

The Use of Time Driven Activity Based Costing and Analytic Hierarchy Process Method in the Balanced Scorecard Implementation

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Abstract

Balanced scorecard (BSC) functions as an action plan for the basis of establishing the strategy which is defined with critical success factors. BSC classifies the vision and strategy of the enterprise in four perspectives in which financial and non financial scales are used. BSC becomes a strong method for planning, developing and transforming the strategy. An active planning is needed in order to settle a strategy. In this study, time driven Activity Based Costing (TDABC) is important not only in the process of providing full and in time information which aim at serving both the customer and cost goals. On the other hand, Analytic Hierarchy Process (AHP) is a decision making method used for evaluating various criteria in order to choose the best one while determining critical success criteria. The aim is to create a modeling in order to integrate BSC with TDABC and AHP in order to provide an effective strategic decision support process.

Keywords: Balanced scorecard, Analytic hierarchy process, Time driven activity based costing

Balanced scorecard (BSC) which consists strategic management, strategic planning, performance and management accounting, arouses companies' interest and increase the number of companies using BSC. Companies determine a criterion for critical success factors for their BSC, but they face with problems while defining data that support these factors. Companies which start BSC implementation after gathering unreliable data which support critical success measures face with the risk of failure. So, in the case of entering risky data into BSC and making important strategic decisions which depend on it, the result will most probably be opposite to companies' interests. For this reason, the senior management has some worries in the course of making strategic and operational decisions about whether or not this data is reliable enough. In order to prevent such negative situations, it is necessary to observe the institutional performance truly, dynamically and in a sustainable way. Besides this, not only it is necessary to evaluate the derivation of internal process and source usage caused by consumer behaviors and product differences correctly, but also it is crucial to reflect those evaluations on the cost and connect them with profits.

Decision making is the process of choosing one of the alternatives action plans for companies that serve for reaching targets and purposes; it is the core of all management functions. Today's rapidly changing environment and globalization movements make it necessary for a company to have a rational deficient making process in order to reach a sustainable success. Rational decision making contains not only gathering and using data but also making strategic decisions with the help of developed decision-making techniques. Making rational decisions is an important strategic process in order to gain a sustainable and competitive advantage. While decision-making requires much time and effort in order to gather and analyze the information, evaluating the alternative action plans requires less time and effort. Deficient analyze periods lead companies to be perception based while making their decisions. In research, it is understood that intuitively made decisions are adequate for daily events, they are not sufficient for complex and vital situations.

One of the aims of this study is to express the necessity of establishing different important strategic decision making methods which support BSC and integrating them with BSC in order to practice it correctly. In order to be successful in this process, raw information in database should be transferred to BSC after correct configuration. Secondly, BSC should be developed in order to determine and organize strategies of the company

according to the four points of views of BSC. Planning of strategies and improving BSC for making decision strategically. This study ensures the analysis of determining critical success criteria and aims using analytic hierarchy process (AHP). So the two important key issues; determining critical success measures and strategic aims are targeted. As a result with this study, it has been tried to get a model toward integrating TDFTM and AHP with BSC in order to perform the activity of strategic decision support process.

Balanced Scorecard

Balanced scorecard, one of the most common used strategic management methods, has been developed by Robert Kaplan and David Norton. This approach functions as an action plan which makes the base for performing the strategy expressed with critical success factors. The BSC method classifies the vision and strategy of the company in four perspectives in which financial and non financial measures are used (Kaplan & Norton, 1992; Veen-Dirks & Wijn, 2002; Pineno, 2002)

- Financial perspective
- Customer perspective
- Internal Business Process perspective
- Learning and Developing perspective

Contrary to traditional methods, in BSC method, financial measures are not used alone in performance evaluation process. In BSC method; the activity measures such as on time deliverance, order time, product return, are important measures besides financial aspects (Sanger, 1998). Besides giving information about physical matters, BSC gives information to the company management about non physical issues such as highly qualified product and services, staff, internal processes, innovation and learning (Walker & Macdonald, 2001). Thanks to its number of wide performance measures, BSC has the ability of serving different demands through a management report. The issues, each of which is important such as; customer needs, quality development, productivity, launching a new product or service to the market, and long-term management can be seen in one report (Storey, 2002). Measures in BSC which present management a fast, clear and understandable picture which covers financial and activity performance of the company help the managers perform management functions successfully (Rickards, 2003).

BSC has two basic advantages one of these is to gather information in just one report instead of several different reports. Second one of these advantages is to prevent possible fractions in the company by helping all managers measure all performance skills.

In an approach like this stressing the wide range of BSC, it is expressed that BSC has an important advantage as it completes the financial measures, thus gives information about the future of the company and makes it possible to evaluate the performance of the companies in different fields (Horngren, Datar & Foster, 2003).

In BSC method another key to success is to identify the correct and qualified measures. Although evaluation criteria are difficult to choose, they are seen as the most important components on the way to the success of the company (Sanger, 1998). In terms of the aspects of evaluation criteria, the important point is not to evaluate everything, but to analyze the activities that will inform the management about the improvements and important activities. (Ritter, 2003) The measures in BSC have to be determined separately as short term and long term in order to evaluate the performance of a company.(Kershaw & Kershaw, 2002) The aspects of the measures that will be used in the evaluation of performance are mentioned below (Niven, 2002)

- To be related to strategy
- To be expressed in numbers
- To be attainable and obtainable
- To be understandable
- To be comparable
- To be related
- To have a general definition

In BSC method, there has to be a strong relation between the chosen performance measures and strategy of the company (Otley, 1999). The ability to transform strategic aims into performance is accepted to be the most important part of BSC and distinguishes it from other methods (McAdam & Walker, 2003; Otley, 1999). Expressing the performance measures in numbers and consisting measurable parts as well as reflecting the

strategy of the company, affect the successful performance of the company. The performance criteria that are can easily be understood make it possible to compare things in different fields, related to the processes and employees within the company will be fruitful and will lead the company to success.

Balanced Scorecard Perspective. BSC model identifies four related perspective on activities that are likely to be critical to most organizations and to all levels within organizations. Four perspectives of BSC; general characteristics of the perspectives, the relations between the perspectives, the qualities that a performance criteria should have are mentioned below.

Financial Perspective. The financial perspectives are criticized as they are short term focused, being directed to the past, not supporting the strategic implementing, not compromising the realities of business world, not being related to most divisions of the company and causing the company to be divided into sections (Otley, 1999; Palmer, 1992). But on the other hand, it is not possible to design a result board that does not include a result card that excludes financial measures. In a recent study, it is understood that 49% of the companies see financial criteria more important than other criteria (Niven, 2002). For this reason, financial perspective is a kind of focus point for the aim and criteria of other perspectives in BSC. As financial criteria are highly beneficial for summarizing the measurable results of the works made in the past and their current status, BSC is keeping the financial perspective as it is. So, BSC expresses the financial aims in a clear and understandable way and helps companies in determining special financial aims for different life periods such as growing, maintenance and taking results. Financial criteria are determined according to the size of the company, its sector and special conditions (Bean & Jarnagin, 2002). These criteria generally focus on performance indicators such as profitability, growing, net income, and increase sales, cash currency and economic value added.

The financial aims and criteria can differ according to the level and life system (growing, getting resisted, maturity, etc.) of the firm (Baxendale & Hornsby, 2001). For a company which is still in the level of getting resisted while, some financial criteria such as the station of sales and cash currency are important for a company which is just in the level of getting resisted, the financial criteria such as profitability, net income etc. for a company which is in maturity level, can be more important.

Customer Perspective. In customer perspective, firstly, the custom and market fields in which the company will compete are defined, and then the aims and performance criteria are defined in order to evaluate the performance of the company that will perform in such. It will certainly affect the success of the method to choose performance criteria among those which could support the aims on financial perspective (McAdam & Walker, 2003).

BSC method aims at increasing the profitability by focusing on customer satisfaction. The aims and performance criteria on customer perspective should have the quality that will support the aims and criteria on financial perspective. Moreover, the perspective taking place in record board should be designed within cause effect relationship. While preparing the result board, working team should answer to the question of what could be done on customer basis in order to perform the aims that take place in financial perspective. That is how, the activities on customer perspective will contribute to the company reach the aims at financial perspective.

Internal Process Perspective. In this perspective, managers determine which internal function methods should be used improve and bring to perfection. These methods will lead the company present some values that will attract customers' attention in target markets and keep them besides answering the financial profit expectations of shareholders. For the reason, the criteria of internal processes perspective such as productivity, process time, quality, cost, new product launching, focus on the internal function processes which are the most effective ones in reaching customer satisfaction and financial aims. Internal process perspective also presents two basic differences between traditional systems and BSC on performance removing. One of these differences is that while current methods give importance to correcting the criteria based on cost, quality and time, BSC leads the company determine new methods and activities in order to reach its customer and financial aims. Second one is to include the renewing process into internal process perspective. Companies can search customers' newly increased and emerged needs and can produce new products and services in order to meet them.

Learning and Development Perspective. In the fourth perspective of BSC, the basic structure is tired to be formed for the long term success and growth of the company. The most important port of this perspective is that whether companies have the capacity to form value in the future for the shareholders. Expectations of shareholders such as development and profit and the expectations of the customers such as new and qualified product, depend on the abilities of learning and development. Institutional education and development in companies are obtained from three main services: persons, system and company methods. The financial, customer and internal processes perspectives in BSC will show that there is a big difference between the current

performance of people, system and methods and the performance requirements that will provide company to develop. In order to minimize this difference, companies have to hire new skillful people, enrich IT and information system, and work internal methods and programs in harmony. These aims take place in learning and growth perspectives of BSC.

One of the most important parts of learning development perspective is the human resources potential of the company. Most of the managers believe that human resource potential plays a key role in having advantage in competition and they state that importance of human resource role will increase in the next years and that human resource management in companies will be more important (Walker & McDonald, 2001). So, it is possible to plan the strength of human resources in accordance with the strategy of the company by preparing cards for employees like the result cards prepared for the company.

Time Driven Activity Based Costing

As companies couldn't get valid cost information and had problems while making decisions because of the inefficiency of traditional cost systems, company managers needed a new costing system. For this reason, the activity based costing system is created which distributes the costs, which emerge as general production expense, through several cost carriers depending on the activities determined by the company. Activity based management which focus on business activities is one of the most important management methods in increasing the quality of the goods and services, performance, functionality, customer satisfaction level and profitability (Maccarrone, 1999). Activity based management method, which continually directs the attention of the managers towards development with the data it gets by focusing on the activities is shown in picture 1 (Gunasekaran, Mcneil & Singh, 2000). Companies which use Activity Based Costing (ABC) are advantageous in several ways, for instance they analyze activities more correctly, and they use reliable costing information in budget, and estimate profitability of customer and product. Yet, it is said that several managers have recently given up using ABC because of the high implementation costs and worries of employees (Kaplan & Anderson, 2004). Because, updating the ABC method requires reanalyzing the activities, re-determining the amount of time spent for activities which cause some unsuitable and incorrect costing and timing results (Bruggeman & Moreels, 2003).

In the last 15 years, ABC has shown that every endorsement is not good and every customer is profitable. However, problems in implementing and updating the ABC method, mostly prevents the acceptance of such systems. Only 50% of companies can implement ABC approach. Time Driven ABC presents a transparent technology that can be evaluated, implemented and updated easily besides removing difficulties. It provides a practical and regular choice that can determine the profitability of customer, costs, product and orders and processes' usage of capacity (Kaplan & Anderson, 2007). The most important aspect of this approach is dynamic calculation of capacity, transferring them on the cost and distinguishing the inactive capacity cost. All data services within the company can benefit from specific aspects such as order, processes, supplier, product and customer. ABC is no longer a complex and expensive financial system application. The improved TDABC presents more meaningful cost and profitability information to the managers in a cheaper and faster way.

Insert Figure 1 about here

TDABC is defined as a system which is developed in order to remove such problems. The advantages of TDABC when compared to traditional ABC are easiness, low costs, installation and improvement, flexibility and system simplicity (Kaplan & Anderson, 2004). Company managers can make correct decisions thanks to this system and can evaluate inactive capacity quantity. So, the managers who have information about the productivity of the persons and the activities can make the source planning more correctly.

TDABC which is a more improved system than traditional ABC is preferred more by the companies which have numerous suppliers and process sources used in different ways, products that are designed in different styles and customers who require different services. So the companies which tend to behave in such processes in order to get true information have to adapt TDABC method.

TDABC, just like the traditional ABC, is a costing system in which company sources are used by the activities and activities are used by the cost (Gramco & Gremco, 2007). In another source, it is defined as the improved version of traditional ABC which helps company estimate the source demand of each process, product and customer with the help of required time to fulfill the activities and the cost of capacity unit time. However, it is stated in the study that the use of only cost carrier, that is 'time' makes TDABC special in respect to the

traditional ABC (Gremco & Gremco, 2007). For this reason, it is thought that although the general logic of both methods are same, there are some significant differences in their functions.

In traditional ABC method firstly which employee gives how much time to which activity is determined after cooperation with the staffs that perform different duties in a company. Then it is explained as the total cost of every activity is distributed to the product, service, customer or lines depending on the number of the activities. But the Time Driven system distributes indirect expenses in the company depending on the active working time used for each activity. So, it is thought that since the services and products run through different processes take different time, they consume sources in different levels. For this reason, employee cost based on their working schedule is distributed to products and services.

As a result, TDABC depends on time and even one minute is important in this technique. As it is cheaper, simpler and faster to use, it removes most restrictions caused by Traditional ABC. It is based on the cost of establishing related capacity's unit besides activities and products by focusing on the real capacity of the unit.

Another field in which ABC method is used successfully is budgeting and deviation analysis (Hixon, 1995). Activity based budgeting which is thought to be a part of ABC management and continuation of ABC method is defined as the budgeting of sources according to target activities. So the management will be able to learn which activities are unproductive and useless after comparing the budgeted activities with real results.

Since budgets prepared in ABC method convert several costs, which are thought to be fixed in traditional methods, into changeable ones, they provide making strategic about cost and profitability decisions towards future. According to another study, activity based budgeting is defined as plan prepared to assign the sources of related departments' activities and is also explained as an important planning vehicle which presents more reliable information when compared with the budgets prepared in traditional methods.

Time Driven Activity Based Costing and Balanced Scorecard. Using TDABC based costing method provides important advantages for presenting performance measures and required critical success factors for all processes. So after integrating TDABC with BSC, companies are evaluated by four different views in a correct way with the target and financial measures by taking the vision and the strategy of into consideration.

Short and long term targets financial and nonfinancial measures can be seen equally by taking four different views into consideration (Kaplan & Norton 1996)

Insert Figure 2 about here

Financial point of View: Critical success factors depends on profitability in BSC TDABC makes it possible for the company to learn which products and customers company are more profitable.

Profitability is very important for customers. This helps company determine the most suitable customer strategy and practice it at the same time. Companies need to know the cost if they want satisfied customers, but on the other hand they have to ensure the continuation of profitability. Services presented to customers should attract customers' attention. Thus, TDABC provides required data to BSC.

Company lateral Processes Point of View contains the critical process knowledge within the company. ABC provides information both about process cost and productivity which are necessary for improving processes in the company. BSC determines the most important processes with the help of AHP method in order to practice the strategy and the time based ABC which helps these processes work properly. It provides criteria of time and quality for critical activities which make up these processes.

Learning and Modernization Point of View takes the least help from TDFTM. There are not many situations in which costing measures emerge.

The role of TDFTM and Activity Based Budgeting (ABB) in BSC process is shown in picture 4. The first two steps that manage the strategy via BSC determine and define the vision and establish communication and connection between strategic targets and their critical success measures. It both defines the suitable and critical success measures and confirms these measures for the TDFTM process model which is practiced here.

In another process, ABC becomes active for planning the activities. The last process is made up of four leveled dynamic processes that manage the strategy such as learning and strategic feedback where the strategy is managed (Kaplan & Norton, 1996).

BSC must be firstly developed in a detailed way so that it can actively work. In this way, employees can see how their performances contribute to the success of their workplace. Moreover wages of employees should depend on BSC in order to support management's attention on the subject of fulfilling the critical success factors. Secondly BSC must have both pioneering and delayed indicators. Pioneering indicators are those which indicate the competition success such as the improvements in activities or in customer services that are not decided by R&D yet. But the delayed indicators are basic output measures like productivity unit cost and profits. While nonfinancial measures could exist in both types, financial measures tend to be delayed. Management accountants should develop a comprehensive score card like economists who use these two types of indicators, that help management predict future and evaluate past (Blocher, Chen & Lin, 2002).

Analytic Hierarchy Process

The Analytic Hierarchy Process (AHP) which was developed by Thomas L. Saaty in 1970's is a process used for solving complex problems which contain more than one criterion. AHP provides opportunity for decision makers on modeling in a hierarchic structure by showing the relationship between complex problems, main targets of problems, criteria, sub criteria and its alternatives. The most important aspect of AHP is that a decision maker can add his/her objective or subjective thoughts into the decision process. In other words AHP is a method in which knowledge experience, thoughts and presentiments of an individual are combined in a logical way. AHP has a wide range of practice field and is used effectively in any decision problems.

AHP is based on the following four principles (Saaty, 1994)

1. Decomposition: The first principle of AHP decomposition is a process in which a more complex problem is divided into several sub problems in a hierarchic order and which provide understanding and evaluating such complex problems more easily. Namely it means establishing the decision hierarchy. The main target is on top of the decision hierarchy. One lower level is formed by the criteria that affect the quality of decisions. If these criteria have characteristics that affect the main target, then new levels might be added to the hierarchy. At the bottom of the hierarchy, there exist the decision alternatives. Establishing decision hierarchy depends on the number of the levels, the complexity of the problem and detail level (Zahedi, 1986; Millet, 1998)

2. Comparative judgments or dual comparisons: Dual comparison term means comparing two factors/criteria with each other and based on the judgment of decision maker. Dual comparisons are designed for establishing the priority distribution of decision criteria and the alternatives. In other words the employees within the hierarchy are compared dually with each other in order to determine their relative importance according to one level higher employee (Wind & Saaty, 1980). If the determined level of hierarchy contains n employee to compare $n(n-1)/2$ number dual comparisons should be made. These comparisons are designed in the form of matrixes.

In making dual criticisms when a decision maker is asked how important is A criteria when compared to B, he uses 1-5 points choice scale shown in picture 1. The effectiveness of this scale is determined after several technical comparisons with other scales and practices in different fields (Saaty, 1980). It is necessary to arrange face to face questionnaire and to take people's ideas about dual comparisons while using AHM. Even though such persons are not specialists, they should at least have same knowledge.

3. Synthesis: After bilateral comparison matrixes are developed, each person's priority (relatively importance) is examined. This stage of AHM is called 'synthesizing'. Linear arithmetic techniques are used while establishing priority vectors. This stage contains the most essential value, calculation of the essential vector equal to the essential value and normalization of it. There are several methods that are used for this purpose. Yet in the most widely used normalization method the units of every column are divided into the total of that column. The line total of the calculated value is then divided into the number of units (Saaty 1980). In this way priority vector of each criteria is found.

4. Sensitivity Analysis: After building the order of the alternatives it is necessary to review the results of the model. This examination indicates the correction parts on the criticism or hierarchic structure. An important part of this examination is the evaluation of are sensitivity of the order of alternatives and the last decision in critics.

The last stage of AHP is the stage of solving the decision problem. In this stage mixed (composite) priorities vector is built for putting decision alternatives into order which will work for performing the main target of problem. In order to build this vector, average of priority vectors' gravity which are determined for each variation, is taken into consideration (Zahidi, 1986). Gathered priorities can also be named as decision alternative marks and represent the density of the decision-maker's critical perceptions about alternative preferences.

Building the Infrastructure of Balanced Scorecard

The main purpose of this study is improve the studies made in this field, create a reliable basis for decision making and strategic planning through integrating the time based FTM of BSC and AHP. In this study, although not given in details, it is mentioned that a pre-condition knowledge based system ought to be established. A knowledge based system is a computer application that analyzes the data about activities and presents this data to the users in order to ease the decision process. Typically the information structure should contain and present applications that support decisions.

Shortly, structure should be suitable for presenting financial or non-financial critical success measures and comparing financial information and data.

It will be beneficial to eliminate all the activities that do not add any value to the company, and be advantageous for decision-makers for improving the processes within the company via gathering all critical success factors which are financial critical and all work processes to be measured with time based ABC which works through an information based system. On the other hand, through AHP method which runs in an information based system it will be beneficial for decision-makers to have critical success measures and alternative strategies in an order of importance. As a result, a good amount of correct data comes into BSC in this way.

Research Model. The stages that are needed to be performed in order to solve a decision making problem with AHP are given below.

Formulations and related explorations are explained in each stage (Huang, 2007).

Step 1: Decision Problem: Importance of the selected criteria. The definition of decision-making problem contains two stages. In the first stage, the decision spots are determined. In other wards, the question of 'How many results will be taken into consideration in order to evaluate the decision?' is tried to be answered. And in the second stage the factors that effect the decision spots is symbolized with "m" while the number of the factors that effect the decision spots is symbolized with "n".

Especially, determining the number of the factors that will affect the result and definition of each factor in detail are important in respect to do logical and coherent bilateral comparisons.

Step 2: Framework for personnel selection

Step 3: Establishing decision hierarchy: In a hierarchy of decision problem stages, as shown in picture 3, in BSC database, BSC strategies' connections run in a 3-level-hierarchy in order to reach the targets. Targets of the organization are classified into 3 levels according to their importance as the four sides of BSC and the strategies of the organization.

Step 4: Collecting data from selected indicators.

Step 5: Creating the comparison matrix between factors.

The comparative matrix between factors is nxn dimensioned. The matrix components on the diagonal of this matrix take 1 value. The comparative matrix is given below.

$$A = \begin{bmatrix} a_{11} & a_{12} & \dots & a_{1n} \\ a_{21} & a_{22} & \dots & a_{2n} \\ \cdot & & & \cdot \\ \cdot & & & \cdot \\ \cdot & & & \cdot \\ a_{n1} & a_{n2} & \dots & a_{nn} \end{bmatrix}$$

 Insert Figure 3 about here

The components on the diagonal of comparative matrix, that is when $i=j$, they take 1 value. Because, in this case, the related factor is compared with itself. Factors are compared either one by one or with each other according to their importance level. While comparing the factors, the importance scale shown in picture 1 is used. The comparisons are made for the valves which remain above the diagonal point where all comparison matrix valves are 1. The diagonal point is enough for the values below (5.1).

$$a_{ji} = \frac{1}{a_{ij}} \quad (5.1)$$

 Insert Table 1 about here

Step 6: The percentage importance level of the factors are determined.

The comparison matrix shows the importance level of the factors according to one another, in a logical way. However, in order to determine percentage importance distributions of these factors namely their value in the whole picture, which make up the comparison matrix' column vectors are used and the B column vector, which has n prices and n components, is created. This vector is shown below.

$$B_i = \begin{bmatrix} b_{11} \\ b_{21} \\ \cdot \\ \cdot \\ b_{n1} \end{bmatrix}$$

The formula (5.2) is taken into consideration while calculating the B column vectors

$$b_{ij} = \frac{a_{ij}}{\sum_{i=1}^n a_{ij}} \quad (5.2)$$

Likewise, when other parts of the B_i vectors are calculated, the vector can be obtained as shown below; and when the components of the column vector are added the total will be 1.

When the steps, explained above, are repeated in other evaluation factors, B column vectors will be obtained as much as the number of vectors. When B column matrix in n piece is brought together in a matrix format, the C matrix will be built as shown below.

$$C = \begin{bmatrix} c_{11} & c_{12} & \dots & c_{1n} \\ c_{21} & c_{22} & \dots & c_{2n} \\ \cdot & & & \cdot \\ \cdot & & & \cdot \\ \cdot & & & \cdot \\ c_{n1} & c_{n2} & \dots & c_{nn} \end{bmatrix}$$

Through the help of C matrix, the percentage importance distribution of factors according to each other can be calculated. For this, as shown the formula (5.3), arithmetical average of line components that shapes matrix are calculated W column vector which is called *Priority Vector* is obtained.

$$w_i = \frac{\sum_{j=1}^n c_{ij}}{n} \quad (5.3)$$

$$W = \begin{bmatrix} w_1 \\ w_2 \\ \cdot \\ \cdot \\ \cdot \\ w_n \end{bmatrix}$$

Step 7: Consistency in factor comparison is evaluated.

No matter how reliable is Analytic Hierarchy Process's (AHP) system, factuality of the results is based on the reliability of factors' one by one comparison that is made by decision maker. Analytic Hierarchy Process (AHP) suggests a process in order to evaluate the reliability of such comparisons. CR, which is found at the end of this process, gives opportunity to test the reliability of factors' one by one comparison. Calculation of CR is based on the comparison of factor number and a coefficient (I) which is called *Basic Value*. In order to calculate I, firstly D column vector is obtained from the multiplication of W priority vector and matrix.

$$D = \begin{bmatrix} a_{11} & a_{12} & \dots & a_{1n} \\ a_{21} & a_{22} & \dots & a_{2n} \\ \cdot & & & \cdot \\ \cdot & & & \cdot \\ \cdot & & & \cdot \\ a_{n1} & a_{n2} & \dots & a_{nn} \end{bmatrix} \times \begin{bmatrix} w_1 \\ w_2 \\ \cdot \\ \cdot \\ \cdot \\ w_n \end{bmatrix}$$

As defined in the formula (5.4), the basic value (E) is obtained form each part of the evaluating factors D and W column vectors. Arithmetic average of these values (the (5.5) formula gives the basic value (λ) of the comparison.

$$E_i = \frac{d_i}{w_i} \quad (i = 1, 2, \dots, n) \tag{5.4}$$

$$\lambda = \frac{\sum_{i=1}^n E_i}{n} \tag{5.5}$$

After - is calculated the *Coherence Indicator* (CI), can be calculated with the help of the formula (5.6).

$$CI = \frac{\lambda - n}{n - 1} \tag{5.6}$$

Finally CI is divided into the standard correction value which is called Random Indicator (RI) and CR is obtained.

$$CR = \frac{CI}{RI} \tag{5.7}$$

CR value below 0.10 shows that decision-makers' comparisons are coherent. The value over 0.10 shows that either there is a calculation error in AHM or incoherence in the comparisons of decision-maker.

Step 8: For every factor, the percentage importance distributions on M decision spots are calculated. In this step as explained above, percentage importance distributions of the decision spots of each factor is identified. In other wards the one-to-one comparisons and matrix operations are repeated as much as the number of factors (n times). However this time, the dimension of G comparison matrixes that will be used on decision spots for every factor will be mxm. After each comparison, according to the mxl dimension and the decision spots of the factors that were evaluated, the S column vectors, which show percentage distributions, are calculated. These column vectors are defined below:

Step 9: Determining the Result Distribution on Decision Spots

In this stage, firstly the $m \times n$ dimensioned K decision matrix is created which consists n numbered $m \times l$ dimensioned S column vectors. The decision matrix is defined below:

As a result, when decision matrix is multiplied with the W column vector (priority vector) as shown below, L column vector with M pieces is obtained. L column vector gives the percentage distribution of decision spots. In other words, the total of the elements of vector is 1. This distribution, at the same time, shows the order of importance of the decision spots.

Decision Support Processes for the Planning of Organizational Strategies

The strategic management approach provides the company dimension in a changeable and risky environment. However as the strategic management is an approach that enables giving effective decisions under negative conditions, when compared to intuitive ones, they provide innovative and intuitive ways to the management. It is a fact that intuition sometimes can explore special and abstract factors that should be taken into consideration.

Although intuition is enough to make many daily decisions, various researches show that it is not enough while giving vital and complex decisions (Forman & Sally 2001). Companies that use modern decision support methods are leading the work relations in global arena and getting a competitive advantage in managing these relations. One of the modern decision support method whose importance has increased in crescent years, is the Analytic Hierarchy Method.

Practicing the strategy is possible only by directing short and long-term targets of the employees and the activities towards the strategy and by supporting the process; it is also necessary to measure the validity of this system systematically. The success and effectiveness of the strategic management system is evaluated when it creates a unity while forming and practicing the strategies. This is possible only when the time driven ABC is integrated into strategic decision making process.

Balanced Scorecard is a new management system which enables putting the vision and strategies into practice and combines the strategic management. But it is needed to integrate BSC with another important strategic management vehicle in order to practice it appropriately.

Strategic planning is important for performing the strategy. This study suggests an integrated approach for an information based system which uses BSC, TDFTY and AHM. As a result, BSC is developed for the strategic planning or the company management that use operational strategies.

The first step of practicing BSC requires Delphi method of performance evaluation and working as a team while approving management strategy. After this step, the AHP management strategy evaluates the important issues based on the ideas and criteria of the team.

Result and Evaluation

Balanced Scorecard is one of the strategic management vehicles that a company should have in the process of decision making. Today within the competitive and injustice trade atmosphere, in terms of sustainable competition, it is important for companies to have such a vehicle. All senior managers use some financial or non-financial measures while making a decision. However BSC is the most important strategic management vehicle that provides companies take various measures into consideration that are integrated with each other, selective and not limited with short term aims. At this very critical point it is necessary to get help from other strategic management vehicles that are integrated with BSC and support it.

Each process of work should be analyzed carefully and suitable criteria should be developed for critical success factors in the company that have decided to apply BSC. Before putting BSC into practice, a data infrastructure should be created and integrated with other strategic tools

In this context, it is important to integrate AHP and FTM into BSC in a correct and suitable way.

As a result BSC which is developed as a strategic management vehicle is applied by the majority of companies. Yet, before putting BSC into practice quickly, its infrastructure should be structured by other important decision support processes in order to run it correctly.

References

- Baxendale, S. J., & Donovan, D. H. (2001). Building a balanced scorecard for entrepreneurs. *Journal of Cost Management*, 15(6), 33-38.
- Bean, L., & Bill, D. J. (2002). New Cost Priorities: Using a Balanced Scorecard Approach in Financial Reports. *The Journal of Corporate Accounting & Finance*, 13(3), 55-62.

- Blocher, E., Kung, H. C., & Thomas, W. L. (2002). *Cost Management: A Strategic Emphasis*. USA: The McGraw-Hill Companies.
- Bruggeman, W., & Moreels, K. (2003). Time-Driven Activity Based Costing a New Paradigm in Cost Management. *Bimac Newsletter*, May 1-2.
- Ghalayini, A. M., & James, S. N. (1996). The changing basis of performance measurement. *International Journal of Operations and Production Management*, 16(8), 63-80.
- Gremco, O. D. L.V., & Yves, L. G. (2007). Time-driven abc: The simplification of the assessment of costs through resorting to equivalents. *30th Annual Congress of the European Accounting Association*, Lisbon 2007.
- Gunasekaran, A., Mcneil, R., & Singh, D. (2000). Activity Based Management in a Small Company: A Case Study. *Production Planning & Control*, 11(4), 391-399.
- Hixon, M. (1995). Activity based management: Its purpose and benefits. *Management Accounting: Magazine for Chartered Management Accountants*, 73, 30-32
- Horngren, C. T., Srikant, M. D., & George, F. (2003). *Cost Accounting: A Managerial Emphasis* (11st ed.). New Jersey: Prentice Hall International.
- Huang, H. C. (2009). Designing a knowledge-based system for strategic planning: A balanced scorecard perspective. *Expert Systems with Applications*, 36, 219-218.
- Kaplan, R. S., & David, P. N. (1992). The Balanced Scorecard - Measures That Drive Performance. *Harvard Business Review*, Jan-Feb, 71-79.
- Kaplan, R. S., & David, P. N. (1993). Putting the Balanced Scorecard to work. *Harvard Business Review*, Sep-Oct, 134-142.
- Kaplan, R. S., & David, P. N. (1996). Using Balanced Scorecard as a Strategic Management System. *Harvard Business Review*, Jan-Feb, 75-85.
- Kaplan, R. S., & David, P. N. (1999). *Balancing the Corporate Scorecard* (version 2.0). Harvard Business School: Harvard Business School Publishing.
- Kaplan, R. S., & Steven, R. A. (2004). Time-Driven Activity Based Costing. *Harvard Business Review*, Nov, 131-138.
- Kaplan, R. S., & Steven, R. A. (2007). The Innovation of Time-Driven Activity-Based Costing. *Cost Management*, 21(2), 5-15.
- Maccarrone, P. (1999). Using ABM to Redesign Corporate Staff Units. *Business Process Management Journal*, 5(2), 136-163.
- McAdam, R., & Timothy, W. (2003). An Inquiry into Balanced Scorecard within Best Value Implementation in UK Local Government. *Public Administration*, 81(4), 873-892.
- Millet, I. (1998). Ethical Decision Making Using The Analytic Hierarchy Process. *Journal of Business Ethics*, 17(11), 1197-1204.
- Niven, P. R. (2002). *Balanced Scorecard Step by Step*. London: Wiley.
- Otley, D. (1999). Performance management a framework for management control systems research. *Management Accounting Research*, 10(4), 363-382.
- Pineno, C. J. (2002). The balanced scorecard: An incremental approach model to health care management. *Journal of Health Care Finance*, 28(4), 69-80.
- Rickards, R. C. (2003). Setting benchmarks and evaluating balanced scorecards with data envelopment analysis. *Benchmarking: An International Journal*, 10(3), 226-245.
- Ritter, M. (2003). The use of balanced scorecards in the strategic management of corporate communication. *Corporate Communications: An International Journal*, 8(1), 44-59.
- Saaty, T. L. (1980). *The Analytic Hierarchy Process*. USA: McGraw-Hill.
- Saaty, T. L. (1994). Highlights and Critical Points in the Theory and Application of the Analytic Hierarchy Process. *European Journal of Operational Research*, 74(3), 426-447.
- Sanger, M. (1998). Supporting the Balanced Scorecard. *Work Study*, 47(6), 197-200.

Storey, A. (2002). Performance Management in Schools: Could the Balanced Scorecard Help? *School Leadership and Management*, 22(3), 321-338.

Veen-Dirks, P. V., & Martin, W. (2002). Strategic Control: Meshing Critical Success Factors with the Balanced Scorecard. *Long Range Planning*, 35(4), 407-427.

Walker, G., & Randall, M. (2001). Designing and Implementing an HR Scorecard. *Human Resource Management*, 40(4), 365-377.

Wind, Y. (1980). Marketing Applications of the Analytic Hierarchy Process. *Management Science*, 26(7), 641-658.

Zahedi, F. (1986). The Analytical Hierarchy Process-a survey of the method and its applications. *Interfaces*, 16(4), 96-108.

Table 1. Fundamental Scale for dual comparisons

Intensity of importance	Definition	Explanation
1	Equal importance	Two activities contribute equally to the objective
3	Moderately more importance	Experience and judgement slightly favour one activity over another
5	Strongly more importance	Experience and judgement strongly favour one activity over another
7	Very strong more importance or demonstrated importance	An activity is favoured very strongly over another; its dominance demonstrated in practice
9	Extremely more importance	The evidence favouring one activity over another is of the highest possible order of affirmation
2,4,6,8	Intermediate values	When compromise is needed

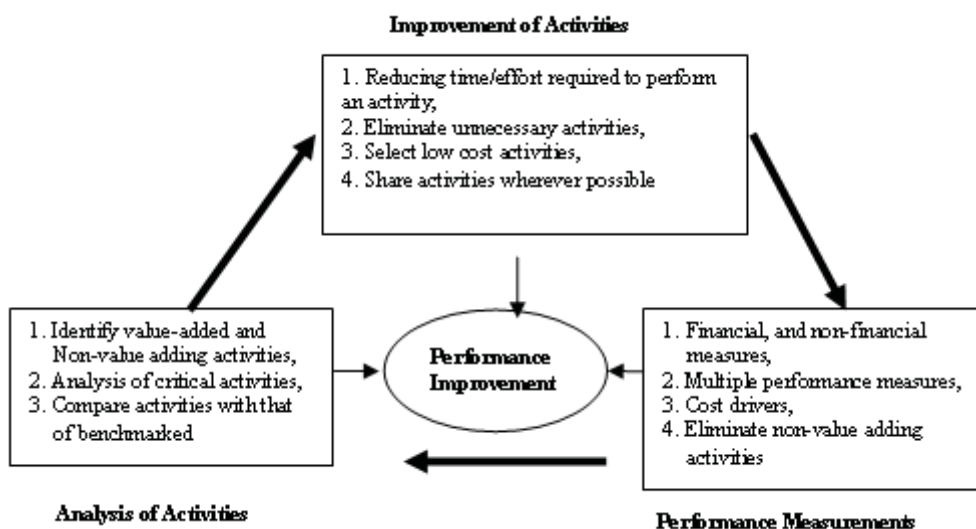


Figure 1. A Conceptual Framework for Activity-Based Management

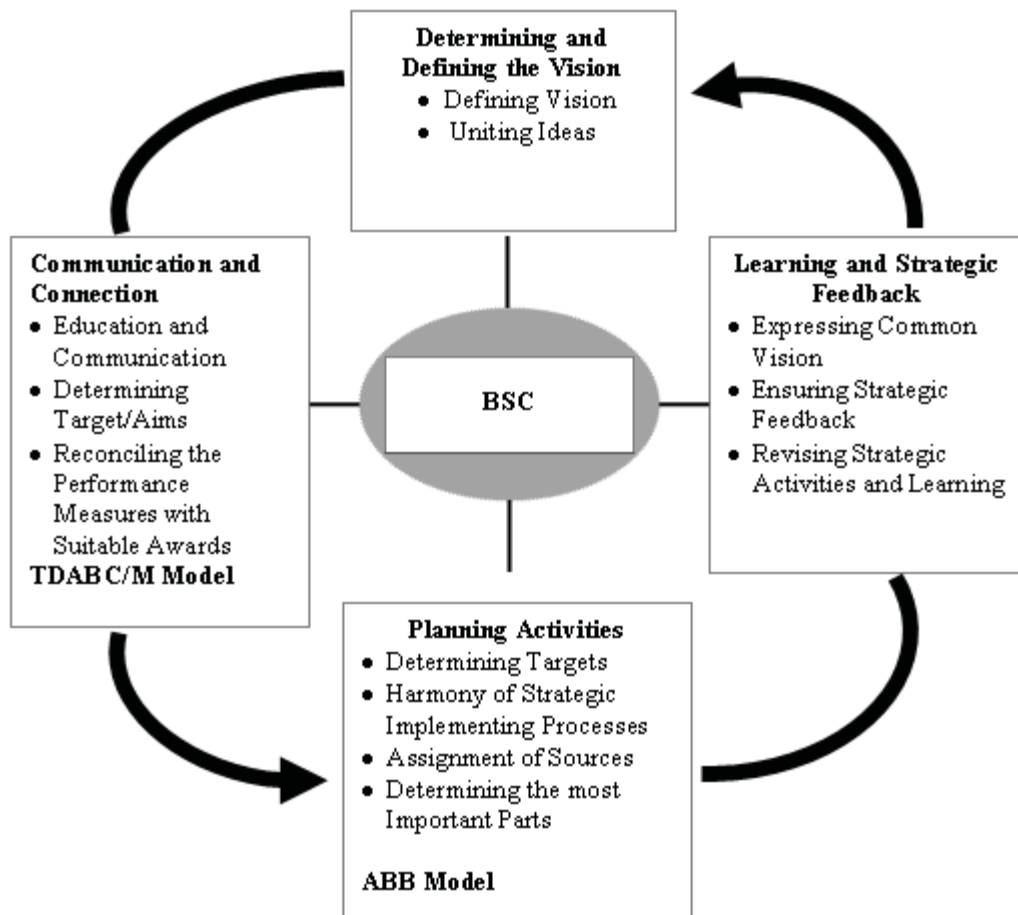


Figure 2. Managing the Strategy through Four Process

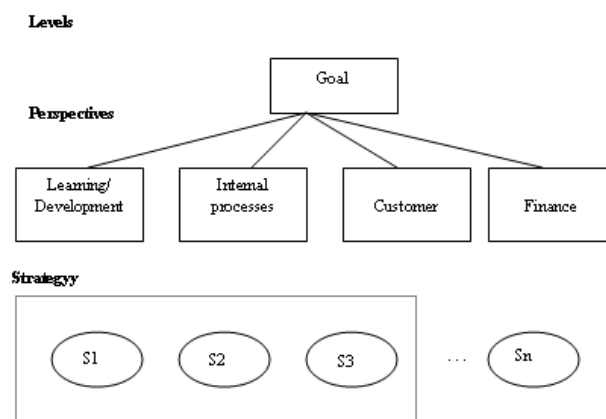


Figure 3. The Basic Structure of hierarchy for the BSC