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### Original Article

## Representation of a Model to Evaluate Effectiveness of Strategic Planning for Information Systems Based on Balanced Scorecard with the Approach of Gap Analysis (Case Study: Stratus Company)

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#### ABSTRACT

In recent two decades, managers' familiarity with strategic planning of the information systems on one hand and continuous development at business market on the other hand have intensified the organizations' desire for formulation of strategy. In this regard, numerous organizations have taken step to organized strategic planning for information systems. Most of the organized strategic plans have less likely undergone execution. As the result of lack of implementation of the strategic plans, effectiveness of this important management activity has not been favorable in Iranian organizations. Yet, implementation of strategies is the stimulant for the challenges within the organizations. Hence, the leading problem of this research is to address one of the most importance challenges within the organizations, that is, implementation of strategies and evaluation of them via reliable methods.

#### INTRODUCTION

When you can evaluate what you are talking about and express it via the figures, indeed it can declare that you are well informed of it; yet when you cannot evaluate it and express it via the figures, your knowledge and information on it will not be satisfactory (Mehregan, M. Dehghaniri, M. 2010). Senior managers have constantly sought a way to trust the implementation of their strategies, for which they have used the performance evaluation methods as a means to control implementation of strategies. Yet, the prevailing features at the age of knowledge-based economy have questioned the efficiency of traditional performance evaluation methods. Under such circumstances, balanced evaluation method as a means to assist the realization of strategy was proposed by Robert David Kaplan (professor at Harvard University) and David Norton (America's leading management consultant) that was welcomed by

the scholars at the field of management and the managers within the organizations. At the age of knowledge-based economy, value creation activities of organizations do not just rely on their tangible assets (Iravani Tabrizi pour et al. 2011). Performance measurement tools via financial measures face some deficiencies that the most important ones are as follow:

- Financial measures are not strategic
- the evaluation relies on historical information
- there are accordingly one-dimensional evaluations
- evaluations rely on accounting information in which important variables such as quality, innovation and customer satisfaction are taken into account

With emergence of information age and intensification of competition, performance evaluation of organization via analysis of financial measures will no longer be possible, that development in evaluation system and strategy management of organization is an inevitable issue. Balanced Scorecard method as a performance evaluation system, in addition to traditional financial evaluation,

evaluates performance of organization by adding three other dimensions including customers, domestic processes of business, learning and development. The aforementioned method regarding a special attention to the intangible assets of the organization which are of a great important at current age allows the organization to take action to resolve the weaknesses and compensate the deficiencies through monitoring and controlling the quality of intangible assets. Balanced Scorecard method avoids different impressions by translating vision and strategy of organization in comprehensible terms and assists successful implementation of strategy by aligning the individual and organizational aims (Asghar pour, 2011).

### Literature review

A variety of methods and tools for operational planning such as quality management, process management, process dashboards, resource capacity planning and so forth have been used in different organizations, that a huge emphasis has been put on performance of domestic processes to enter into the competition (Chiang, CH, Lin, B, 2009). A variety of methods and theories including ratio analysis, regression analysis, Delphi analysis, BSC, AHP and DEA have been used to fulfill the evaluation, so that each method has been used based on type of activity and position of organization and aims and advantages of the used method within different organizations. Balanced scorecard has been regarded as a means to extend the strategy to all sectors of the organization and align the required resources to achieve the strategy and also as a means for evaluation of performance considering financial and nonfinancial aspects for the purpose of control and planning (Hemati, M, 2012). Growing globalization of economy and correlation of economic activities at the late decades of 20th century have caused fading out the geographical borders, so that, emergence of international companies is required for measurement and evaluation of performance and awareness from the results (Wang, J, Wu, H, 2006).

### Performance evaluation systems in the past and today

Indeed, if we tend to explore the history of performance evaluation, we must turn back to the history of human life and the first time at which the individuals engaged in working in a group. At that period, the evaluation was made only based on the individual judgments, yet a variety of methods were used to control and evaluate performance in different countries by the passage of time (Kaplan & Norton, 2004). Performance evaluation system was proposed for the first time by Robert Owen in Scotland in textile industry at individual and organizational level since 1980, so that the manufactured goods have been being graded via the woods in different colors, and this has been regarded as an evaluation for the quality or input of the organization.

By starting post-industrial management by W. Edwards Deming in the 1950s and his works by cooperation of Japanese directors such as Genichi Taguchi, a development was emerged in quality, innovation and power of the staffs, and also in evaluation-based feedback and management. People like Peter Drucker, Juran, Crosby and Tom Peters expanded Deming's philosophy (Cebeci, U, 2009). Development of evaluation indicators undergoing representation of general principles to evaluate the organizations and total quality management represents development in evaluation systems. According to overview of the existential philosophy of performance evaluation, we face two attitudes: 1-traditional attitude towards evaluation in which the most important aim is to evaluate judgment and reckon performance, 2-modern attitude in which a particular attention has been paid to development and improvement of performance. With regard to traditional attitude, the performance measures have been grounded on industrial accounting techniques which have numerous limitations (Jalalpoor, M, Tolouei, P, 2011).

### Research method

To conduct the research, firstly overview of literature review has been considered. At this stage, balanced scorecard model has been described and a number of studies conducted at this area have been investigated. At the next stage, by holding expert meeting in the company under study, the balanced scorecard has been designed by exploitation from organization's strategic plan and vision. For this purpose, strategic aims and measures have been formulated via four visions of balanced scorecard. After designing the balanced scorecard, by exploitation from experts' views and fuzzy analytic hierarchy process, weights of strategic aims and visions corresponding to each vision have been calculated and determined. To determine the weights, a questionnaire based on pair-wise comparisons was designed and given to the experts, whereby the experts' views were collected.

Then, by overview of the existing documents, current performance of organization at each of four visions of balanced scorecard has been examined and the existing gap at each vision has been calculated and determined. Then, the contributing factors in the gap regarding the extent to which each factor has been contributed in the gap raised in performance have been ranked. To rank these factors, Friedman test and software SPSS have been used. Ultimately, an ideal planning model has been represented to select the best items which provide the highest reduction in the existing gap. To resolve the ideal mathematical model, software LINGO has been used.

### Data analysis method

In the present research, experts' views on importance of visions, aims and measures have been collected via fuzzy analytic hierarchy process, and the weights have been calculated using developmental analysis method. In

following, Friedman test and software SPSS have been used for some of the analyses. Further, an ideal planning model and software LING have been used to resolve this planning model.

### Strategic aims and measures of financial vision

Three strategic aims and ten measures have been considered for financial vision and represented in table 1.

**Table 1.** Strategic aims and measures of financial vision

Code of measure	measure	Code of Strategic aim	Strategic aim	Vision
F1	Total cost	FS1	Reduce operating costs	financial
F2	Percent annual growth of cost			
F3	economic value added	FS2	Increase the productivity of production factors	
F4	Productivity Investment			
F5	Percent of annual growth in productivity of Intermediate Consumptions			
F6	Return on net assets			
F7	Return on investment			
F8	revenue in new product	FS3	Increase new revenues	
F9	Ratio of revenue to total assets			
F10	Ratio of income to total staffs			

### Determine weight of strategic aims corresponding to the financial vision

As the calculations associate to determination of weight of strategic aims such as the calculations provided for determining the weight of visions, thus representation of details has been prohibited.

Two weights have been calculated for any strategic aim.

-local weight: this represents the degree of importance of the aim in the corresponding vision.

-ultimate weight of aim: this weight which is obtained from multiplication of the local weight for the aim by the weight of corresponding vision, represents the extent to which that aim has influenced realization of the determined macro aims for the organization. Three strategic aims have been considered for financial vision. Table 2 represents fuzzy pair-wise comparison matrix for these three aims.

**Table 2.** Fuzzy pair-wise comparison matrix for aims of financial vision

	Reduce executive costs	Increase productivity of production costs	Increase new revenues
Reduce executive costs	(1•1•1)	(0/95 •1/57 •3/07)	(0/76 •1/40 •3)
Increase productivity of production costs	• 0/64 •1/05) (0/33	(1•1•1)	• 1/47 •3/20) (0/84
Increase new revenues	• 0/71 •1/32) (0/33	(0/31 •0/68 •1/19)	(1•1•1)

According to the required calculations, Weight of strategic aims corresponding to the financial vision has been determined, and represented in table 3.

**Table 3.** Weight of strategic aims corresponding to the financial vision

strategic aims	Code of Strategic aim	Weight of strategic aim in vision	Ultimate weight of aim
Reduce executive costs	FS1	0/39	0/1482
Increase productivity of production costs	FS2	0/34	0/1292
Increase new revenues	FS3	0/27	0/1026

### Determine the weight for measures of financial vision

Weight of the measures corresponding to the strategic aims has been calculated via the aforementioned methods. Three weights have been calculated for each measure.

-local weight: this represents degree of importance of the measure in the corresponding strategic aim.

-weight of measure in the vision: this represents degree of importance of the considered measure in the associated vision. This weight which is obtained from the multiplication of the local weight for the measure by the local weight for the corresponding aim represents the

extent to which the considered measure has influenced access or lack of access to the aims of vision.

-ultimate weight of measure: this weight which is obtained from multiplication of the weight for the measure by the vision represents the extent to which the considered measure has influenced the determined strategic aims for the organization.

Table 4 represents the weights associated to the measures corresponding to the financial vision. To sum up, ten measures have been recognized for this vision. With regard to high rate of calculations in this section, it has been sufficed only to the ultimate results.

**Table 4.** Weight of the measures corresponding to the financial vision

Ultimate weight of measure	Weight of measure in vision	Local weight	Code of measure	Measure	Strategic aim	Vision
0/1023	0/2691	0/69	F1	Total cost	Reduce operating costs	Financial
0/0459	0/1209	0/31	F2	Percent annual growth of cost		
0/031	0/0816	0/24	F3	economic value added	Increase the productivity of production factors	
0/0284	0/0748	0/22	F4	Percent of productivity growth for the investment		
0/0245	0/0646	0/19	F5	Percent of annual growth in productivity of Intermediate Consumptions		
0/022	0/0578	0/17	F6	Return on net assets		
0/0233	0/0612	0/18	F7	Productivity Investment		
0/0472	0/1242	0/46	F8	revenue in new product	Increase new	
0/0277	0/0729	0/27	F9	Ratio of revenue to total		

				assets	revenues	
0/0277	0/0729	0/27	F10	Ratio of income to total staffs		

### Overview of status of realization of the determined aims for financial vision (gap analysis)

As mentioned above, the information pertaining to the company under study in 2012 has been used to examine status of access to the aims.

For this purpose, the determined quantitative aim pertaining to 2012 has been extracted for each measure on one hand and the current status of that measure has been extracted on the other hand. Then, by having the aim and current status, the rate of access to the aim has been calculated. Table 5 represents the calculations pertaining to the measures of financial vision. It should be noted that due to the limitation announced by the company under study in relation with providing information to out of the company, thus announcing the aims and current status of the measures has been avoided in this study, and only sufficed to providing to which extent the determined aims came to realize for each measure. The fourth column in table 5 represents the direction of measure, that is, the ascending or descending aim of measure. The percent for realization of determined aims for each measure has been calculated at three different statuses. The percent for realization of

aims concerning the measure has been calculated in this way:

Refer to equation (1) concerning the measures with ascending direction:

(1)

Percent of realization=aim of measure/current value of measure×100

Refer to equation (2) concerning the measures with descending direction:

(2)

Percent of realization= current value of measure/aim of measure ×100

In the fifth column, the table representing the values pertaining to the percent of realization of aims of measures has been represented. In the next column of table, percent of lack of realization of aims of measures which represents the gap pertaining to the measures has been represented. It is obvious that these values have been obtained by subtracting the values in the fifth column from 100.

**Table 5.** Functional status of the measures for financial vision

Corresponding vision		Corresponding strategic aims		Measure		Direction of measure	Measure	Strategic aim	Vision
Percent of lack of realization	Percent of realization	Percent of lack of realization	Percent of realization	Percent of lack of realization	Percent of realization				
%7.44	%19.47	%19.06	%49.94	%27.63	%72.37	descending	F1	Reduce operating costs	Financial
%5.22	%6.87	%13.37	%17.63	%43.14	%56.86	descending	F2		

						g		
%2.47	%5.69	%7.26	%16.74	%30.25	%69.75	ascending	F3	Increase the productivit y of production factors
%2.31	%5.17	%6.79	%15.21	%30.86	%69.14	ascending	F4	
%1.98	%4.48	%5.81	%13.19	%30.59	%69.41	ascending	F5	
%1.36	%4.42	%4	%13	%23.53	%76.47	ascending	F6	
%0.99	%5.13	%2.93	%15.08	%16.25	%83.75	ascending	F7	
%3.94	%8.48	%14.58	%31.42	%31.69	%68.31	ascending	F8	Increase new revenues
%1.61	%5.68	%5.96	%21.04	%22.07	%77.93	ascending	F9	
%1.54	%5.75	%5.72	%21.28	%21.18	%78.83	ascending	F10	

The seventh column represents the table for percent of realization of the aims of measures to the corresponding strategic aim of the measures. The values in this column for each measure have been obtained through multiplication of the value in the fifth column by the local weight of that measure. The values in this column for each measure represent the extent to which the measure has been intervened in realization of the strategic aim corresponding to that measure. Hence, sum of the values in this column for the measures of each strategic aim represents the extent to which the strategic aim has been intervened. For instance, sum of the values corresponding to the measures F1 and F2 at this column represents the percent for the realization of strategic aim 'reduce operating costs'. The eighth column in the table which represents the value pertaining to the percent of lack of realization of the measure to the strategic aim corresponding to that measure has been obtained through multiplication of the value in the sixth column by

the local weight of the measure. The values in this column for each measure represent the extent to which the measure has been intervened in lack of realization of the strategic aim corresponding to that measure. The explanations pertaining to the ninth and tenth columns in table below are the same as that of in the seventh and eighth columns, with this difference that the values in these two columns have been obtained through multiplication of the fifth and sixth columns by the weight of measure in the vision. In table 6, the extent to which the strategic aims for financial vision has come to realize and percent of realization and Percent of lack of realization for the financial vision have been represented. The fifth and sixth columns represent the percent of realization and percent of lack of realization for each of the strategic aims for the financial vision. The values in these two columns for each strategic aim have been obtained through sum of the values in seventh and eight columns which represent the measures pertaining to the strategic aim.

**Table 6.** Functional status of the strategic aims concerning the financial vision

Corresponding to the vision		Aim		Strategic aim	Percent of lack of realization	Percent of realization	Vision
Percent of lack of realization	Percent of realization	Percent of lack of realization	Percent of realization				
%12.65	%26.35	%32.43	%67.57	Reduce operating costs	%28.85	%71.15	Financial
%9.11	%24.89	%26.78	%73.22	Increase the productivity of production factors			
%7.09	%19.91	%26.26	%73.74	Increase new revenues			

The values in seventh and eighth columns in table above for each strategic aim have been obtained through multiplication of the values in the fifth and sixth column by the local weight for that strategic aim. The values in these two columns represent the extent to which the strategic aim has intervened in percent of realization and Percent of lack of realization for the vision. Finally, the second column represents the extent for realization of the vision. This value is obtained through sum of the values in the seventh column in table above. The third column represents the percent for lack of access to the strategic aim corresponding to the vision. This value represents the existing gap for the financial vision. This value is obtained through subtraction of the percent for realization of the vision from 100. Further, sum of the values in the last column in the table represents this value. Hence, regarding the values in the last column, it can conclude that the strategic aim ' reduce operating

costs' has the highest share in building the gap. Looking into the seventh column in the table, it can observe that this strategic aim has the highest share in realization of vision with 26.35%.

Ranking the strategic aims and measures of financial vision

In this section, ranking aims and measures of the financial vision have been considered. Further, the measures and aims have been ranked in two ways.

#### **Ranking based on the extent to which the measure or aim has intervened in the existing gap in the vision**

The values existing in the column representing lack of realization of the vision in tenth and eighth columns in table 5 & 6 are used for ranking. The results of this ranking have been represented in tables 7 & 8.



**Table 7.** Ranking the measures of financial vision based on the share of each measure in building the existing gap in the vision

Share	Measure	Rank	Share	Measure	Rank
1.98	Percent of annual growth in productivity of Intermediate Consumptions	6	7.44	Total cost	1
1.61	Ratio of revenue to total assets	7	5.22	Percent annual growth of cost	2
1.54	Ratio of income to total staffs	8	3.94	revenue in new product	3
1.36	Return on net assets	9	2.47	economic value added	4
0.99	Return on investment	10	2.31	Percent of productivity growth for the investment	5

**Table 8.** Ranking aims of financial vision based on the share of each aim in building the existing gap for the vision

Share	Aim	Rank
12.65	Reduce operating costs	1
9.11	Increase the productivity of production factors	2
7.09	Increase new revenues	3

As shown in table 8, the measure 'total cost' has the highest share in the gap built for the financial vision. Hence, it can say that reduce the gap for about 7.44(28.85%) by an emphasis on this measure and realization of the determined aim for this measure and reach the existing gap to 21.41%. concerning the aims, it can state what aforementioned for the strategic aim 'reduce operating costs'.

### Conclusion

In this study, using the balanced scorecard and gap analysis, evaluation of effectiveness of the strategic plans in the company under study has been considered. For this purpose, with regard to the macro strategic planning in the company under study, the balanced scorecard was designed for the company and the macro aims were embedded in the balanced scorecard. After designing the strategic map, weight of each of four visions in the balanced scorecard was calculated by asking the experts' views together with pairwise comparison questionnaire in form of the fuzzy AHP model. These weights indicate the degree of importance of each of visions in access to the determined macro aims for the company. Then, weight of the strategic aims corresponding to each of these visions as well as weight of measures corresponding to each of the strategic aims was calculated.

Finally, with regard to the determined quantitative aims for the measures in 2012 as well as overview of the current status of the measures through overview of documents, the rate of access to the determined aims concerning the vision was calculated and the existing gap in the performance was identified. Finally, by overview of the share of each factor in building the gap in the performance of the visions in balanced scorecard, these factors were ranked. As the result, the ideal planning model to select the best items regarding the limitations to reduce the maximum gap in the performance of visions was used.

The results from this study include:

- performance of the company under study has a gap equal to 28.82%, thus this company has enabled to achieve about 71.18% of its macro aims in 2012.
- further, percent of realization of the determined aims for four visions in the balanced scorecard for the visions of financing, customer, domestic processes, growth and learning equal to 71.15%, 66.42%, 76.77% and 68.20%. Hence, the existing gap concerning these visions equal to 28.75%, 33.58%, 23.33% and 31.80%, respectively.
- share of each of these visions in building the existing gap in the company's performance equals to 10.96, 7.05, 6.04

and 4.77, respectively. These values have been obtained through multiplication of each vision by the weight corresponding to that vision.

-further, the results indicate that the strategic aims of reduce operating costs, representing the work explanation with competitive price, improvement of project control system and development of information and communication infrastructures have the highest share in building the existing gap in the visions of financing, customer, domestic processes, growth and learning.

-the results from ideal planning model indicate that the gap existing in company's performance will decrease from 28.82% to 8.54% by performing the results of model and realization of the determined aims for the proposed items in the model.

### Suggestions

- propose a multipurpose ideal model to select the best items instead of single-criterion ideal model
- weigh the experts concerning their experiences and intervene the obtained weights in Fuzzy Analytic Hierarchy Process
- use rest of methods to determine the weights such as TOPSIS method
- examine the correlation coefficient between the visions and strategic aims

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