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Using Multi-Attribute Decision Making For Designing Revised Balanced Scorecard In National Iranian Oil Products Distribution Company

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Abstract: Balanced Scorecard (BSC) is used as a comprehensive method in evaluation of organization's performance. The model emphasizes on organizational strategies and provides a reasonable and perfect relation with all organizational aspects (e.g. financial, customer, internal process, learning and growth), in order to achieve the goals and their evaluations. In this paper, we propose the concepts and procedure of Balanced Scorecard (BSC) evolution in public and private dimensions. Managers want to implemented company's strategy by Balanced Scorecard to archive the vision. But they have not lot of money, time, resource and etc to execute all improved programming that reach performance driver's indicators. Therefore, we want to ranking perspectives and performance drivers to reach vision by Multi-Attribute Decision Making (MADM) methods. The proposed approach is applied to an example problem and is shown to be successful, ultimately providing a new managerial tool for planning and analyzing excellence organization more effectively.

Key words: Balanced Scorecard; Analytic Hierarchy Process; Simple Additive Weighting Method (SAW).

INTRODUCTION

In order to align the organization's business activities with its strategy and vision, monitor the performance against strategic goals and improve external and internal communications, governmental, industrial, business and non- profit organizations world wide, use the balanced scorecard as an strategic planning and management system.

The balanced scorecard is not used as a simple performance measurement framework any longer, but it is utilized as a full strategic planning and management system.

The balanced scorecard suggests that an organization is viewed from learning and growth, business process, customer and financial perspectives and metrics are developed and data are collected and analyzed based on each of these four perspectives. In this paper, we try to add two more perspectives to those mentioned: social and supply chain management perspectives.

This paper has been organized in six sections. In Section 2, we have provided a brief literature review which highlights the deficiencies remedied by the proposed work and summarizes the current state of art.

Section 3 is dedicated to the details of the Balanced scorecard (BSC) model which is used evaluate an organization's performance. Sections 4 deals with the introduction of methods for solving the model. In section 5 we have given a sample problem and discussed the results extensively. And finally, in section 6, the summary of the primary contributions and discussions on the broader implications of the work have been provided. In this section, we have also itemized the potential areas for future work.

Literature Review:

The available literature indicates that BSC, whose history goes back to 1992, has been accepted and used by businesses and profit organizations a performance management tool. The empirical studies by Ittner and Larcker (2003), Evans and Jack (2003) and Davis and Albright (2004) found that there is a direct relationship between BSC proper application and improved financial results.

Although, other studies by Dumond (1994), and Forza and Salvador (2000 & 2001), indicate that the application of BSC can lead to the employee satisfaction and understanding of the business, Nqrreklit (2000), has questioned the principles of BSC in his theoretical analysis.

Having a look at the available literature, one can see that most studies on BSC have focused on the application of this tool by private profit manufacturing and service sectors. However, some researchers such as Andersen and Lawrie (2001) have analyzed the effective application of BSC by public sector and a few researchers have focused on the effectiveness of BSC application in public sector.

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In this paper, we are to propose social responsibility and SCM perspectives to be added to the original BSC model. Multi-Attribute Decision Making (MADM) methods are used for ranking performance drivers to find the derivers of higher priority.

The proposed approach, applied successfully in National Iranian Oil Products Distribution Company, provided a new managerial tool for planning and analyzing an effective excellent organization.

Six perspectives of the BSC:

BSC is a comprehensive and effective method for evaluation of an organization's performance, which stresses on the organizational strategies and creates a reasonable relationship with all financial, customer, internal process and learning and growth aspects of the organization (Kaplan and Norton, 1996), which are briefly discussed below. The relations between BSC's six perspectives are shown in figure 1.

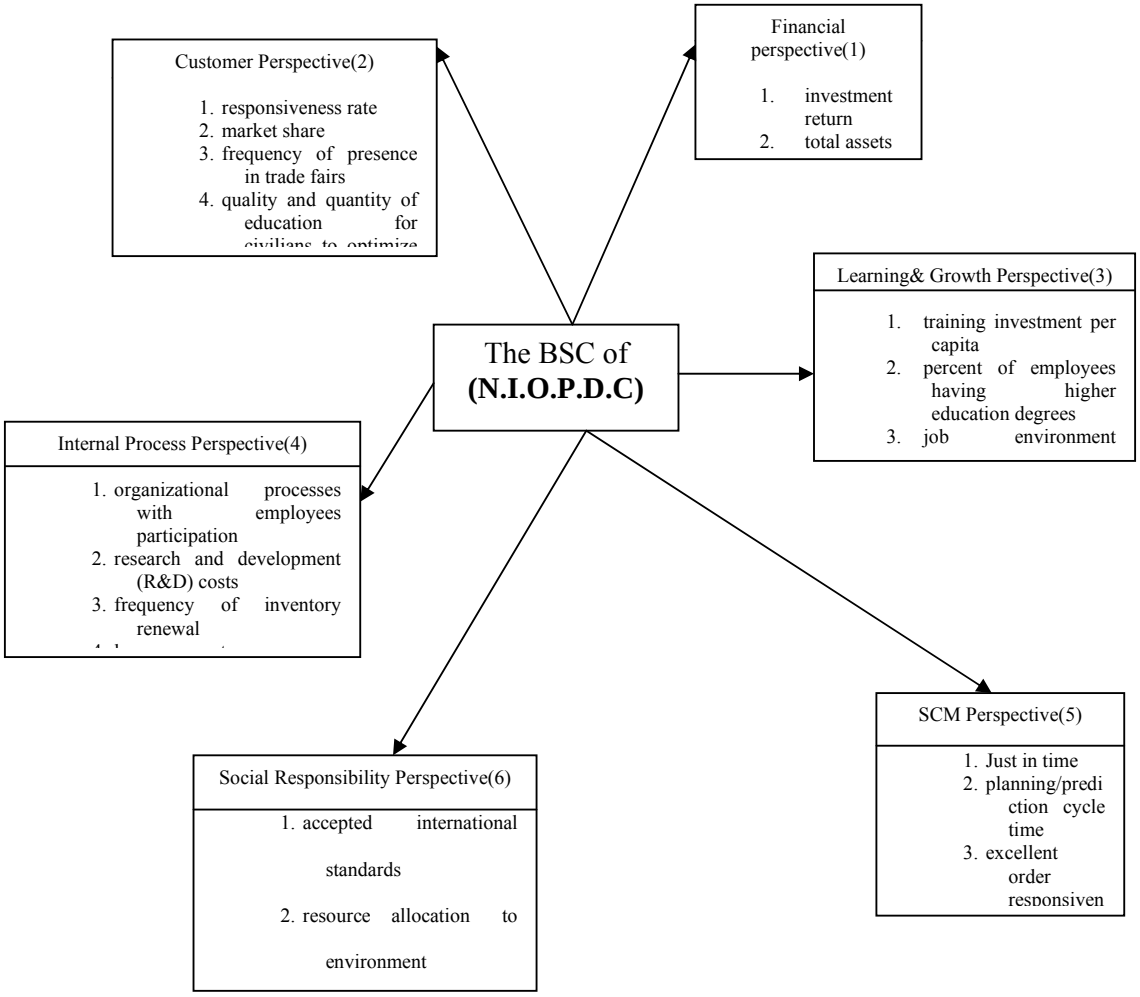

Fig. 1: The BSC Model for N.I.O.P.D.C

Financial Perspective:

As financial measures are very important tools to summarize the measurable economic results of actions taken, BSC tends to retain the financial perspective. In order to see if a firm's strategy and its implementation are contributing to the bottom-line improvement of the company, financial performance measures can be a good indication. What we call "financial objectives", generally related to a firm's profitability which is measured by variables such as economic value added, operating income and return on capital (ROC). Rapid sales growth and cash flow generation can also be added to a firm's financial objectives.

Customer Perspective:

Companies look at satisfying customers' needs as an objective which should be pursued, because customers are considered to be a source of business profit for companies. In customer perspective, the management of a company first determines the company's target customers and the market segments for operational units. Then it monitors the performance of each operational unit in the market segments determined.

Internal Business Process Perspective:

With this perspective in mind, the management of a company improves some of the company's important business processes in order to satisfy the shareholders and the customers. In order to determine the measures and objectives of a company, the value- chain of the company should be analyzed first. To do so, the old operating processes should be adjusted in way that they can best realize the company's objectives on financial and customer side. In the next step, a comprehensive internal business process value chain should be designed which can meet the current and future needs. Innovation , operation and after sales services are the main three business processes involved in a typical firm internal value chain.

Learning and Growth Perspective:

The main objective of learning and growth perspective, is to lay the ground for reaching the objective of the other three perspective, company's improvement via improvement of people, systems and organizational procedures and creating long term growth. Considering the fact that the employee's growth is a firm's intangible asset which contributes to the business growth, the learning and growth perspective focuses on employee performance measurement such as employee satisfaction, continuity, training and skills. In the other three dimension, a gap between the actual and target human, system and procedure capabilities can often be seen which can be decreased by the employee's learning and growth via increasing turnover rate of workers, investment on new technologies , more training expenses and lead time.

Social Responsibility Perspective:

Each organization has beneficiaries and sponsors in external environment. Public service industries including water, electricity, communications, oil, etc have to form proper relations with government authorities and comply with environmental regulations and laws. Moreover all organizations have to attempt to be a good citizen for their society. Those organizations that are due to comply with environmental health and safety regulations have valuable opportunity to exploit balance evaluation system and change their role from subordinate to leader. Long-term success of companies depends on society welfare in one hand and people participation in providing. While social welfare is not just organization’s duty, considering its performance toward society and assuring its participation in providing society with welfare are a great importance, and have many benefits. Reduction of environmental hazards, improving health and safety of employees, leading to improve of utilization and reduction of operational expenditures and finally famous companies increase their reliability between customers and investors who are sensitive to social problems. These relations of increasing human resources, operations, customers and financial processes, show that how effective management of legal performance led to long-term value making.Also social responsibility's performance drivers are emphasized in the mission of N.I.O.P.D.C. Professor Kaplan pointed to this perspective in “strategy map “(2004).

Supply Chain Management (SCM) Perspective:

The question is that how many perspectives you will choose. Choosing a perspective for BSC must be based on what requires explanation and provides the organization with competitive advantage. When you attention into your strategy and try to translate it, which beneficiaries or basic elements are required. While distribution of oil, gas and their derivatives are leaded just by Oil Products Distribution National Company and while the oil is a vital product for the country, and the country’s budget is based on oil income and with respect to the importance of oil expert for the country, and negative effects of stopping oil sale on the society’s economy which may lead to mention in the country, we consider supply chain perspective in this company. In traditional contracts there was a more economic and material relation between organization and environment, the economic institutes such as capital human resources and raw materials changed into goods, services, benefit and income. If the relation was acted well, the organization was assumed as successful. However currently organizations must contract to environment in a new and widespread way and must apply social institutes including qualities, social and human values, work force combination, nature and weather of the environment so that output would not be polluted, discriminated, and chaos but it preserves natural gifts, social qualities, balance and justice in employment, society can not bear indirect expenditures of production in organizations and make itself poor to make them profitable. Since the National Distribution Company is provided for world and domestic markets, some international regulations and rules must be observed and domestic market goods and products must be met international standards. Also the company is obliged to develop the privatization based on

principle 44 of constitution. (in this situation the government must leave the company to non governmental segments) Therefore, social responsibilities and their criteria perspective were determined for the company.

Also professoe Essige in their article pointed to add SCM perspective.(2006)

The Solution Procedure

Analytic Hierarchy Process Methodology:

Analytic hierarchy process (AHP), which is a technique of multi-criteria decision making (MCDM), was developed by Saaty in 1980 year. AHP is used to solve complex decision-making problems in different areas, such as maintenance selection problem (Bertolini and Bevilacqua, 2006), selection of location (Wu et al., 2007), measuring performance (Frei and Harker, 1999), allocating resources (Ramanathan and Ganesh, 1995), choosing the best policy after finding a set of alternatives (Poh and Ang, 1999, Zeng et al, 2007), setting priorities (Lee et al. 1999). As a decision method that decomposes a complex multi-criteria decision problem into a hierarchy (Saaty, 1980), AHP is also a measurement theory that prioritizes the hierarchy and consistency of judgmental data provided by a group of decision makers. AHP incorporates the evaluations of all decision makers into a final decision, without having to elicit their utility functions on subjective and objective criteria, by pair-wise comparisons of the alternatives. To develop the required model using AHP, the following three steps were taken:

(a) Defining a site-specific hierarchic structure;
(b) Calculating weights; and
(c) Computing inconsistency ratios

Tarantino (2003) applied AHP to determine the performance of management indicators using the Balanced Scoreboard. AHP has thus been successfully applied to a diverse array of problems, with the calculation procedure as follows:

First, it must establish the pair-wise comparison matrix A To let C1, C2,⋯,Cn denote the set of elements, while aij represents a quantified judgment on a pair of elements Ci, Cj. This yields an n-by-n matrix A as follows:

$$A=[a_{ij}]=\begin{array}{c} \\ C_1 \\ C_2 \\ \vdots \\ C_n \end{array}\begin{array}{c} \begin{array}{cccc} C_1 & C_2 & \cdots & C_n \end{array} \\ \begin{bmatrix} 1 & a_{12} & \cdots & a_{1n} \\ \frac{1}{a_{12}} & 1 & \cdots & a_{2n} \\ \vdots & \vdots & \vdots & \vdots \\ \frac{1}{a_{1n}} & \frac{1}{a_{2n}} & \cdots & 1 \end{bmatrix} \end{array} \quad (1)$$

Where aij =1 and aij $=1/a_{ij}$, i, j =1,2…,n. In matrix A, the problem becomes one of assigning to the n elements C1, C2…Cn a set of numerical weights W1, W2,⋯, Wn that reflects the recorded judgments. If A is a consistency matrix, the relations between weights Wi and judgments aij are simply given by $W_j/W_i = a_{ij}$ (for i, j = 1, 2, 3… n). Saaty (Saaty, 1990) suggested that the largest value λmax would be

$$\lambda_{max}=\sum_{j=1}^{n} a_{ij}\frac{W_j}{W_i} \quad (2)$$

If A is a consistency matrix, eigenvector X can be calculated by $(A-\lambda_{max}I)X=0$ (3)

Saaty (Saaty, 1990) proposed utilizing the consistency index (C.I.) and consistency ratio (C.R.) to verify the consistency of the comparison matrix. C.I. and R.I. are defined as follows:

$$C.I.=\frac{\lambda_{max}-n}{n-1} \quad (4)$$

$$R.I.=\frac{C.I.}{R.I.} \quad (5)$$

Where R.I. represents the average consistency index over numerous random entries of same order reciprocal matrices. If the C.R<0.1, the estimate is accepted; otherwise, a new comparison matrix is solicited until C.R <0.1.

In this case the quastionaire are designed based on AHP method and are contributed between 25 managers of N.I.O.P.D.C.

4.2. The Sensitive Analysis

Simple Additive Weighting (SAW) is the most popular method of classical MADM. In this method alternatives are measured by some attributes. Then, each alternative is assigned a score which is the weighted sum of these attributes. In this section we propose the Simple Additive Weighting Method (SAW) for the sensitive analysis our solutions. The SAW solution method consists of the following steps:

Step 1. Normalize the decision matrix:

$$n_{ij} = \left\{ \frac{r_{ij}}{r_j^{\max}} \middle| j \in \Omega_b \right\} \quad , \quad \text{i=1,2,…,m}$$

$$n_{ij} = \left\{ \frac{r_j^{\min}}{r_{ij}} \middle| j \in \Omega_c \right\} \quad , \quad \text{i=1,2,…,m} \tag{6}$$

Where Ω_b is the set of benefit criteria and Ω_c is the set of cost criteria. Then, the columns of the normalized decision matrix by the associated weights are multiplied. The normalized weighted decision matrix results as follows:

$$v_{ij} = w_j * n_{ij}, \text{ i=1,2,…,m, j=1,2,…,n} \tag{7}$$

where w_j represents the weight of j th criterion.

Step 2. Calculating the score of i th alternative: the score of each alternative is calculated as follows:

$$s_i = \sum_{j=1}^{n} v_{ij} , \text{ i=1,2,…,m} \tag{8}$$

where s_i represents the score of i th alternative.

Step 3. Ranking the alternatives: Alternatives must be ranked as the highest score is the best alternative (Aryanezhad, etl, 2009).

5. A Case study: National Iranian Oil Products Distribution Company

In this example the performance drivers for six perspectives in oil product Distribution Company was recognized. For each perspective we determine performance driver based on organizational missions, strategic planning, analyzing internal and external factors and interview with elites. The prepared AHP questionnaire to prioritize the performance driver and perspectives, and distributed it among organizations elites. After analyzing them, we used Expert Choice (EC) software to prioritize them. Then we compare with other MADM methods such as SAW, Copeland method, Borda method, and Ranking Average method.

In these stages perspectives and their performance driver were compared them in airs achieved perspectives in the Oil Products Distribution National Company are as follows:

- Financial perspective: debt, cash flow, investment return, total assets, and total expenditures.
- Customer perspective: market share, sale volume, and frequency of presence in trade fairs, responsiveness rate, quality and quantity of education for civilians to optimize fuel consumption.
- Internal process perspective: research and development (R&D) costs, frequency of inventory renewal, losses percent. The number of positive subjects about the organization presented in media, organizational processes with employees participation learning and learning and Growth perspective: training investment per capita, percent of employees having higher education degrees, job environment quality, employees productivity, absence rate, motivation.
- Supply chain perspective: excellent order responsiveness, planning/prediction cycle time, total cost of good delivery in time delivery, order cycle time, data access.
- Social responsibility prospect: accepted international standards, resource allocation to environment, andorganizational participation in solving social problems, private section development.

Following results are achieved based on the questionnaire distributed among elites and through analyzing it, (Table 1).

Table 1: The value of BSC perspectives (Inconsistency Rate: 0.03)

BSC Perspective	w_i	Priority	Financial	Customer	Internal	Learning and Growth	SCM	Social Responsibility
Financial	0.245	1	-	1.1	2.1	1.4	2.1	3.6
Customer	0.238	2	0.9	-	3	1	1.8	3.9
Learning and Growth	0.225	3	0.47	0.33	-	1	1	2
Internal	0.124	4	0.714	1	1	-	3.7	3.9
SCM	0.114	5	0.47	0.55	1	0.27	-	2.9
Social Responsibility	0.05	6	0.27	0.25	0.5	0.25	0.34	-

In financial perspective definition 5 indicators for each other and therefore on base of AHP priority each indicator is show in Table 2.

1. investment return
2. total assets
3. cash flow
4. total expenditures
5. debt

Table 2: Financial performance driver (Inconsistency Rate: 0.04)

Performance driver of financial perspective	w_i	Priority	Financial performance Driver	total assets	investment return	cash flow	total expenditures	debt
investment return	0.363	1	total assets	-	1.1	1	1.5	2.8
total assets	0.24	2	investment return	0.9	-	2.8	4.1	3.4
cash flow	0.214	3	cash flow	1	0.35	-	2.7	3.1
total expenditures	0.108	4	total expenditures	0.66	0.24	0.37	-	1.6
Debt	0.078	5	debt	0.35	0.29	0.32	0.625	-

In customer perspective definition 5 indicators for each other and therefore on base of AHP priority each indicator is show in Table 3.

1. responsiveness rate
2. market share
3. frequency of presence in trade fairs
4. quality and quantity of education for civilians to optimize fuel consumption
5. sale volume

Table 3: Customer performance driver (Inconsistency Rate: 0.08)

Performance driver of customer perspective	w_i	Priority	Customer performance Driver	market share	responsiveness rate	quality and quantity of education for civilians to optimize fuel consumption	frequency of presence in trade fairs	sale volume
responsiveness rate	0.332	1	market share	-	1.1	1	1.5	2.8
market share	0.285	2	responsiveness rate	0.9	-	2.8	4.1	3.4
frequency of presence in trade fairs	0.154	3	quality and quantity of education for civilians to optimize fuel consumption	1	0.35	-	2.7	3.1
quality and	0.151	4	frequency of	0.66	0.24	0.37	-	1.6

quantity of education for civilians to optimize fuel consumption			presence in trade fairs					
sale volume	0.078	5	sale volume	0.35	0.29	0.32	0.625	-

In internal process perspective definition 5 indicators for each other and therefore on base of AHP priority each indicator is show in Table 4.

1. organizational processes with employees participation
2. research and development (R&D) costs
3. frequency of inventory renewal
4. losses percent
5. The number of positive subjects about the organization presented in media

Table 4: Internal process performance driver (Inconsistency Rate: 0.08)

Performance driver of internal perspective	w_i	Priority	Internal performance driver	organizational processes with employees participation	research and development (R&D) costs Improve	frequency of inventory renewal	losses percent	The number of positive subjects about the organization presented in media
organizational processes with employees participation	0.34	1	organizational processes with employees participation	-	1.8	1.6	2.5	5.5
research and development (R&D) costs Improve	0.321	2	research and development (R&D) costs Improve	0.55	-	3.6	3.8	2.8
frequency of inventory renewal	0.172	3	frequency of inventory renewal	0.625	0.27	-	2.3	3.2
losses percent	0.11	4	losses percent	0.4	0.263	0.43	-	3
The number of positive subjects about the organization presented in media	0.061	5	The number of positive subjects about the organization presented in media	0.18	0.35	0.31	0.33	-

In learning &growth perspective definition 6 indicators for each other and therefore on base of AHP priority each indicator is show in Table 5.

1. training investment per capita
2. percent of employees having higher education degrees
3. job environment quality
4. employees productivity
5. absence rate
6. motivation

Table 5: Learning&growth performance driver (Inconsistency Rate: 0.04)

Performance driver of internal perspective	w_i	Priority	Learning and growth performance driver	training investment per capita	percent of employees having higher education degrees	job environment quality	absence rate	employees productivity
training investment per capita	0.34	1	training investment per capita	-	1.8	1.6	2.5	5.5
percent of employees	0.321	2	percent of employees	0.55	-	3.6	3.8	2.8

having higher education degrees			having higher education degrees					
job environment quality	0.172	3	job environment quality	0.625	0.27	-	2.3	3.2
employees productivity	0.11	4	absence rate	0.4	0.263	0.43	-	3
absence rate	0.061	5	employees productivity	0.18	0.35	0.31	0.33	-

In SCM perspective definition 6 indicators for each other and therefore on base of AHP priority each indicator is show in Table 6.

1. Just in time
2. planning/prediction cycle time
3. excellent order responsiveness
4. order cycle time
5. cost of delivery
6. data access total

Table 6: SCM performance driver (Inconsistency Rate: 0.04)

Performance driver of internal perspective	w_i	Priority		training investment per capita	percent of employees having higher education degrees	job environment quality	absence rate	employees productivity
training investment per capita	0.34	1	training investment per capita	-	1.8	1.6	2.5	5.5
percent of employees having higher education degrees	0.321	2	percent of employees having higher education degrees	0.55	-	3.6	3.8	2.8
job environment quality	0.172	3	job environment quality	0.625	0.27	-	2.3	3.2
employees productivity	0.11	4	absence rate	0.4	0.263	0.43	-	3
absence rate	0.061	5	employees productivity	0.18	0.35	0.31	0.33	-

In social responsibility perspective definition 4 indicators for each other and therefore on base of AHP priority each indicator is show in Table 7.

1. accepted international standards
2. resource allocation to environment
3. organizational participation in solving social problems
4. private section development

Table 7: Social responsibility performance driver (Inconsistency Rate: 0.03)

Performance driver of internal perspective	w_i	Priority		accepted international standards	resource allocation to environment	organizational participation in solving social problems	private section development
accepted international standards	0.522	1	accepted international standards	-	3.3	3.3	3.9
resource allocation to environment	0.23	2	resource allocation to environment	0.3	-	1.8	3.1
organizational participation in solving social problems	0.161	3	organizational participation in solving social problems	0.3	0.55	-	2.5

private section development	0.087	4	private section development	0.25	0.32	0.4	-

Then, the priority of BSC perspective in NIOPDC is:

1. Financial
2. Customer
3. learning & growth
4. Internal process
5. SCM
6. Social Responsibility

After ranking with AHP we rank with SAW:

$$W_F = (0.0889 + 0.0588 + 0.0264 + 0.0196) = 0.246 \quad (9)$$

$$W_C = 0.238, W_I = 0.125, W_G = 0.227, W_{SCM} = 0.114, W_{SR} = 0.05 \quad (10)$$

$$A_1 > A_2 > A_4 > A_3 > A_5 > A_6 \quad (11)$$

Suppose that we change the weight of financial perspective from 0.245 to 0.3 ($\Delta_1 = 0.055$) Therefore:

$$w_1^{'} = w_1 + \Delta_1 = 0.3 \quad (12)$$

$$w_j^{'} = \frac{1-(w_1+\Delta_1)}{1-w_1} * w_j \quad (13)$$

$$w_j^{'} = \frac{0.7}{0.755} w_j \quad (14)$$

$$w_1 = 0.3,\ w_2 = 0.221, w_3 = 0.21, w_4 = 0.115, w_5 = 0.107, w_6 = 0.0477 \quad (15)$$

$$E_{A1}^{'} = 0.245 * 0.3 = 0.0735, E_{A2}^{'} = 0.052598,$$
$$E_{A3}^{'} = 0.04725, E_{A4}^{'} = 0.01426, E_{A5}^{'} = 0.012198, E'_{A6} = 0.00235 \quad (16)$$

$$A_1 > A_2 > A_3 > A_4 > A_5 > A_6 \quad (17)$$

If we change a weight of fourth indicator an increase to $\Delta_4 = 0.185$, therefore:

$$\Delta_4 = 0.185$$
$$w_4^{'} = w_4 + \Delta_4 = 0.3 \quad (18)$$

$$w_1^{'} = 0.227, w_2^{'} = 0.221, w_3^{'} = 0.209, w_4^{'} = 0.3, w_5^{'} = 0.105678, w_6^{'} = 0.04635 \quad (19)$$

$$E_{A1}^{'} = 0.0558, E_{A2}^{'} = 0.052598, E_{A3}^{'} = 0.026125, E_{A4}^{'} = 0.0372, E_{A5}^{'} = 0.0038532, E_{A6}^{'} = 0.00231 \quad (20)$$

$$A_1 > A_2 > A_4 > A_3 > A_5 > A_6 \quad (21)$$

If in one real problem had used with different MADM methods. These methods do not show the single ranking we want to know that which one is correct. This situation can be predicted. DM did not strict themselves for one method in important problem. It is possibility that they found a various and different result. For prevail this situation we must do "Aggregate Method" that include three methods:

1. Ranking Average Method
2. Borda Method
3. Copeland Method

$$A_1 > A_2 > A_4 = A_3 > A_5 > A_6 \quad (22)$$

In the Borda Method all forms are 15:

$$\frac{m(m-1)}{2}=\frac{6(6-1)}{2}=15 \tag{23}$$

According to Borda Method ranking of Items are:

$$A_1 > A_2 > A_3 > A_4 > A_5 > A_6 \tag{24}$$

In Copeland method we calculate both of wins and looses for each item.

$\sum R$ = number of looses for each items

$\sum C$ = number of wins for each items

Scoring that Copeland method calculates subtraction looses from wins.

Scoring of A_1 item: 5-0=5

Scoring of A_2 item: 4-1=3

Scoring of A_3 item: 3-2=1

Scoring of A_4 item: 2-3=-1

Scoring of A_5 item: 1-4=-3

Scoring of A_6 item: 0-5=-5

Next, we attempt that these three ranking strategy (Average Ranking, Borda and Copeland) to form partially Order set (POST) to get convoking. According this aggregate by priority linear we archive the convoking (Please see Figure 2, and Table 8 & 9). This priority is that:

Table 8: Compare of Methods

	AHP	SAW	SAW Analisys-1	SAW Analisys-2	Average Ranking
A_1	1	1	1	1	1
A_2	2	2	2	2	2
A_3	3	4	3	4	3.5
A_4	4	3	4	3	3.5
A_5	5	5	5	5	5
A_6	6	6	6	6	6

Table 9: Results of ranking

	A_1	A_2	A_3	A_4	A_5	A_6	Sum Wins
A_1		M	M	M	M	M	5
A_2	X		M	M	M	M	4
A_3	X	X		M	M	M	3
A_4	X	X	X		M	M	2
A_5	X	X	X	X		M	1
A_6	X	X	X	X	X		0
Sum Looses	0	1	2	3	4	5	

$K=(o_1, o_2, o_3)$

$$o_1 : A_1 > A_2 > A_3 > A_4 > A_5 > A_6 \tag{25}$$

$$o_2 : A_1 > A_2 > A_4 = A_3 > A_5 > A_6 \Rightarrow A_1 > A_2 > A_4 > A_3 > A_5 > A_6 \tag{26}$$

or

$$A_1 > A_2 > A_3 > A_4 > A_5 > A_6$$

$$o_3 : A_1 > A_2 > A_4 > A_3 > A_5 > A_6 \tag{27}$$

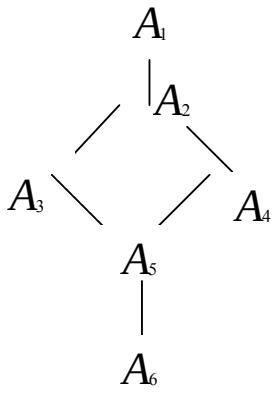

Fig. 2: Results of Ranking of BSC Perspectives

A_6 : Always For Each Items Is More Less Important.

A_5 : Always For Each Up Item Of Itself Is Less Important.

A_3 : And A_4 Can Not Compare That Because In o_1 Is $A_3 \succ A_4$ And In o_3 Is $A_3 \prec A_4$.

A_2 : Is Less Important From A_1

A_1 : Is More Important From All Items

Conclusion:

Balanced Scorecard (BSC) is used as a comprehensive method in evaluation of organization's performance. The model emphasizes on organizational strategies and provides a reasonable and perfect relation with all organizational aspects (e.g. financial, customer, internal process, learning and growth). Oil is a very important thing in Iran and if disorder to contribute of it has made a lot of problems for people and there are strict rules about standards environment and social's principles. Therefore we added two perspectives (SCM and Social Responsibility) for N.I.O.P.D.C .Non of organization had a time, budget, human resource and a lot of constraint to get it. Therefore, we must rank this performance drivers and perspectives that help N.I.O.P.D.C to allocate this resource to get the vision. Then, we sent questionnaire to all mangers to rank perspectives and performance drivers by MADM method (AHP, SAW, Copeland, Borda) and built Road Map. Finally we know the critical performance drivers and perspective and have a Road Map to allocate resource to them. The proposed approach is applied to an example problem and is shown to be successful, ultimately providing a new managerial tool for planning and analyzing excellence organization more effectively.

REFERENCES

Andersen, H. & G. Lawrie, 2001. Balanced scorecard implementation in SMEs: reflection on literature and practice. Proceedings of SME, Aalborg University, Aalborg.

Mir, Ariyanezhad, b., A. Ahi, B. Ashtiani, A. Makui, 2009." A novel approach to determine cell formation, intracellular machine layout and cell layout in the CMS problem based on TOPSIS method " Computers & Operations Research, 36: 1478-1496.

Beamon, B.M., 1999. "Measuring Supply Chain Performance", International Journal of Operation and Production management., 10(3): 275-292.

Bertolini, M. and M. Bevilacqua, 2006. "A combined goal programming-AHP approach to maintenance selection problem," Reliability Engineering and System Safety, 91: 839-848.

Brewer, P.C., T.W. Speh, 2000. "Using the Balanced Scorecard to measure supply chain performance" journal of business logistics, 21(1): 75-93.

David Tarantino, P., 2003. Using the Balanced Scorecard as a performance management tool, Physician Executive, 29(5): 69-72.

Davis, S., & T. Albright, 2004. An Investigation of the Effect of Balanced Scorecard Implementation on Financial Performance. Management Accounting Research, 15(2).

Dumond, E.J., 1994. Making Best Use of Performance-Measures and Information. International Journal of Operations & Production Management, 14(9): 16-31.

Eßig, M., V. Batran, 2006. "Developments of long-term relationship in public procurement in Germany" Journal of Purchasing and Supply Management (accepted, Journal of purchasing and supply management).

Essige, Michael;Dorobek,Sandra(,2006.)"Adapting the Balanced Scorecard to Public Supply Chain Management". Working Paper for the 15 th Annual IPSERA Conference 2006, San Diego, CA

Evans, J., & E., Jack, 2003. Validating Key Results Linkages in the Baldrige Performance Excellence Model. Quality Management Journal, 10(2): 7-24.

Forza, C., & F., Salvador, 2000. Assessing some distinctive dimensions of performance feedback information in high performing plants. International Journal of Operations & Production Management, 20(3): 359-385.

Forza, C., & F. Salvador, 2001. Information flows for high-performance manufacturing. International Journal of Production Economics, 70(1): 21-36.

Frei, F.X. and P.T., Harker, 1999. "Measuring aggregate process performance using AHP," European Journal of Operational Research, 116: 436-442.

Gunasekaran, A., C. Patel and E., Tirtiroglu, 2001. "Performance Measures and Metrics in a Supply Chain Environment", International Journal of Operation & Production Management., 21(1): 71-78.

Handfield, R. & S. Ghosh, 1995. An empirical test of the linkages between the Baldrige criteria and financial performance. In Proceedings of the Decision Sciences Institute, Atlanta: Georgia State University.

Ittner, C., D. Larcker and M.W. Meyer, 2003." Subjectivity and the weighting of performance measures: Evidence from a balanced scorecard". The Accounting Review, 78: 725-758.

Kaplan, R. & D. Norton, 1996. Using the balanced scorecard as a strategic management system. In Harvard Business Review: On Measuring Corporate Performance. Boston, MA: Harvard Business School Press, pp: 183-211.

Lapide, L., 2000. "What about Measuring Supply Chain Performance?", Achieving Supply Chain Excellence through Technology (2),

Lee, H.L. and C., Billington, 1992. "Managing Supply Chain Inventory: Pitfall and Opportunities", Sloan Management Review, (33): 65-73.

Lee, M., v Pham and X. Zhang, 1999. "A methodology for priority setting with application to software development process," European Journal of Operational Research, 118: 375-389.

Nqrreklit, H., 2000. The balance on the balanced scorecard: A critical analysis of some of its assumptions. Management Accounting Research, 11: 65-88.

Poh, K.L. and B.W. Ang, 1999. "Transportation fuels and policy for Singapore: an AHP planning approach," Computers and Industrial Engineering, 37: 507-525.

Ramanathan R. and L.S. Ganesh, 1995. "Using AHP for resource allocation problems," European Journal of Operational Research, 80: 410-417.

Saaty, T.L., 2000. Fundamentals of decision making and priority theory analytic hierarchy process, Pittsburgh: RWS Publications, pp: 1-478.

Saaty, T.L., 1980." The Analytic, Hierarchy Process". New York, NY: McGraw-Hill.

Saaty, T.L., 1990. "How to make a decision.: The analytic hierarchy process" European Journal Operation Research, 48: 9-26

Wu, C.R., C.T. Lin and H.C. Chen, 2007. "Building and Environment," 42: 1431-1444.

Zeng, G., R. Jiang, G. Huang, M. Xu and J. Li, 2007. "Optimization of wastewater treatment alternative selection by hierarch grey relational analysis," Journal of Environmental Management, 82: 250-259.