

## Evaluating the Function of Transportation (Logistic) Companies based on Analytic Hierarchy Process (AHP): Iran Case Study

Abolfazl Pakari and Parisa Ansari Amoli

Msc Student of Executive Management at Ayatollah Amoli Branch of Islamic Azad University

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**Abstract:** Industries competitive atmosphere in the present era encounters big challenges such as globalization, human capital, and new technologies, if they are dealt without a definite integrated and strategic structure. A major way of determining the deficiencies and strong points and identifying the opportunities and outer threats to the transportation companies is to evaluate their performance. How to the evaluation has always been questionable. It enables the companies to diagnose their positive and negative characteristics and find out whether their performance encounters any irrational issue or not to promote their management. The current project attempts to depict an appropriate method to evaluate small and medium groups of transportation companies according to four financial criteria, including appropriate innovation, occupation, commerce, and customers. Hence, an evaluation model based on analytic hierarchy process (AHP), which includes the four aforesaid criteria and sub-criteria, has been proposed. The research findings indicate that the executed system is rational and the evaluation results are acceptable.

**Key words:** Transportation (logistic) companies, function evaluation, analytic hierarchy process (AHP), technology.

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### INTRODUCTION

Owing to the quick development of the world economy, modern transportation companies are considered as a developed organization with management technology which have promoted in the world quickly and governments and economic institutions have attributed them a high value. Transportation (logistic) companies became more developed as the world economic countries joined the World Trade Organization, but they encountered more competition in the world. Concerning the current condition, it is necessary to develop and design the function evaluation system according to the working process of the transportation companies and modifies the rational evaluation method. They are required for scientific reflection and organizing the working process of the companies, but quantitative researchers focus on the function evaluation of the logistic companies. Utilization of the traditional methods of function evaluation is a very difficult task concerning the companies working process where continuity and prominent properties have not provided an advanced complete model as the result of the company's activities. The current project introduces a new technique to solve these problems after their simplification and investigates complicated issues according to their mutual effects. This method of decision-making is based on binary comparisons and the decision-maker begins working through providing the hierarchy tree. The tree displays the comparison elements and the under evaluation options. Finally, the AHP logic incorporates the matrixes resulted from the binary comparisons to achieve an optimal decision [Ghodratian Kashan and Anvari Rostami, 2004]. The function evaluation is computed in the advanced management of the economic institute to investigate the current situation. This evaluation is always questionable in theory and practice. Executing the evaluation of the companies may enable the companies to diagnose their positive and negative properties to see if there are any irrational phenomenon there to improve their management level according to them or not (Parsaian and Erabi, 2000). An objective goal, appropriate indexes of function evaluation, and consistency of function evaluation method have great importance in the following stages:

1. Optimal allocation of the sources promotes transportation process and improves the companies management and their work execution.
  2. It provides the transportation companies with the development and formation of an appropriate method.
  3. Creating the prominent system of function evaluation in the small and medium transportation companies.
- Transportation companies based on identification of current domestic and foreign evaluation function index system adjusts an executive, rational, and scientific evaluation resulted from clients, financial, occupational, and commercial criteria for small and medium companies.

#### *Literature Review:*

Since, forming the management science and organization and occupation division concepts, the control and supervision words have successively used in the management literature. Although, the modern management

model hasn't violated the traditional ones, but these concepts have seen a changed-forms variables via the political, economical and social events (Parsian, arabi 1999).

A consistency and acceleration process on the economic corporations and may be the whole of the economy is gagged to completely know of these corporations' advantages and disadvantages, and whereas these concepts are as relative ones too based on comparison, this performance evaluation (PE) may be a significant tool to making decision for the managers, investors and policy (strategy) makers, also may be drawn attention of the researches to more know of the markets' situation. Petroski(2000) has investigated about a division on the successful and unsuccessful companies. He had a question; we could have a higher productivity between the companies which have a diery value rate against the price of the market via the hierarch analyze based on accounting? This research show that use of the fundamental signs may change the quality of distribution, that is seen between the companies which have a higher diery value rate against the price of market( mehrani 2004).

The financial evaluation of companies mostly based on financial statements, is as one of the oldest interfaces of the performance evaluation (PE). The financial analyzes are introduced the precious data about; quality, interest of per stock, advantages and disadvantages of companies and their processes (saati 1980).

These analyzes have the four main tools namely: horizontal analysis, longitudinal analyze, analyze, analyze about process and finally rations (rate).

**Theory:**

1. It seems, the financial standard has impact on the transportation companies?
2. It seems, the human standard has impact on the same companies?
3. It seems, the commerce standard has impact on the same companies?

**Methodology:**

The project was conducted as a field study and the required data to identify the theoretical bases were collected from online resources, valid scientific documents, libraries, different foreign and Iranian books and journals, theses, and data.

**Data Analysis:**

Analysis Hierarchy Process (AHP) was introduced by Tomas Saati in the early 1970. He, the founder of this method, presented the following four criteria as AHP principles and founded all the computations, rules, and regulations on them.

- a) Reverse Condition: If A preference to B equals n, B preference to A would be 1/n.
- b) Homogeneity Principle: A should be homogeneous and comparable to B. In other word, A superiority to B extreme or zero.
- c) Dependence: Every hierarchical element may depend on its higher element and the dependence may continue to the highest level.

Inter-level relationships are defined after constructing the analytic hierarchy process and the two elements are compared in different levels.

**Table 1:** A importance in relation to B.

Criterion	Computation of Mean
1	Two factors are equally important.
3	One factor is less important than the other factor by far. (fairly more important)
5	One factor is evidently more important than the other factor.
7	One factor is less important than the other factor by far. (higher priority)
9	One factor is more important than the other factor extremely. (incomparable)
2, 4, 6, 8	High mean of criterion value (intermediate values among preferred values)

**Table 2:** Criteria of evaluating the function of transportation companies.

Objectives	Main Criterion	Secondary Criterion
Small Objectives of A	Financial B1	Profiting capacity C11, Payment Capacity C12, Development Capacity C13
	Customers B2	Institute perspective C21, Controlling the quality of executive function C22, services C23, expenditure evaluation C24
	Transportation B3	Economy C31, safety C32, sex ability C33
	Storage B4	Economic privileges C41, controlling storage quality C42, storehouse exploitation degree C4, research quantity C44
	Technology B5	Higher management method C51, transportation automation C52, storage automation C53, information technology, exploitation rate C54

**Stages of Weight Calculation:**

Weight of the elements is determined in respect to each other through a collection of numerical computations.

You compute the product elements in each matrix line.

$$M_{ij} = \prod_{k=1}^n a_{ik} a_{kj}$$

Calculate, the root of M, that lead to the whole of vector weight:

$$V = \sqrt[n]{m1}$$

Standardize, (z) vector:  $V = (W_1, W_2, W_3, \dots)$

Calculate, the average of consistent vector- based elements:

$$W = \frac{V_i}{\sum V_i} \quad (i = 1, 2, 3, \dots, n)$$

$$N: \text{options on the sample: } \lambda_{max} = \frac{2}{n} \sum \left( \frac{A_{wsi}}{W_i} \right)$$

These results should be normal, this lead to the some errors. However, we introduce the two consistency indexes, that may remove or decrease of the error- progress of confidence. Matrix is directing of consistency index (C.I), also this index investigates the random index (R.I).

$$C.I = \frac{\lambda_{max} - n}{n - 1}$$

Weight of the computed criteria is in agreement with the importance of relative weight among different factors from primary level to the next level. The matrix data is not complete and should be normalized. At this time, some errors occur. Hence, we suggest two consistency indexes to omit and reduce error and improve reliability and trust:

Matrix deviates from consistency index (CI) and investigates the consistency degree of the random index (RI).

$$C.I = \frac{\lambda_{max} - n}{n - 1}$$

It diverts random index and consistency index. Function evaluation index could decrease the errors by increasing their dimensions. Table 3 shows RI value for matrixes 3 to 12:

**Table 3:** The value of Inconsistency Rate (IR) according to the order of different numbers.

Order	3	4	5	6	7
Random index Value	0.25	0.98	1.21	1.35	1.54
Order	8	9	10	11	12
R.I value	0.89	1.37	1.41	1.28	1.45

In the current procedure, investigation usually accompanies the relation of CI to RI (consistency rate to random index) which occurs as  $C.R = \frac{C.I}{R.I}$  and is called consistency index. In sum, the index is consistent when  $C.R < 0.1$ .

### 1.1. Weight analysis of function evaluation accompanied with AHP

Weight is computed in level 1 structure. First, the matrix for financial B1, clients B2, transportation B3, and technology B5 and the results came in table 4:

**Table 4:** Matrix B1, B2, B3, B4, B5.

B5	B4	B3	B2	B1	A
1.5	3	7	5	1	B1
1.14	1.2	2	1	1.2	B2
3	1.5	1.2	1.45	1.56	B3
1.5	5	4	2	1.2	B4
2	6	1.4	1	4	B5

Compute the estimating value of the properties through square root method. According to formula 1, 2, 3, and 4, we can draw the following results:

$$V = [1.838, 0.582, 0.143, 1.165, 2.036]^T \quad W = [0.319, 0.101, 0.025, 0.202, 0.353]^T$$

$$AW = [1.127, 0.425, 1.206, 1.190, 0.683]^T, \quad \lambda_{max} = 5.224 \quad C.I = 0.056 \quad C.R = 0.0 < 0.1$$

Congruence of the test results are acceptable. Hence, weight index level 1 is as the following:

$$W = [0.319, 0.101, 0.025, 0.202, 0.353]^T$$

Weight index in level 2 structure accompanies method AHP. Computation of weight function evaluation of level 2 is conducted similar to the weight index of level 1. The results are displayed in Table 5.

**Table 5:** Composite Weight Computation.

Objectives	Standards	Weight Standards	Indexes	Weight Indexes	Weight Compositions
General objectives of function evaluation in logistic economic institute A	Financial B1	0.214	C11	0.323	0.121
			C12	0.432	0.113
			C13	0.235	0.075
	Clients B2	0.214	C21	0.225	0.021
			C22	0.225	0.032
			C23	0.14	0.034
			C24	0.24	0.014
	Transportation B3	0.027	C31	0.35	0.011
			C32	0.215	0.008
			C33	0.125	0.006
	Storage B4	0.201	C41	0.322	0.064
			C42	0.255	0.032
			C43	0.215	0.023
			C44	0.108	0.24
	Advanced technology B5	0.243	C51	0.332	0.123
			C52	0.125	0.034
			C53	0.254	0.04
			C54	0.148	0.056

**Table 6:** Computing the conceptual evaluation on Iranian transportation companies.

Comprehensive Scores	Scores (Account)	Degrees				Indexes
		Weak	Medium	Good	Optimal	
2.102	25	0	4	2	3	C11
3.301	31	0	1	3	4	C12
1.12	32	1	2	5	1	C13
0.234	18	0	3	5	3	C21
2.123	22	1	1	3	5	C22
0.12	31	0	2	4	3	C23
0.298	28	0	4	2	3	C24
0.29	29	0	3	3	5	C31
0.324	32	0	3	5	4	C32
0.123	27	1	2	2	4	C33
2.34	28	1	2	3	4	C41
1.23	27	0	3	4	3	C42
1.78	30	0	2	4	5	C43
0.54	32	0	2	4	5	C44
2.56	29	1	2	5	3	C51
2.01	28	1	3	2	2	C52
2.46	31	0	4	3	5	C53
1.34	23	0	4	2	3	C54

**The Findings (Case Analysis):**

Iranian transportation (logistic) companies are some institutes which are managed in transportation industry. Survival and revival revealed that the current transportations suffer from a series of comprehensive and scientific deficiencies in the function evaluation system which cause the company to be unaware of their advantages and deficiencies. The current project conducted function evaluation of the economic institute based on AHP.

Score and point is given to particular criteria through specialized marking method. According to each criterion, score is divided to four grades: Optimal (4 points), good (3 points), medium (2 points), and weak (1 point) are a level to test points based on the eighteenth secondary index in the function evaluation system. Ten experts were invited and they were asked to give a score with real operational conditions to Transportation Company. The results are displayed in Table 6. The conducted computations indicate that function score of the Iranian transportation company is 26.4 and this equals 68% of the general score 40. In other words, when the general score is 100, the company’s function has gained 68 points. Combining with the function evaluation index system shows that the causes of weak performance, C11 lower usefulness, C21 company face, evaluation of C24 expenditure, safety and reliability C31, ability C33, C51 management method, C52 transportation automation, application of C54 information technology, and the scores of the higher scores are all higher than 30 points.

**Conclusion:**

Organizations should utilize appropriate methods and patterns to determine and recognize their current status and progress in the modern competitive world. Nowadays, agreement of the organization plans and activities with mission and perspective, which are determining in moving to obtain competitive privileges in the processes and indexes of growth and success, are considered as the most important plans and measures of the forerunning organizations.

Nevertheless, the companies are using of the most suitable strategies to take competitive advantage on the growth indexes and processes. The performance analyze (PE) is always an important aspect of the progressive economic institutes, also this tool can help to the same companies to find their advantages and disadvantages? These current PE aren't capable to assign their advantages and disadvantages, because they are based on adjust an index. There are different practices to have an exact performance analyze (PE) including: Practice of grading, statistical and numerical decisions, and hierarch analyze.

The some of these PE-Pased practices illustrate, the grading practice basically is related to the specialists' view, so that could take results analyzes. The statistical decision practice has related to the large data and according to these data may be created suitable results, but this practice has ignored the qualitative data. The hierarchy analyze practice (model) is known as an analyze practice, that is using to evaluate the complicated system with the different layers indexes, but this requires the experts to present the scores in scales 9 or 5. According to the findings, building rational criterion system and the evaluations have been reliable.

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