“A new technique for evaluating the balanced scorecard dashboard values”

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A new technique for evaluating the balanced scorecard dashboard values

Abstract

Determining the contents and weights of a balanced scorecard (BSC) evaluation system constitutes a major challenge in its implementation. Although it would be ideal to measure directly the contribution towards the strategy and vision, the content must be based on data from periodic measures.

This paper presents a new technique for designing a BSC using the principles of quality function deployment (QFD) to propagate the strategy into sound and applicable measures and compute proper weights.

BSC divides its measures into: (1) short-term performance; (2) long-term performance and growth; (3) internal efficiency; (4) external relationships. Each of these four components is assigned three hierarchical cascading matrices in a QFD style. The matrices are then used to translate the strategy into measures, required activities and desired results that are weighted accordingly and measured periodically.

Keywords: productivity measurement, balanced scorecard, quality function deployment.
JEL Classification: M10.

Introduction

A performance measurement system is the critical link between strategy and its implementation. Every experienced manager knows that if you cannot measure it, you cannot control it. And if you cannot control it you cannot manage it (Harrington, 1991; Andersen, 1999). However, there is **no** extant mature technique for translating a given strategy directly into a performance measurement scheme. This paper deals with propagating organizational strategy into measures and proposes a methodology for constructing the measures, and weighing them. In doing so, the paper utilizes and combines the principles of quality function deployment (QFD) and the balanced scorecard method.

The balanced scorecard. Balanced scorecard (BSC) is a strategic measurement system with growing popularity. It was first presented in 1992 by Robert Kaplan and David Norton (1992), and its use has been growing considerably ever since (De-Waal, 2002; Kaplan, 2009; Huang, Lai and Lin, 2011). The BSC suggests that the organization would be viewed from the following four perspectives (Kaplan, 2009; Kaplan and Norton, 1996; Kaplan and Norton, 2006):

1. The internal business (process) perspective.
2. The external business (customer) perspective.
3. The present financial perspective.
4. The future prospects (learning and growth) perspective.

These perspectives are illustrated in Figure 1. Thus, one should develop metrics, collect data and analyze it relative to each of the four perspectives.

In order to make a management tool out of the BSC a popular approach is to break each of the four perspectives into four areas (Kaplan and Norton, 2006; Kaplan and Norton, 1996; Kaplan and Norton, 2008):

1. Objectives.
2. Measures.
3. Targets.
4. Initiatives.

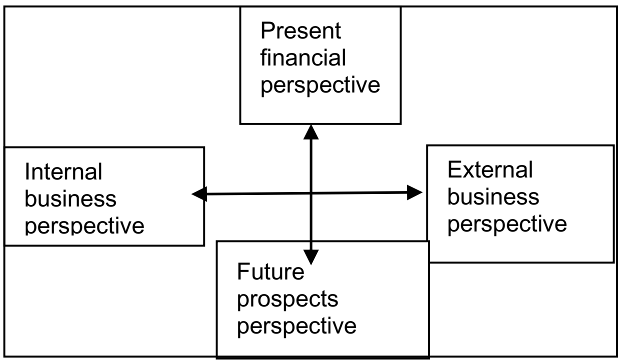

Fig. 1. The main structure of a typical balanced scorecard (BSC) scheme

While there has been some criticism on the BSC lack of scientific foundations (Nørreklit, 2003) and its lack of fit for small and starting companies (Hoque, James, 2000), evidence show that BSC proved to be an effective management tool (Krausa and Lind, 2010; Speckbacher, Bischof and Pfeiffer, 2003; Khan, Halabi, 2009). However, studies found that lack of communication and misalignment between organizational functions significantly reduce the affectivity of BSC (Malina and Selto, 2001; Decoene and Bruggeman, 2006; Yang and Islam, 2009; Cardinaelsa and Veen-Dirks, 2010).

Using strategic maps and some other conceptual alignment of the general four perspectives with the strategy, and propagation or cascading the alignment

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into implementation through strategic maps was suggested later by Kaplan and Norton (2006; 2008; 2008). However, the details of the transition from the strategy down to detailed measures is more an art than a science. It is in that specific stage that a technique, such as the one proposed, can smooth the transition and make it structured, more consistent, and technical.

The quality function deployment (QFD) method. Quality function deployment (QFD) is a methodology used as a tool of quality management to ensure the propagation of the customers' needs and desires to the production processes (Bossert, 1991). QFD was developed in Japan in the late 1960s by Professors Shigeru Mizuno and Yoji Akao (1990). Central to the QFD is the relational matrix and its associated columns and rows (or the "house of quality") (Hauser and Clausing, 1998) depicted in Figure 2.

Constructing the house of quality starts from listing the customer needs in column (1) and by listing the product attributes in row (2). The construction continues with analysis of the strengths of the relationships for the entries of the relational matrix (3) and analyzing the relationships between the different product attributes in the half-matrix that forms the "roof" (4).

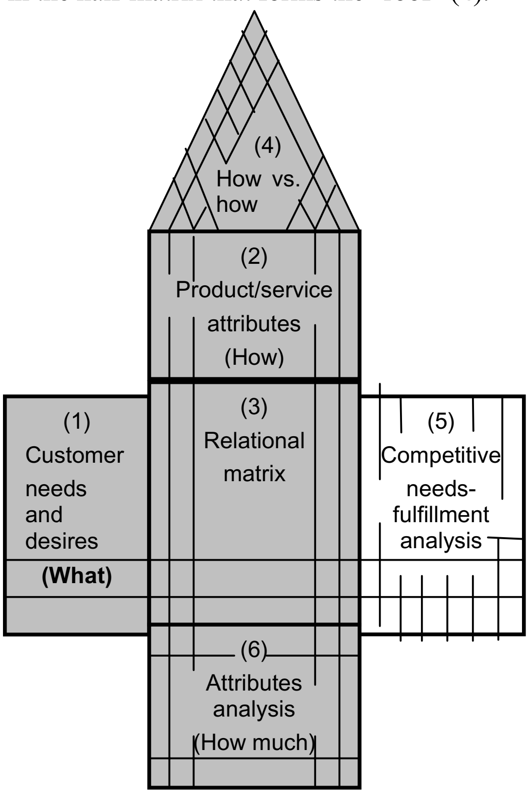

Fig. 2. The general structure of the QFD's "house of quality" (areas to be used in the proposed scheme are shaded)

The next stage is to rate the company's performance in the first column of (5) (based on the customer needs/desires in (1)) and to rate each competitor on a separate column of (5). A comparison assists in setting targets for improvement (the final column of (5)). The last stage in the construction is attributes analysis (6), where the attributes of our product are weighted according to their contribution to the customer needs and desires. In this stage too, a comparison with competitors helps set the improvements targets.

Another important principle of the QFD is the cascading scheme. When using QFD in manufacturing processes it is customary to cascade the customer requirements down to product features then cascade it into part features, and again to main processes, and finally to production control. The usage of the QFD matrices for cascading is depicted in Figure 3.

No structured methodology exists for translating BSC into set of final measures. This gap has been an obstacle to a successful BSC implementation and there is a need to fill this gap (Schneiderman, 1999).

The proposed approach combines the principles of the BSC and QFD to form a structured technique for translating BSC into set of final measures. Thus, it ensures that the organizational strategy is propagated down to the measures.

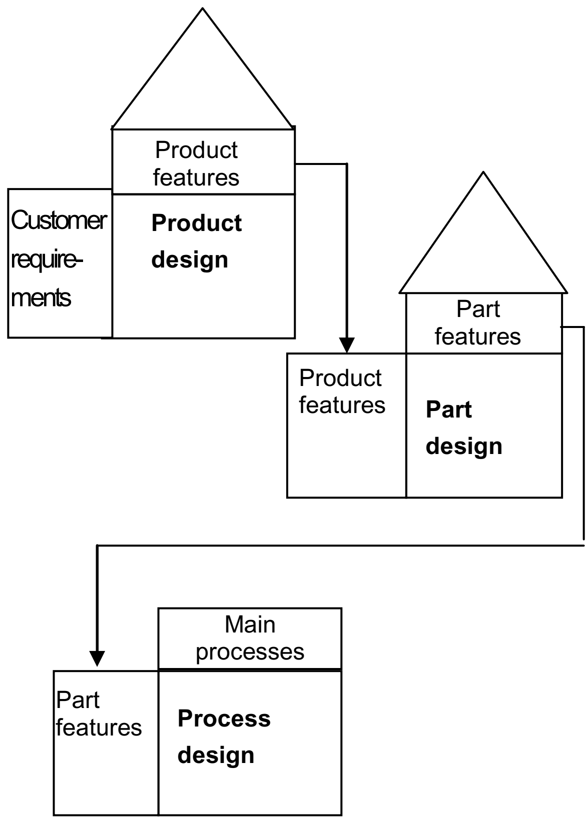

Fig. 3. The cascading QFD matrices

2. Objective

The important insight of the BSC is that a balance must be kept in all dimensions in order to manage successfully. Neglecting one area for attending the others is unacceptable (Kaplan and Norton, 2006; Kaplan and Norton 2001). Moreover, being high on some aspects of the same dimension and low on others is not enough. For example, having (1) high profitability and (2) zero growth in market share, may be a foreboding omen for customers reaction to our high prices, and a danger of low price competitors. On the other hand high growth in market share with negative profitability may also give any (chief executive officer) CEO the shivers. So, high profitability and market share cannot stand by their own, and both are needed to complete the picture (or the proverbial puzzle). It is therefore, that a double balance is required: first level – a balance in the internal/external present/future dimensions; and second level – a balance within each of the four areas of the first level.

The balance in the second level is achieved by treating each of the four dimensions individually and looking at the different aspects of the dimension that are important for its achievement and is independent of other basic measures.

For example, let us look at the future prospects perspective from Figure 1. The aim is to build a dashboard that will reflect the current situation in each of the items of the perspective (see Figure 4).

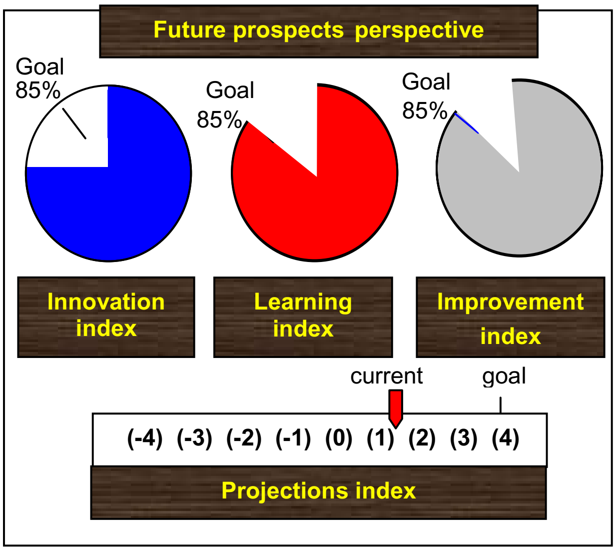

Fig. 4. Example of future prospects perspective dashboard – the desired balancing tool for external perspective

Some studies used the analytic process hierarchy (AHP) (Fong-Ching and Chaochang, 2009) and network process hierarchy (ANP) to generate weights for the measures (Yuksel and Dagdeviren, 2010). However, no structured methodology exists for generating the measures, and no consistency is guaranteed for the weights. ANP and AHP require the knowledge of experts. So, a competing approach is to use the experts directly (Dilla, Steinbart, 2005).

Thus, developing framework of indexes (such as shown in Figure 4), remains a challenge and an art. This is where the QFD approach can be adopted and reshaped to perform the transition from the desired dashboard to proper measures that work nicely to implement such a dashboard. One step toward this direction was taken by Chen and Chou (2006) who suggested using QFD for developing key productivity indicators (KPI). An excellent coverage of KPI development and implementation could be found in Parmenter (2010).

3. Methodology

The proposed technique adopts a cascading approach that is best illustrated by applying the idea presented in Figure 3 to this case as presented in Figure 5.

The upper matrix in Figure 5 is the classic balanced scorecard with the relationships between dimensions and the sub-dimensions of Figure 1.

The second matrix translates the sub-dimensions into determinants (or main factors). For illustration purposes, future prospects index is chosen as an example for a sub-dimension. The determinants are indexes of the main areas that compose the sub-dimension. For example, future prospects perspective may include the following determinants (main factors):

1. Innovation index.
2. Learning index.
3. Improvement index.
4. Projections (and deviations from projections) index.

These should be converted to gauges and placed on virtual dashboards as shown in Figure 4. In this stage of the first matrix, there is no advantage in ranking or weighing the importance of the sub-dimensions (all of them are needed for the balance).

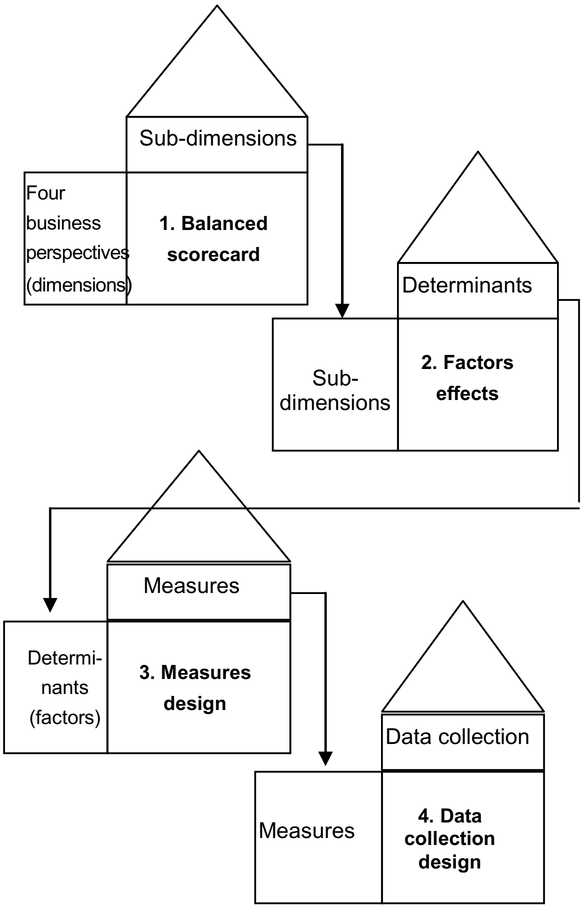

Fig. 5. Cascading the balanced scorecard from strategy into measures through matrices

The third matrix translates the determinants into measures. To consider all relevant measures one should ask "what could be measured that may be related to the future prospects of a business or its determinants?" Future prospects may have different versions in different organizations leading to different measures. So, some analysis should take place before determining the measures. While the measures for productivity are simple, measures for other dimensions may be complex and hard to get. In general, designing the measures is a process that has several aspects worth noting:

1. Measurements must not only be attainable, but also easy to perform.
2. Some measurements may not correspond to a specific factor but be rather unclear and general indication of several factors (e.g., R&D productivity).
3. Each measurement must have a responsible person that takes the responsibility for getting accurate consistent data periodically.
4. In some cases, a measurement system must be added (even if its installation costs are high) simply because the data is needed and there is no existing way of supplying it.

Thus, the following questions should be addressed for identifying the desired measures:

1. What can be measured that is related to the sub-dimension (productivity).
2. What can be measured that is related to each of the determinants of the sub-dimension (e.g., the 5 determinants of productivity).
3. Based on the measures considered in items 1 and 2 above, what determinants are not measured in a satisfying way and are worth the toil and expenditure of creating a dedicated measurement system.
4. How exactly should the measurements be carried out and who is going to be responsible for each type of measurement.

For the example of future prospects, each of the above questions shall be now answered:

1. General measurements of future prospects: projected sales; projected costs; pending completion of large projects.
2. Measures for each of the determinants are:
   - measures of <u>innovation</u>: number of pending patents; number of patents under development;
   - measurements for <u>learning</u>: % decrease in projected hours per product; % decrease in projected cost per product;
   - measures of <u>improvements</u>: number of patents under development; % decrease in projected cost per product; projected % increase in sales due to product improvements (not measured and cannot be derived from current data);
   - measures of projections: achieved R&D milestones (relative to the plans); sales projection; actual budget relative to the plan; actual sales vs. projected sales.
3. Of the above measures, only the "projected % increase in sales due to product improvements" is missing. This could be amended by having a periodic meeting of the marketing department and the engineers and designers related to the product improvements to assess the effects of current and future improvement on sales.
4. How and who will collect the data depends on the specific organizational structure and the specific data collection system at each organization. The answers to these questions are the entries in the fourth relational matrix ("data collection design" matrix). This fourth relational matrix has a row dedicated to each measurement and a column dedicated to each responsible person, and a column to each data collection procedure.

Answering the above four questions, gives enough information to form the list of measures. For the conciseness of the example only the following 6 measures are used:

1. Sales projection (% increase/decrease).
2. Projected cost per product (% increase or decrease).
3. Projected hours per product (% increase or decrease).
4. Number of pending patents.
5. Number of patents under development.
6. Achieved R&D milestones (relative to the plans).

Table 1 illustrates an example for a measures design matrix. From the measures design matrix proceed by assigning each measurement a responsible person and a data collection procedure. This data is entered in the data collection design matrix (the fourth matrix from Figure 5).

From the measures design matrix one should not only be able to proceed to the data collection design matrix, but also be able to generate the gauge of future prospects index shown in Figure 6.

This is done using the following six steps:

1. Perform competitive evaluation to get scores for all measures (a measure forms a column in Table 1).
2. Normalize each score to a 100% scale (get normal scores).
3. Multiply the entries of Table 1 by the normal score of their corresponding column, and sum the entries of each row (as shown in Table 2). The total of each row is called "Sum of Scores".
4. Form a new table (Table 3) with the same rows as Tables 1 and 2. Fill the first column entries of the new table with the sum of scores from Table 2. Fill the second column entries by the sum of the corresponding row in Table 1. The values of the third column entries are calculated by dividing (for each row) the first by the second column entries for each row. Table 3 illustrates this step.
5. For each row multiply its scores of step 4 by its importance weights.
6. Sum the multiplication results of step 5 – this sum is the score for the gauge (see Figure 6).

The above six steps are illustrated using Tables 1 through 3, and Figure 6.

Thus, not only does the technique manage to develop the system of measures, it also shows how to go back and compute the gauge value that integrates the required measures.

For brevity of the tables, the following definitions are used: A – sales projection (% increase/decrease); B – projected cost per product (% increase or decrease); C – projected hours per product (% increase or decrease); D – number of pending patents; E – number of patents under development; F – achieved R&D milestones (relative to the plans).

These letters are used as columns headings as follows.

Table 1. An example of measures design matrix for "productivity" sub-dimension

(some measures removed for conciseness and clarity of the example)*

Determinants	Importance	A	B	C	D	E	F
Innovation	20%	3			9	9	3
Learning	10%		6	9			
Improvement	20%	3	9			9	
Deviations from projections	50%	9					9

Note: * Strong relationship is denoted by 9, medium relationship by 6, and weak relationship by 3.

After setting Table 1, comes the time for benchmarking and competitive evaluation. The purpose is to give a grade (1-100 scale) for the performance of our own organization in each of the column measures (relative to competitors). These grades are named "Normal scores".

Suppose that the grades of our comparative study yield the following normal scores: A = 80%, B = 90%, C = 70%, D = 90%, E = 60%, F = 70%.

This would serve in calculating Table 2. Table 2 entries are calculated by multiplying the corresponding Table 1 entries by the normal scores. Finally, by summing each row the sum of scores for each determinant is computed.

Table 2. Calculating the sum of scores

	A	B	C	D	E	F	Sum of scores
Normal scores	80%	90%	70%	90%	60%	70%	
Innovation	2.4			8.1	5.4	2.1	18.0
Learning		5.4	6.3				11.7
Improvement	2.4	8.1			5.4		15.9
Deviations from projections	7.2					6.3	13.5

Table 3. Calculations for developing the gauge value for Table 1

	Sum of scores	Sum of Table 1 entries	Ratio	Importance	Score
	A	B	C = A/B	I	S = C*I
Innovation	18.0	24	0.750	20%	15%
Learning	11.7	15	0.780	10%	8%
Improvement	15.9	21	0.757	20%	15%
Dev. from projections	13.5	18	0.75	50%	38%
Total score for the gauge					75%

The total score computed in Table 3 is the gauge index value of future prospects, as shown in Figure 6.

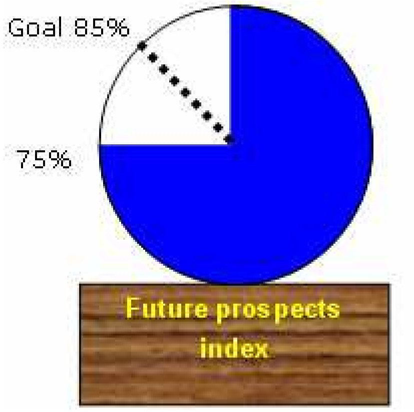

Fig. 6. The developed gauge presented in the dashboard of Figure 4

The importance scores of Table 4 enable us to know which measure is more important, and rank the measures accordingly. These scores have important role in setting priorities for improvement.

Table 4. Calculating importance scores

Determinants	A	B	C	D	E	F
Innovation	0.6			1.8	1.8	0.6
Learning		0.6	0.9			
Improvement	0.6	1.8			1.8	
Deviations from projections	4.5					4.5
Importance scores	5.7	2.4	0.9	1.8	3.6	4.1

Setting priorities for improvement is critical in this case. These priorities are positively related to the importance scores of Table 2 and negatively related to the normal scores (used in Table 3). Thus, one should divide the importance scores by the normal scores and than rank the measures. In our example, these divisions would yield: A = 7.1, E = 6.0, F = 5.9, B = 2.7, D = 2.0, C = 1.3.

This means that improvement efforts should be directed at the top measures. In the example, the top three are:

- A(7.1) − sales projection (% increase/decrease);
- E(6) − number of patents under development;
- F(5.9) − achieved R&D milestones (relative to the plans).

Conclusion

This paper addresses the need for a structured systematic way to propagate strategy into measures and finally into data collection and reports. The cascading approach of the QFD is adopted with significant changes to form a framework, where measurement system could be designed and its results presented in an effective manner as gauges on a dashboard. This proposed approach is expected to be honed with case studies until it will reach a final form.

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