



## **Evaluating the Implementation of Strategies in Plants Using Balanced Scorecard (BSC): A Case Study**

M. Nikkhah<sup>1,\*</sup>, A. Nikkhah<sup>2</sup>, A. Afsahi<sup>3</sup>

<sup>1</sup>Neka Power Plant, Neka, Iran

<sup>2</sup>School of Nursing and Midwifery, Mazandaran University of Medical Sciences, Sari, Iran

<sup>3</sup>Department of Industrial Management, Islamic Azad University of Semnan, Semnan, Iran

### **ABSTRACT**

The main purpose of the present paper is to investigate the implementation of strategies in Neka Power Plant Management Company using Balanced Scorecard. For this purpose, it is necessary that the aspects of financial, customer, internal process development and learning BSC in electric power generating be identified, major Neka power strategies be prioritized, Neka power plant's performance on four aspects of BSC be evaluated and, by using a six step BSC, implementation of the strategies be evaluated. The Delphi and AHP are used to analyze the organization while prioritizing strategies, initiatives, along with qualitative and quantitative measures of the four perspectives of financial, customer, internal processes and learning are achieved.

**Keywords:** *Strategy, Balanced Scorecard (BSC), Neka Power Plant.*

Received: 16 September 2015   Revised: 10 August 2016   Accepted: 09 September 2016.   Available online: 8 March 2017

## **1. Introduction**

Successful implementation of the strategy requires continuous and comprehensive evaluation and control of operational programs in order to comply with the objectives, assess the organization's overview, and monitor performance. Without evaluating and controlling the performance, implementation of the strategy will fail. In the past, performance evaluating systems were specifically designed for management over financial and tangible properties but with entrance into the era of knowledge and information that evaluating the performance cannot be done relying on financial measures since it was based on data and accounting figures [1].

In order to overcome these problems and barriers to effective implementation of the strategy and to develop a comprehensive framework of management and performance improvement,

---

\*Corresponding author  
E-mail address: nikkhah1354@gmail.com

two outstanding management scientists, Professor Robert Kaplan and Dr. David Norton, in 1992 introduced an innovative system called BSC (Balanced Scorecard) as a comprehensive framework of performance measurement and as an improvement of communication strategy and communication that provides a balance between short-term and long-term goals, financial and non-financial measures, external and internal performance, inner and outer beneficiary orientation and conductor indices function performance, constraints and strategy barrier (Figure 1) [2]. Regarding the balanced scorecard, instead of placing the emphasis on financial control tools that have no impact on guiding the long-term decisions of the employees, uses a measurement as a new language to express the key elements in order to achieve a strategy. Using the measurement in order to achieve the strategy is necessary [3].

However, BSC also includes financial measures but complements them with three distinct perspectives: customer, internal processes and learning and growth. Successful companies set their goals in each of these viewpoints and, in order to evaluate the success of these goals and objectives, select indicators and quantitative targets for each of these parameters for evaluation [4].

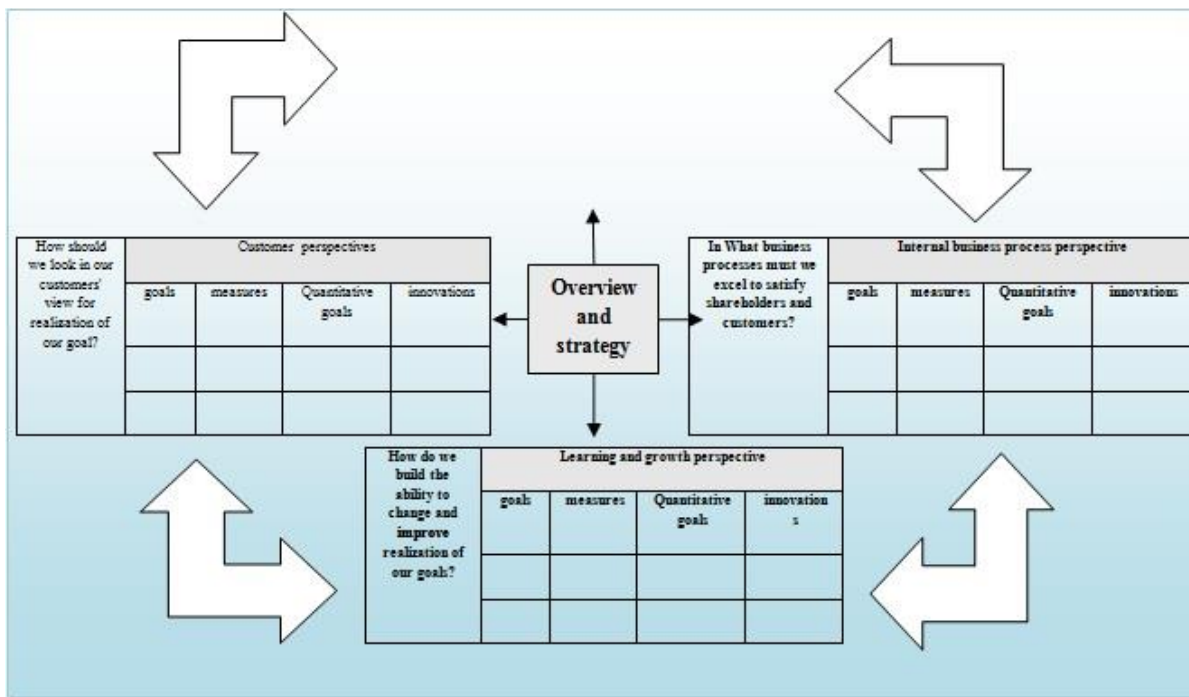


Figure 1. Balanced Scorecard (WLAN-1996)-Kaplan and Norton

**Main purposes:**

- Identifying and investigating the current strategy component using the BSC approach in Neka Power Plant,

**The secondary objectives:**

- Identifying financial aspects, customer, internal processes and BSC learning and growth in power plant
- Prioritizing main strategies of Neka power plant
- Evaluating performance of Neka power plant in four aspects of BSC
- To help understanding and describing of the strategy in the organization with strategic mapping .

**2. Procedures and Methods**

This study is an applied research and the implementation of the BSC is done in six steps and they are as follows:

**First step:** In the first step, foundations and core beliefs of the organization are assessed. Every organization is established to answer and fix some needs. Therefore, what needs to be determined before any action is what needs lead to the formation of the company. SWOT matrix is used to determine the organization's mission. In this matrix, strengths and weaknesses, opportunities, and threats of the organization are identified and evaluated.

**Second step:** In this step, grand business strategy is drawn.

**Third step:** Once the strategy is drawn, it is necessary to divide main strategy into smaller components. These components are called targets. The main objectives are the basic components of the strategy.

**Fourth Step:** In the fourth step, strategic plan of the organization's overall strategy is outlined (these steps are presented in the results of chapter five). Step Four: strategic map is drawn by using information from the previous step and the balanced scorecard framework. Each strategy should be in one part of the four models reflected by BSC.

**Fifth step:** After putting strategies within the BSC, indicators and target values are determined. Measurement's performance indicators are the relative change between two dates or different parts of a figure.

**Sixth Step:** In the last step, plans and programs that are necessary to achieve the desired goals are determined. The following table is an example of a balanced scorecard that steps 5 and 6 are implemented. In the fifth step, indicators and their target values are identified and the final step required designs are identified in order to achieve the goals.

**2.1 Participants**

21 senior managers of strategy document participated in this study as well as the implementation of the EFQM model is chosen.

### 2.1.1 Materials and data collection

In this study, different methods were used to collect data from the questionnaire twice. First, for settling strategies and sub-strategies among 60 strategies, 23 strategies were chosen. Second, a questionnaire was used to adjust the parameters among the obtained parameters. The following questionnaires, financial indicators, customer, internal process and learning and growth were distributed respectively among 4, 5, 16 and 12 experts.

### 2.1.2 Measuring the reliability and validity of data collection

Cronbach's alpha was run with SPSS software so that the results of prioritization of sub-strategies and the indices are greater due to the high reliability coefficient of 0.7.

### 2.1.3 Methods of data analyses

In analysis of data of this study, the following method was used.

- Delphi was used twice. The questionnaire asked the participants to give a score from 1 to 10 in relation to the importance of each indicator. Then, the mean score was calculated for each question that its average is more than 8 is accepted and the rest are omitted.
- AHP method
- The statistical hypothesis test for mean of a population  
In order to ensure normality of the data, Kolmogorov-Smirnov was also used.

### 2.1.4. BSC Implementation Steps

**First step:** identify the main strategies

In 2009, Neka power generation company was established with expert committees and community leadership, staff, partners and resources and processes in the presence of counsel and used SWOT method to extract the company's strategy as provided by managers and employees in all sectors. In this study, the following main strategies of this document were derived: 1. Growth, 2. Financing, 3. Target Cost Management, 4. Maintaining the position of the company in evaluating the power, 5. Customer satisfaction, 6. Timely production and high quality products, 7. Improving the environment, 8. Developing information system, 9. Recruiting skilled and efficient staffs, 10. Improving and developing the suggestions, 11. Developing and upgrading knowledge and skills of staff

**Second step:** Classification of the main strategies in BSC perspectives

The four perspectives of the BSC model, strategies are divided into financial, customer, internal process and learning and growth. According to the literature, similar cases and referrals to experts on the four aspects of each of these strategies have been categorized as follows:

### 2.1.5 Prioritizing the main strategies with the AHP group

At this stage, the group AHP was used for determining priority and scoring strategies. After drawing the hierarchical tree, experts and managers who were involved in the strategy

document were asked to identify the importance of each criterion in each of the perspectives and in the second step, with putting into practice the criteria for each criterion, strategies were compared together. The information obtained has been entered in the coupling matrix. In the next step with the use of the Expert Choice software, consolidated results including the priorities and points of strategy and their disagreed rates were obtained. Every aspect of the measures and strategies is as follows:

**Third step:** Check the secondary objectives using Delphi

After identifying the main strategic priorities, for each of the main strategies sub-strategy were defined. As the strategy was regarded as of low importance, it was necessary to check the goals. Therefore, the Delphi was used.

To implement this approach, a questionnaire was distributed among 20 people from the target population during which the subjects were asked to score each question 1 to 10 based on their importance. After collecting the questionnaires, the mean was calculated and those goals whose scores were above eight were chosen and the rest were omitted. Thus, 23 strategies out of 60 sub-strategies were extracted (Tables 1-4).

**Table 1.** Evaluated BSC from a financial perspective

Strategic financial perspective (for financial success, income growth over financing sources should be attempted.)					
Goals	measures	unit	available	desired	innovations
Maximum use of strategic support for banking facilities	financing				Liquidity of financial institutions and banks
	Cost to income ratio	-			Anticipated funding from power company
Effective utilization of available assets	Profit to sales ratio	-			Regular six-month firms's audit
	Net profit/ total assets	-			Prepare an inventory control program to minimize the stock
	Net profit/ equity				The use of machines and devices in other projects
Observing the principle of economy and management of production overheads	Production - Production Budget (thousands of MWh)	-			Creating an integrated financial system and office automation
	Efficiency of the sales (earnings)				Identifying Systems that do not have proper efficiency
	Efficiency of the equity				Reducing fuel consumption by optimizing the combustion system
	Ratio of inventory to current assets				Creating a full list of defects and reducing duplication constant monitoring of repairs

**Table 2.** Evaluated BSC from a customer's perspective

Customer perspective (to fulfill our overview while improving customer satisfaction, position of the company in power evaluation will be maintained)					
Goals	measures	unit	available	desired	innovations
identify and meet communicative needs with customers	Satisfaction of Communication and Information ( submitting all requested reports , human resources , finance and statistics)				Energy efficiency of internal power
	Level of confidence in rules and regulations and obligations				
	Satisfaction with quality of the delivered energy				Optimizing fuel energy with management policy
	Satisfaction of performing repairs and monitoring them				
Position maintenance in evaluating the power	Satisfaction of the stability of the unit at the time of peak load				Minimizing emergency output
Enhance customer satisfaction	Satisfaction of the emergency output range unit				Maximum prepration at peak hours
	Satisfaction of the principles and regulations concerning safety equipment, equipment maintenance and depreciation				Continuous and complete cooperation and communication with dispatching
	Satisfaction of achieving the maximum predicted annual production				Terms related to the implementation of ISO 9002 Version
	The total number of days of delay in commissioning of Units				To minimize monthly losses through fearful optimization system
	The company's applause				To minimize environmental damage
	The company's applause				Increase of the papers in national and international seminars along with encouragement

**Table 3.** Evaluated BSC from an internal process perspective

Internal business processes perspective (To satisfy shareholders and customers to produce timely and quality management systems, quality, cost and environmental advantages)					
Goals	Measures	Unit	available	desired	innovations
Timely and high quality production for maximum load capacity use	Practical emergency exit rate (PFOR) steam unit	-			Associated with fuel suppliers to increase fuel quality
	Practical emergency exit rate (PFOR) combined cycle	-			
	The amount of fuel (FSC) steam	-			
	The amount of fuel (FSC) combined cycle				Improving technological level of equipment control system and instrumentation
	Trip unit of steam	Number			
	Trip unit of gas	Number			Decrease of the problems through extensive repairs
	Failure producing hours emissions units trip				
	AF readiness index				
Safe Water Supply Plant	Number of hours of water supply in emergency				Optimization of the water supply
					Construction of raw water reservoirs
Moving toward maintenance and a comprehensive repair	The total number of units issued to heater ( current and planned )				Identifying reputable and experienced companies in repair plant
	The total number of units issued for gas ( current and planned )				Updating and completing the repair instructions Old pieces replacement planning project
Increase the storage capacity of fuel and fuel drain	The amount of oil fuel storage				increasing fuel storage tanks with new fuel tanks development
	The amount of oil discharged per day in fuel unloading station				Fuel transfer capacity from Neka and Amir Abad port Activation of using the second fuel
Updating important spare part lists and spares supply	Number of days delayed from component suppliers in a given order				determination of the level of the order and supply components to separate essential items

channels	The number of component suppliers from domestic companies				Follow-up and get permission to purchase the necessary parts
					Identifying local committee activities
	Component supply is provided by certain foreign companies				Identify local construction companies
Reducing the threat of environmental accidents, health, occupational safety management	The rate of NOX's steam units				Implementation of Environmental Management Systems
	The rate of NOX's gas units				
	Intense personal accidents (SR)	Days lost per thousand hours worked in			Identification of risk factors , and incident creation and reduction of them
	Personal Accident (FR)	-			
	Number of accidents / total events and pseudo-accidents	-			

**Fourth step:** Check the parameters using Delphi

In the next step, for each of the sub-strategy, indices were defined. Evaluation criteria for the indicators that are available for each of the sub-strategies should be checked in every aspect. So at this stage, the Delphi was used. And with distribution and collection of questionnaires among experts, the mean was calculated. Wherever the mean was higher than 8, it was selected for treatment. At this point, in terms of financial experts 4 people, customer perspective 5 people, process perspective 16 people, and growth and learning perspective 12 people were chosen that are shown in Tables 1-4.

**Fifth step:** defining quantitative and desired objectives

After checking the indicators before referring to background and current information of the power plant, for each of the indicators, quantitative targets are defined.

**Sixth step:** actions and executive programs

In the final phase of implementation of the strategy, after identifying sub-strategies and quantitative indices, it is the time to define actions and implementation plan for sub-strategy that were suggested to the people at this stage by interviewing them (Tables 1-4).



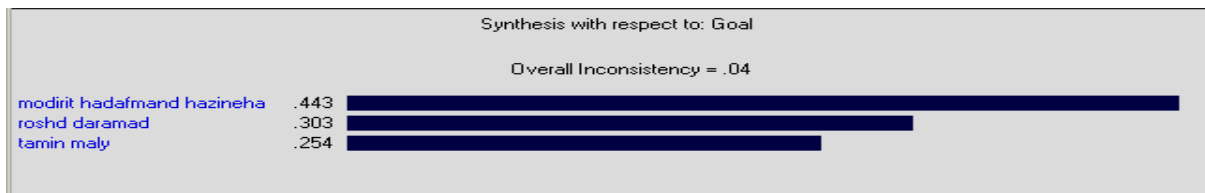
**Table 4.** Evaluated BSC from a learning and growth perspective

Learning and Growth perspective (for the realization of our overview, we must build the ability to change and improve.)					
Goals	measures	unit	available	desired	innovations
Developing and improving recruiting human resources efficient planning	Recruiting human resources				Planning and succession planning strategies
					New recruits from university undergraduates and technician
Objective: To develop human performance management system in order to boost motivation	Capitation welfare costs / Number of employees				Participating in formulation and implementation of the procedure
	health services and health insurance satisfaction				
	The organization's joint meetings with staff				Increasing employee loan
Objective: planning organization's overview and explaining that for the employees	Number of Appreciates of the best employees				Establishing contracts with a number of reputable hospitals and welfare services companies to provide services
					Comprehensive planning information
					Prints and posters of local magazines
Objective: To encourage staff to participate in group work	Rate of satisfaction from equitable distribution of resources				Competition in line with the strategy of the organization
					In line with the stated strategy of the organization's intranet
Objective: To evaluate employee performance and helping them to improve their performance	Rate of satisfaction from appointments and promotion of equal opportunities for the career				Setting up a comprehensive guideline in order to encourage employees and its implementation
					Creating numerous specialized problem-solving committees
Objective: To evaluate employee performance and helping them to improve their performance	Rate of satisfaction from appointments and promotion of equal opportunities for the career				setting a comprehensive guideline for evaluating the performance and efficiency of the parts
					Presenting the trainings in relation to complex technologies of the powerhouse
					Defining the investigating project regarding the efficiency of the courses and trainings and omitting the unnecessary cases

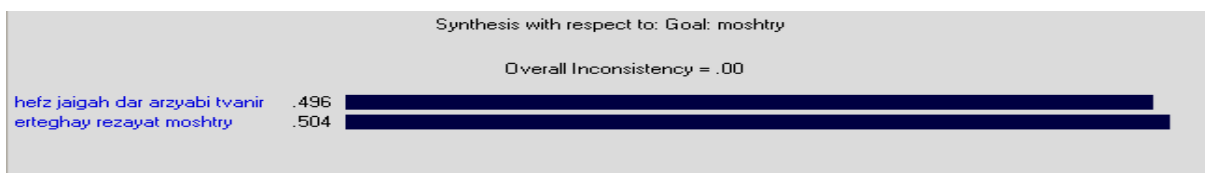
Objective: To evaluate employee performance and helping them to improve their performance	Rate of satisfaction from how the best workers were chosen				Clarifying the contract between the general contractor contracts with companies through tenders
					Coordinating the implementation of the salary
Meritocracy					Establishing criteria for evaluating jobs
					Codifying an instruction for selecting the best worker

### 3. Results and Findings

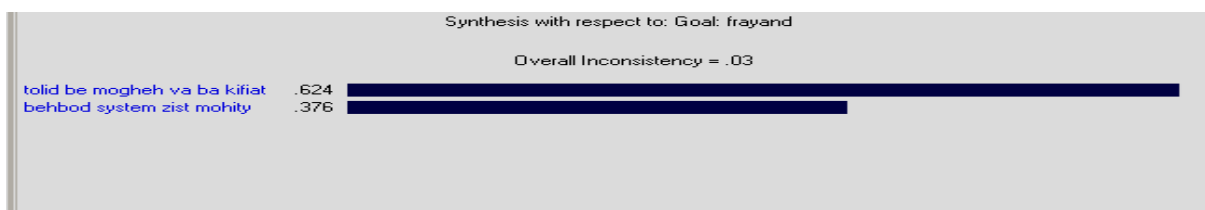
The results are shown in Figures 2-5.



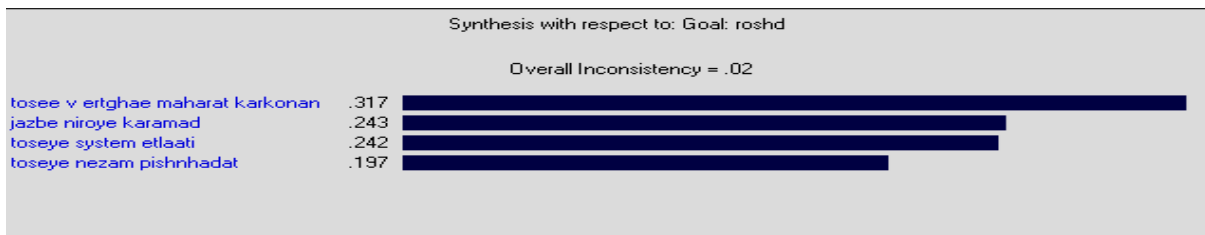
**Figure2.** Results of the final combination of financial perspective strategies



**Figure3.** Results of the final combination of customer's perspective strategies



**Figure4.** Results of the final combination of internal process perspective strategies



**Figure 5.** Results of the final combination of learning and growth perspective strategies

#### 4. Discussion, Conclusions and Recommendations

According to prioritizing strategy, targeted cost management at the financial perspective is suggested so that the financial institutions focus on their own. In doing so, the company can optimize system that do not have adequate efficiency, reinventing with constant monitoring of maintenance and reduced fuel consumption by optimizing the combustion system.

High Average customer perspective and quantitative indicators, as well as high customer satisfaction ratings, indicate the suitability of the company's activities in this regard.

So, the company can maintain them while acting in its position. Indicators that do not receive the adequate points will go to a higher position and strengthen their position.

Given the importance of timely and quality production dominates in terms of the internal processes of enterprises, there is a need to invest more in this area and improve the indicators with low scale. This is possible along with innovations such as upgrading control system tool technology, doing extensive repairs, planned replacement of old plant projects, increased fuel storage and tracking of license is possible to buy the essential components.

The company can implement an environmental management system and identify risk factors for improving injury mechanism of environmental policies in the system.

Two strategies of developing and enhancing the knowledge and skills of the staff and recruiting qualified and efficient experts with higher points has a paramount importance in the development and learning perspective. Given that both of these strategies are related to staffing, it is essential to focus on programs that lead to increased knowledge, skills and satisfaction. These forces are of particular interest, and the indicators of strategies need further efforts.

#### 5. Further future research:

- Using the model plant for other companies
- With regard to the implementation of the EFQM Excellence Model in plant research, further research as employing the same BSC and EFQM as two complementary performance evaluations is suggested.
- Continuing the research to determine the details of the executive program along with strategies and actions proposed by the staff and prioritizing action plans with existing methods of FAHP according to different sectors of engineering, operation and

maintenance of Neka power plant implementation model BSC in each of these sections separately.

## References

- [1] Kaplan, R. and Norton, D. (2008). *Map Strategy of Converting the Intangible Assets into Tangible Outcomes*. Tehran, Iran.
- [2] Kaplan, R. and Norton, D. (2007). *Strategy-Oriented Organization*. Industrial management organization publications, Tehran, Iran.
- [3] Niven, P. (2003). *The Balanced Scorecard Step by Step: For Government and Nonprofit Agencies*. New York, Wiley.
- [4] Momeni, M. (2006). *Innovative Research Discussions in Action*. Tehran Management University, Tehran, Iran.