09	
b_6	0	0,5	1	0,09	0,00	0,09	0,09	0,34
b_7	0	1	1	0,11	0,00	0,09	0,09	
b_8	0	1	1	0,11	0,00	0,09	0,09	
b_9	0	1	1	0,11	0,00	0,09	0,09	
b_{10}	0	0,5	1	0,09	0,00	0,09	0,09	0,17
b_{11}	1	0,25	0	0,07	0,09	0,00	-0,09	0,09

cb_{ij}- transformed target, neutral or actual score (i=1,2,3), $b_{i=}$ wiedths,BSD=balanced score difference.

It is observed that there is not only variation under the overall figure, but also there are variations in all the criteria and the factors as well. Let us therefore make a detailed analysis of all the factors in each of the perspective.

A. Financial perspective

From the financial perspective, the company's actual performance score is less than the target score with 0,13 (Table III). It is evident that the organization varies in terms of financial performance from the targeted or the desired level. The reason quoted by the organization for this under performance is inadequate financial evaluation based on NPV, budget and cost reduction. This is true, because under the financial evaluation based on NPV, budget and cost reduction there is a variation of 0,26.

B. Customer perspective

We know that shortage of NPV affects the financial output. But, we feel that this alone cannot be the reason. In fact, we find that under customer perspective the variation 0,34, which is more than the variation shown under financial perspective. This clearly shows that the management did not perceive this larger difference in the variation. This is possibly because they were actually working on the financial value of the activity and not on the importance value, the activity deserves. Further under all factors though the actual performance is less than the targeted performance, it is necessary for the management to ensure the reason for such a negative variance. Possibly, the firm is diverting fewer resources than it needs to for the performance of those factors. The significant differences hence call for a detailed review.

C. Internal perspective

In the internal, perspective shows the actual performance varies from the target performance with 0,17 is given in Table III. Here, also we observe that these factors needed management's attention. Possibly, the performance under this factor may be enhanced by providing adequate internal training for the employees.

D. Learning and growth perspective

Learning and growth perspective also shows difference in that the actual performance varies from the target performance with 0,09. This will naturally happen, as in the only metric identified under this perspective the actual performance under the measure percentage of change and adjustments made throughout different development stages varies from the targeted value. The reason quoted by the organization for this under performance is inadequate involving of the employees in corporate governance and inadequate training days/ person. For example, if we look at the variance in b_{11}, we find the variance as very large (0,09), which call for a review to find the cause for such a variance.

VI. Findings and contributions

In this paper, we have detailed a process of identifying the essential criteria to be achieved by the company and the relative importance the company should give for the fulfillment of those criteria. If the company either gives less attention to the fulfillment of any factors, then the organization has to set it right as otherwise the performance of other criteria would suffer. This situation is also true if it gives more attention than is needed to the factors. But obviously, if there is variance in any factors which has the higher weighting allocated to it, and then it commands more attention, as such variations would have a leveraged impact on the overall performance of the organization. So, it becomes apparent that the performances under all the perspectives are interdependent. If the performance in a factor under any perspectives is affected, then it may result in the show of adverse or favorable performance in the factors of the other perspectives. That is why the management had given the reason of training inadequacy as the sole reason for the failure of adequate performance in other perspectives.

So by adopting the balanced score process as detailed in this paper, we are able to identify the deficiency with respect to the importance afforded by the organization in their entire set of activities.

VII. Conclusions

There are any numbers of attempts made to show the efficacy of the usage of the BSC for showing better performance. While retaining all the advantages that are made available by using the BSC approach in providing a framework for showing better performance, through this process of calculating the balanced score we are able to add more value for the analysis. We are able to identify those parameters whose actual performance vary from the targeted performance and find out their relative proportion of adverse or favorable contribution to the performance of the company by assigning appropriate weights for such parameters. Therefore, we are in a position to objectively capture the reason for variations in the performance from the targeted levels in all the functional areas of the business with the use of the concepts of BSC as well as applying the extended information arising out of arriving at the balanced score.

In conclusion the proposed model, will certainly help the users of this model to make an objective evaluation while implementing the same in their business environment.

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