

# Performance Evaluation of Supply Chain by Using Balanced Scorecard and Fuzzy TOPSIS Technique (Case Study: Pars Renault Company)

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## ABSTRACT

Now-a-days in the age of information, companies need to measure all their financial and nonfinancial aspects. To this end, various frameworks and models for measuring performance have been developed, one of which is balanced scorecard. The main issue in this study is to provide a method for designing a system of evaluating supply chain performance with balanced scorecard approach and also using fuzzy TOPSIS technique for linking the performance measures to strategy and main factors of supply chain success and evaluating supply chain performance based on organizational strategy. According to this method, after identifying and clarifying the mission and vision of the company, company objectives were defined in each of the four recommended perspectives of finance, customer, internal processes, and growth and learning and then success criteria, indicators and suitable measures for each objective were determined. It is noteworthy that to this end, fuzzy TOPSIS decision-making method was used for prioritizing objectives and indicators. Eventually, the presented method was experimentally implemented at a company which was part of Pars Renault Co supply chain and the results were studied. The results show that fuzzy multi-attribute decision-making methods, such as fuzzy TOPSIS, can be successfully used by a structured methodology in designing balanced scorecard as a system of measurement and management of performance based on strategy in order to evaluate the supply chain performance. In regard to objective, the current research is applied and in respect to research methodology, it is of descriptive type. In this study library and field methods were employed for collecting data and seeking experts' opinions.

**Keywords:** Performance Appraisal, Supply Chain, Balanced Scorecard, Organizational Strategy, Fuzzy TOPSIS

## 1. INTRODUCTION

Performance measurement is one of the best ways of acquiring information for decision making in organizations. Between 1850 through 1975, the only way in which organizations could accredit their situation was making decision based on their financial measures but by increasing competition in the markets, managers need to be aware of other organizational performance aspects in addition to financial measures. Balanced scorecard model is one of the most comprehensive frameworks that are used by organizations linking performance measures to organizational strategy and vision. It enjoys a conceptual framework which converts organizational strategic objectives to measurable indicators and establishes a balanced distribution among critical perspectives of an organization. It focuses on main perspectives of an organization (i.e. financial, customer, internal processes, growth and learning) to measure organizational performance (Ahn, 2001).

The main issue in this study is to provide a method to design supply chain performance evaluation system by balanced scorecard approach in order to link performance measures to strategy and critical success factors of supply chain and its performance evaluation around organizational strategy to provide the outlines for improving the performance and revising strategies. In present study, qualitative variables are become quantitative and are used as Fuzzy data.

## 2. LITERATURE REVIEW

### 2.1 Performance Evaluation Definition and Concept

Management scholars have provided different definitions on performance evaluation system and each definition merits to be discussed. There are two comprehensive and complete definitions on performance evaluation as below:

Performance evaluation is a performance comprehensive measurement process in administrative organizations in the format of terms such as efficiency, effectiveness, empowerment and accountability in the framework of management scientific principles and concepts to achieve organizational aims and functions in the format of executive plans (Kaplan et al, 1992).

and

Performance evaluation is process by which organizations officially measure in certain intervals.

Since performance assessment and measurement is guideline for all managerial functions and sustainable growth and development of domestic organizations and institutes and its ramification namely national economy growth owes measurement, analysis, comparison and performing necessary initiatives, performance evaluation is incrementally important today.

## 2.2 Introducing Balanced Scorecard

Financial measures are good indicators to reflect previous events but they are inadequate and inefficient in indicating real value – generation factors and stimulants in today organizations namely intangible assets like, employees' knowledge and capability, information networks and customer relation. In an attempt to overcome such criticisms, modern performance evaluation frameworks are developed in organizations. For instance, Keegan et al (1998) suggested a balance between internal/external indicators as well financial/nonfinancial indicators. Lynch and Cross (1988, 1989) showed a pyramid of indicators which integrates organizational performance in its hierarchy. In 1991, Fitz Gerald categorized the indicators and their determinants in two groups. Ultimately, Kaplan and Norton (1992) introduced a new method to measure the performance called balanced evaluation. Since 1992, this method is rapidly grown and is used by different organizations broadly (Kaplan et al, 1992). As a performance evaluation system, this method evaluates organizational performance by adding three perspectives namely customers, internal business processes and learning/growth to traditional financial assessment.

This method allows managers to express organizational vision and strategy in measurable indicators in order to create a trustable instrument to measure organizational performance and management system (Kaplan et al, 1993).

## 2.3 A Review on Supply Chain Concepts

Supply chain management (SCM) was initially invented in Toyota's supply systems which enjoyed a remarkable coordination in supply management. Supply chain traditional approach included Just-In Time delivery (JIT) and Procurement Management. In practice, supply chain management is a combination of Total Quality Management (TQM), Business Process Redesign (BPR) and Just – In Time (Faezi Razi, 2004).

Joy Ashan Karetal (1998) defines supply chain as: “a network of independent or semi – independent trading institutes which are collectively responsible for producing and distributing products and relevant activities such as after sale services.

According to Cooper and Lamulderr (1999) supply chain is all needed activities to deliver a joint product to end user and supply chain management is in fact the management of such activities. Overall, it is believed that supply chain includes two or more organizations that are legally separated entities while they are linked by material, information and financial flows. Such organizations can be entities which produce components and final products and even can involve logistic companies and final customers (Demeter, 2006).

It is believed that supply chain management has incrementally determining principles for competition. One may be able to provide an overall definition on supply chain which covers other definitions. Quinn (2000) defines supply chain as all events that happen on a product which include preproduction to post-consumption steps namely from raw material to ashes.

Supply chain is something more than above definitions namely physical replacement of goods from earth to earth. Supply chain includes information, money and capital replacement and allocating intelligent capital or knowledge work. James Ayers believes that supply chain includes lifecycle processes compared to physical, information, financial and intelligent knowledge flows to satisfy end users' needs by goods and services through several chains.

## 2.4 Multiple Criteria Decision Making and Introducing TOPSIS Method Under Fuzzy Environment

Decision making is the process of finding the best option from all of the feasible alternatives. In almost all such

problems the multiplicity of criteria for judging the alternatives is pervasive. Hence, decision maker wants to achieve more than one objective in the way of selecting how to execute the activities (Zeleny, 1982).

That is, for many such problems, the decision maker wants to solve a multiple criteria decision making (MCDM) problem (Chen, 2000). Current models in MCDM are categorized into two groups: Multiple Objective Decision Making (MODM) and Multiple Attribute Decision Making (MADM). MODM models are used in designing and MADM models are used in selecting the best alternative (Asgharpour, 2009).

Classic models introduced for resolving multiple criteria decision making are categorized into two compensatory and non-compensatory models. Compensatory models consist of methods in which it is allowed to trade off between indicators. It means that the weakness of one indicator is compensated by the advantages of other indicators. In present study, TOPSIS method (in compensatory group) is used under fuzzy environment to prioritize the options.

## 2.5 TOPSIS Method

TOPSIS (Technique for Ordering Preference by Similarity to Ideal Solution) one of the known classical MCDM method, was first developed by Hwang and Yoon for solving a MCDM problem in 1981. It bases upon the concept that the chosen alternative should have the shortest distance from the positive ideal solution (PIS) and the farthest from the negative ideal solution (NIS). In the process of TOPSIS, the performance ratings and the weights of the criteria are given as crisp values.

## 2.6 Decision Making in Fuzzy Conditions

Fuzzy condition is a space of decision making in which data are collected in an ambiguous or limited manner. Ambiguous data have no border and are accompanied with such words as “almost”. Under many conditions, crisp data are inadequate to model real-life situations. Since human judgements including preferences are often vague and cannot estimate his preference with an exact numerical value. A more realistic approach may be to use linguistic assessments instead of numerical values, that is, to suppose that the ratings and weights of the criteria in the problem are assessed by means of linguistic variables (Chen and Klein, 1997).

## 2.7 Fuzzy TOPSIS Method

In 2000, Chen submitted his paper to scientific community in order to extend TOPSIS technique under fuzzy environment.

Assume that  $\tilde{a} = (a_1, a_2, a_3, a_4)$  and  $\tilde{b} = (b_1, b_2, b_3, b_4)$  are two fuzzy trapezoid numbers. In present paper, following formula is used to compute the distance between two numbers:

$$D(\tilde{a}, \tilde{b}) = \sqrt{\frac{1}{4} (a_1 - b_1)^2 + (a_2 - b_2)^2 + (a_3 - b_3)^2 + (a_4 - b_4)^2} \quad (1)$$

In this method, the weight of various criteria and rating qualitative criteria are determined by linguistic variables.

## 3. METHODOLOGY

In regard to objective, the current research is applied and in respect to research methodology, it is of descriptive type. Since present study is conducted as a case study in selected companies in Supply Chain of Pars Renault Company, the sample frame includes five companies in suppliers group with more than 5 years of experiences in this chain. The proposed sampling frame consisted of 29 members from five selected companies which were studied by considering specified criteria by senior managers and advisors. Then, by using questionnaire and interview, relevant data on given traits were gathered. Relevant data should be standard in order to be evaluated, analyzed and summarized easily. To study and analyze internal/external data, field study is too effective since one can change data to quantitative data. In present study, Company A (they are anonymous due to the request of studied companies) was selected as a member of supply chain companies. Normally, this system can be extended and utilized for other companies. There are varied methods to test the validity of questionnaires and content validity method is used here. Used questionnaires in each step were studied by some experts before distribution among the members of the sample and then they were distributed among them after necessary reforms and confirmation. There are also varied methods to test the reliability and Cronbach's alpha is used in present study. This method is used to compute the internal consistency of measurement tools such as questionnaires or those tests which measure different traits (Sarmad, 1997).

$$\alpha = \frac{K}{K-1} \left( 1 - \frac{\sum_{i=1}^K \sigma_{Y_i}^2}{\sigma_X^2} \right) \quad (2)$$

To test Cronbach's alpha, some questionnaires were pretested and acquired data were used to calculate Cronbach's alpha by SPSS software. Usually, if  $\alpha$  is greater than 0.7, the reliability of the questionnaire is acceptable. It is necessary to point out that, used questionnaires in this research enjoyed suitable reliability so that  $\alpha$  in both questionnaires were 0.846 and 0.717.

## 4. THE PROPOSED METHOD

Introduced methodology by Papalexandris (2005) has provided executive activities for balanced scorecard in five separated disciplines. Explained approach in present study has a strong foundation in Kaplan and Norton quadruple model (Asian, 2008).

The process of executing supply chain performance evaluation by using balanced scorecard can be described in three main phases: 1. starting or preparing phase, 2. Designing and development phase, 3. Establishment and execution phase.

### 4.1 Starting Phase

#### 4.1.1 Preparing the Project

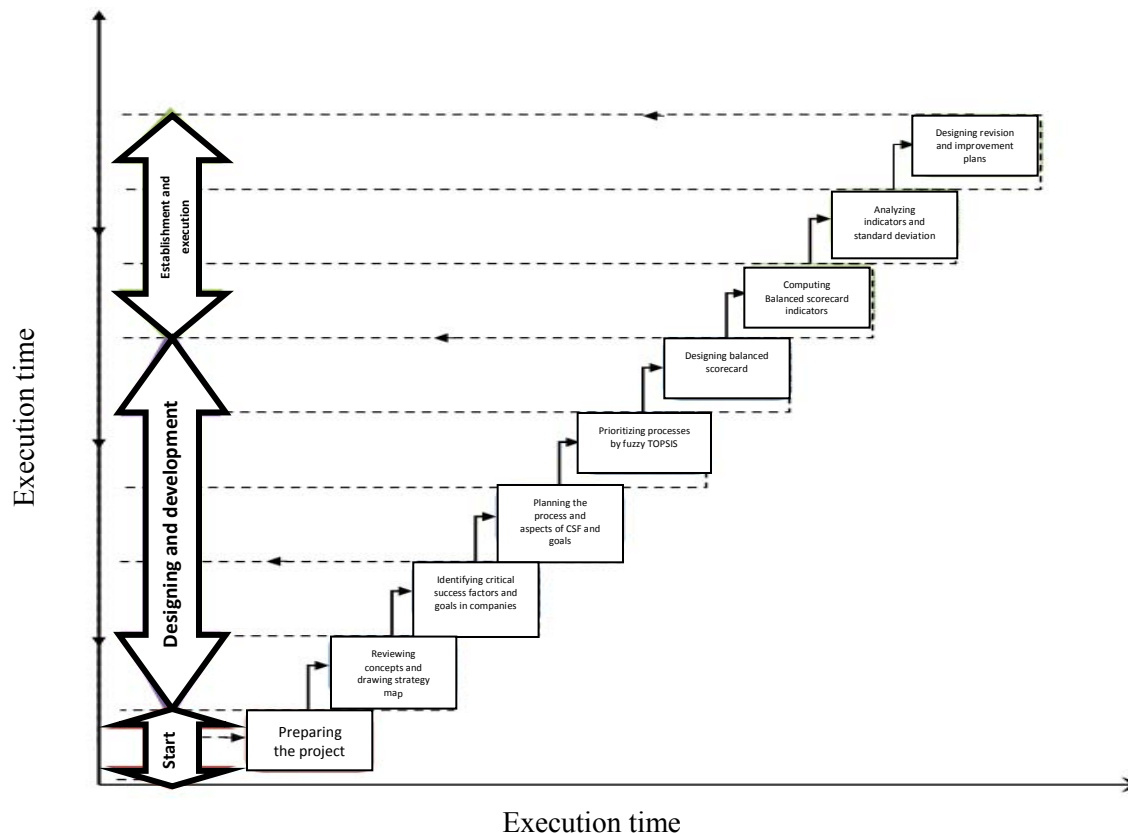
Starting and preparing phase is the most important step in the process of project execution in an integrated manner. In this step, the executive team to evaluate the performance with balanced scorecard was recognized. The executive team is responsible to define executive plans and necessary operations to complete execution process. During meetings with directors (board of directors) and internal experts, customers and external experts, the aim of the project, vision and the scope of planning the project were expounded and organizational commitment and the support of senior management as a necessary condition was achieved.

- ◆ Project vision

Establishing a balanced performance management system which can evaluate the performance of supply chain members in all aspects around organizational strategies

- ◆ local scope of the project

Graph 1: Necessary Steps to Execute Suggested Methodology



The local scope of the project was Pars Renault Company and its supply chain affiliated companies. Since the utilized model in this research can be used in terms of qualitative and quantitative criteria in different conditions, present study can be studied separately in other companies, workshops and other organizations.

- ◆ Interval scope of the project

This research is conducted between 2010 and 2011.

## 4.2 Designing and Development Phase

### 4.2.1 Reviewing and Clarifying Strategic Concepts

To determine the vision, values and mission of the organization, strategic teams were used several meetings/workshops were conducted. The details on organizational strategies were scrutinized and, finally, by justifying and concurrence of all attendees, following critical success factors were approved:

CSF1: optimizing HR management and organizational culture

CSF2: total cost management and organizational productivity.

CSF3: optimizing marketing management, market studies and sale engineering

CSF4: optimizing information systems and networks

CSF5: promoting the level of technology and technical knowledge

### 4.2.2 Identify Organizational Internal/External Processes

In devising organizational internal/external processes, we can use process chart and other existing charts. Likewise, one can use Porter's model to identify such processes. To this end, organizational process map in the quality management system of Company A is used to identify the processes. The list of key processes is as below:

P1: managing and planning human resources

P2: financial management and accounting

P3: infrastructure and workplace

P4: reforms and improvement

P5: planning and control

P6: training

P7: production

P8: commercial planning

P9: technical and engineering

P10: designing and evolution

P11: customer relation

P12: purchase

P13: refining, measurement and quality confirmation

P14: sale

P15: network management and information

Then, fuzzy TOPSIS technique is used to prioritize and select organizational internal/external processes precisely that their improvement has the highest impact and role in achieving critical success factors.

### 4.2.3 Prioritizing Critical Success Factors and Key Processes in Fuzzy TOPSIS Method (Chen's Method)

Prioritizing the processes by fuzzy TOPSIS consists of below steps:

At first, we devise hierarchical matrix by using critical success factors (criteria) and processes (options) of the company. Then, proper linguistic variables are defined to determine the weight and to rate each process. To increase the preciseness and correctness of these steps which address qualitative comparisons, a 7-item scale is use which includes very low, low, lower than medium, medium, higher than medium, high and very high.

**Table 1:** The Rates of Fuzzy Variables to Rank Options by Considering the Criteria

<i>The degree of impacts of i on J</i>		<i>The quantitative rate of fuzzy variable</i>
Very low	VL	(0, 0, 1, 2)
Low	L	(1, 2, 2, 3)
Medium low	ML	(2, 3, 4, 5)
Medium	M	(4, 5, 5, 6)
Medium high	MH	(5, 6, 7, 8)
High	H	(7, 8, 8, 9)
Very high	VH	(8, 9, 10, 10)

**Table 2: The Matrix of Paired Comparisons of Critical Success Factors (Criteria) and Process (Options)**

	CSF1	CSF2	CSF3	CSF4	CSF5
	(8, 9, 10, 10)	(7, 8, 8, 9)	(4, 5, 5,6)	(2, 3, 4, 5)	(7, 8, 8, 9)
P1	(8, 9, 10, 10)	(8, 9, 10, 10)	(4, 5, 5, 6)	(2, 3, 4, 5)	(7, 8, 8, 9)
P2	(1, 2, 2, 3)	(4, 5, 5, 6)	(2, 3, 4, 5)	(4, 5, 5, 6)	(2, 3, 4, 5)
P3	(5, 6, 7, 8)	(5, 6, 7, 8)	(2, 3, 4, 5)	(4, 5, 5, 6)	(5, 6, 7, 8)
P4	(2, 3, 4, 5)	(4, 5, 5, 6)	(0, 0, 1, 2)	(2, 3, 4, 5)	(4, 5, 5, 6)
P5	(0, 0, 1, 2)	(1, 2, 2, 3)	(4, 5, 5, 6)	(2, 3, 4, 5)	(2, 3, 4, 5)
P6	(7, 8, 8, 9)	(7, 8, 8, 9)	(7, 8, 8, 9)	(2, 3, 4, 5)	(4, 5, 5, 6)
P7	(8, 9, 10, 10)	(7, 8, 8, 9)	(5, 6, 7, 8)	(4, 5, 5, 6)	(5, 6, 7, 8)
P8	(2, 3, 4, 5)	(7, 8, 8, 9)	(0, 0, 1, 2)	(2, 3, 4, 5)	(7, 8, 8, 9)
P9	(5, 6, 7, 8)	(8, 9, 10, 10)	(4, 5, 5, 6)	(2, 3, 4, 5)	(8, 9, 10, 10)
P10	(2, 3, 4, 5)	(2, 3, 4, 5)	(7, 8, 8, 9)	(2, 3, 4, 5)	(4, 5, 5, 6)
P11	(0, 0, 1, 2)	(2, 3, 4, 5)	(7, 8, 8, 9)	(0, 0, 1, 2)	(2, 3, 4, 5)
P12	(2, 3, 4, 5)	(7, 8, 8, 9)	(0, 0, 1, 2)	(0, 0, 1, 2)	(4, 5, 5, 6)
P13	(7, 8, 8, 9)	(7, 8, 8, 9)	(7, 8, 8, 9)	(2, 3, 4, 5)	(2, 3, 4, 5)
P14	(5, 6, 7, 8)	(8, 9, 10, 10)	(8, 9, 10, 10)	(2, 3, 4, 5)	(2, 3, 4, 5)
P15	(7, 8, 8, 9)	(5, 6, 7, 8)	(5, 6, 7, 8)	(8, 9, 10, 10)	(2, 3, 4, 5)

Then, normalized fuzzy decision making matrix is computed and normalized fuzzy weight matrix is attained by multiplying the weight of organizational critical success factors in the relevant matrix to determine the rate of processes to impacting on critical success factors.

$$\tilde{V} = \tilde{v}_{ij} \quad m \times n, \quad i = 1, 2, \dots, m, \quad j = 1, 2, \dots, n$$

$$\tilde{r}_{ij} = \frac{a_{ij}, b_{ij}, c_{ij}, d_{ij}}{d_i^+, d_i^-, d_j^+, d_j^-}, \quad j \in B$$

$$\tilde{v}_{ij} = \tilde{r}_{ij} \cdot \tilde{w}_j \quad (3)$$

The total positive ideal and negative ideal points are calculated as well as the distance of each option from positive ideal and negative ideal. Therefore, one can define A\* positive ideal and A- negative ideal solutions as below:

$$d(\tilde{a}, \tilde{b}) = \sqrt{\frac{1}{4} (a_1 - b_1)^2 + (a_2 - b_2)^2 + (a_3 - b_3)^2 + (a_4 - b_4)^2} \quad (4)$$

$$A^- = (\tilde{v}_1^-, \tilde{v}_2^-, \dots, \tilde{v}_n^-), \quad A^* = (\tilde{v}_1^*, \tilde{v}_2^*, \dots, \tilde{v}_n^*),$$

$$\tilde{v}_j^* = (1, 1, 1, 1) \text{ and } \tilde{v}_j^- = (0, 0, 0, 0)$$

To rank options by  $d_i^*$  and  $d_i^-$ , closeness ratio is computed for all options by following formula:

$$CC_i = \frac{d_i^-}{d_i^* + d_i^-}, \quad i = 1, 2, \dots, m \quad (5)$$

Finally, the option which is closer to positive ideal and farther from negative ideal is the option that its closeness ratio is closer to 1. Therefore, by closeness ratio we are able to rank all options and select the best one.

**Table 3: Computing Closeness Ratio and Options Ranking**

CCi	closeness ratio	Pi	Priority
CC1	0.522169766	P1	1
CC 2	0.260042420	P 2	13
CC 3	0.410078438	P 3	8
CC 4	0.275118226	P 4	12
CC 5	0.199251976	P 5	15
CC 6	0.467628461	P 6	4
CC 7	0.505550567	P 7	2
CC 8	0.367242558	P 8	9
CC 9	0.49586129	P 9	3
CC 10	0.322362378	P 10	10
CC11	0.233351027	P11	14
CC12	0.301595541	P12	11
CC13	0.445757992	P13	7
CC14	0.450918794	P14	5
CC15	0.447852518	P15	6

Improving those processes that enjoy higher priority has the highest impact on achieving critical success factors. In this step and concerning the importance of process priorities in organizational performance management, the combination of prioritization of processes achieved by TOPSIS method was discussed in the strategic committee of the organization in order to final assessment and conclusion by the senior managers, experts and internal/external elites and following processes were introduced to be evaluated by BSC:

1. HR planning and management process
2. Production process
3. Technical and engineering process
4. Training process
5. Sale process
6. Network and information management process
7. Evaluating, measuring and controlling the quality
8. Infrastructures and workplace

#### 4.2.4 Designing Balanced Scorecard

The members of project team defined a group of performance indicators selected for measuring prioritized processes. Defined measurement indicators are categorized into four BSC areas due to their nature.

### 4.3 Establishment and Execution Phase

#### 4.3.1 Computing Indicators in Various Aspects and Computing Overall Efficiency

After defining measurement indicators, the quantitative goals of each indicator which is in reality the same ideal rates for measurement indicators are determined based on macro aims. Then, organizational plans to achieve macro aims and aim rates are recognized as the performance determinants and stimulants.

**Table 4:** Balances Scorecard for Company A

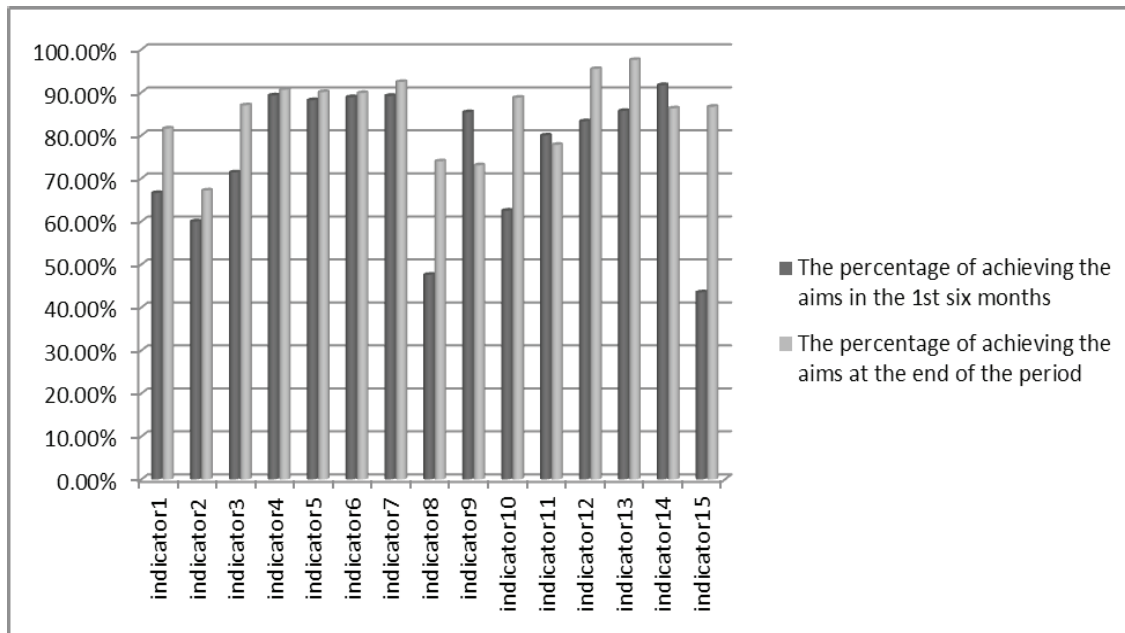
Financial perspective (W1: 25%)					
Total efficiency	Achieving the goal	Weight	Performance stimulants	Measurement indicator	Macro aims
	66.6%	0.25	Energy consumption management	energy costs Indicator	Reduction in energy consumption cost
70.40%	60%	0.25	Sale system improvement	Sale power indicator	Improving mixed income (sale)
	71.4%	0.25	over time and shift costs management	over time and shift costs indicator	Improving cost effectiveness
	89.3%	0.25	Operations, components and consuming tools costs management	Input costs indicator	
Customers' perspective (W2: 25%)					
Total efficiency	Achieving the goal	Weight	Performance stimulants	Measurement indicator	Macro aims
	88.2%	0.333	maintaining Employees' status	Internal customers Satisfaction indicator	Enhancing customer – orientation culture and customers' satisfaction level
88.90%	88.9%	0.333	Customer relation management (CRM)	External customers Satisfaction indicator	
	89.3%	0.333	Making agile production system	Organizational agility indicator	
Internal processes perspective (W3: 25%)					
Total efficiency	Achieving the goal	Weight	Performance stimulants	Measurement indicator	Macro aims
	47.6%	0.333	Improving products' quality	group wastes indicators	Promoting qualitative level of products
65.30%	85.4%	0.333	Improving production system	generated individual added – value indicator	Promoting productivity
	62.5%	0.333	Productive maintenance	technical cessations in production line indicator	Improving the performance of machineries and equipment

Growth and learning perspective (W4: 25%)					
Total efficiency	Achieving the goal	Weight	Performance stimulants	Measurement indicator	Macro aims
	80%	0.2	Developing internal networks and integrated information system	Organizational network broadness indicator	Increasing information productivity
79.10%	83.3%	0.2	Developing effective training system	Per capita effective training indicator	optimizing the knowledge and enhancement of skills level
	85.7%	0.2	Technical projects management	Technical projects efficiency indicator	supporting and developing technical projects
	91.7%	0.2	Disseminating security and hygiene culture	Organizational health and safety indicator	HR development and maintenance
	43.5%	0.2	Developing employees' partnership culture	Per capita proposal providing indicator	

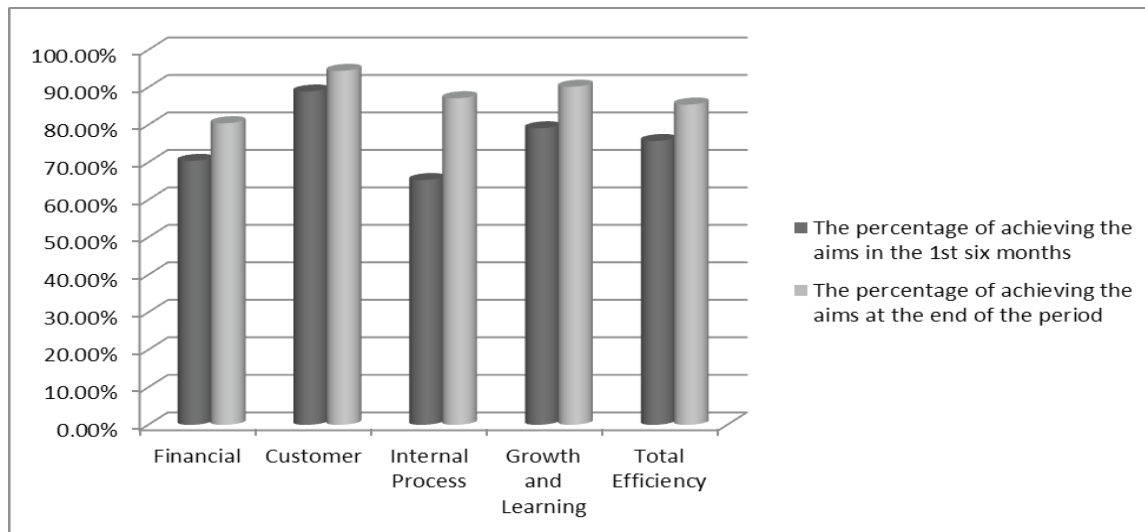
**Table 5: Improvement and Revision Plans**

<i>Process needed improvement</i>	<i>considered indicator</i>	<i>Performance gap</i>	<i>Diversion reasons</i>	<i>The title of improvement project</i>	<i>Project aims</i>
HR management and planning process	Per capita proposal providing indicator	56.5%	(1)Frequent repeated proposals (2)Disability of production personnel in right transfer of proposal concepts (3) Lack of proper follow-up	Improving proposal system	developing proposal giving culture employees' contribution in organization creating and managing an efficient proposal system increasing the indicators to 30%
Technical and engineering process	technical cessations in production line indicator	37.5%	(1)Frequent repeated cessations (2) Lack of proper analysis on the reasons (3) Lack of proper follow-up to remove cessations	Mitigating technical cessations	Comprehensive productive maintenance mitigating gaps and deviation in indicator to 20%
Evaluation, measurement and controlling the quality	group wastes indicators	52.3%	(1)Not attention to quality planning (2) Improper analysis on the causes of wastes (3)The weakness of quality culture in the organization	Waste management (production sector)	Developing self – control culture quality planning mitigating gaps and deviation in indicator to 20%

**Graph 2:** The Results of Comparison Among Bsc Indicators



**Graph 3:** the results of comparison among BSC total effectiveness



**4.3.2 Analyzing Indicators and Performance Deviation**

To identify and to determine the situation of organizational performance in given period and to identify those processes which need improvement, selected processes through fuzzy TOPSIS method are considered based on provided prioritization and then two existing and ideal performance levels are compared. Finally, the existing distance between both levels is determined.

**4.3.4 Devising Improvement Plans And Revising in Processes and Strategies**

After discovering the reasons of diversion in indicators and categorizing and prioritizing them, here we devise improvement plans and revise identified processes and some strategies.

Ultimately, after executing defined improvement projects

in the organization, defined indicators are recomputed in a balanced scorecard to evaluate the performance of the group and to study the impact of improved project execution within the first sixth months of 2011. The findings confirm the validity and fruitfulness of suggested methodology.

## 5. CONCLUSION

According to the findings of the research, although we faced with trivial mitigations in a few indicators, the size of total efficiency indicator at the end of the first six month of 2011 indicate that by 9.72% performance improvement compared to past period (the 2<sup>nd</sup> six months of 1389), the organization has been able to achieve 85.42% of its plans rooted in its organizational strategies. However, we should note that the aim of present study is to introduce a method to evaluate the performance of supply chain companies not studying the effectiveness of improvement projects. By using these findings, one can evaluate the performance of supply chain companies with more confidence periodically. The advantage of fuzzy TOPSIS is that it analyzes both quantitative and qualitative measures simultaneously and evaluates various options based on varied criteria that have no similar units. Concerning the suggested methodology in which BSC is used; the suggested scorecard method is based on fuzzy TOPSIS and impacts on organizational performance in all aspects positively by providing fundamental guidelines from feedback system in most defined indicators.

By using these findings, strategy – oriented organizations can design and use BSC with more confidence and evaluate the performance of supply chain companies in different aspects compared to determined strategies and make proper reforming initiatives in the case of any diversion.

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