Evaluating and rating the performance of Qazvin municipalities, using the Balanced Scorecard (BSC) model, with Fuzzy Multi-Criteria Decision-Making (FMCDM) approach

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Abstract
Using the Balanced Scorecard (BSC) model, with Fuzzy Multi-Criteria Decision-Making (FMCDM) approach, this study aimed at evaluating the performance of Qazvin municipalities. The population of this study consists of Qazvin municipality regions. Municipality performance evaluation indicators were extracted from the Kaplan Norton book, and then using the experts and managers' opinions, these indicators were screened, and finally, 52 of them were selected. Furthermore, the relative weights of performance indicators were calculated with the help of fuzzy analytic hierarchy process (FAHP). Finally, based on these weights, Fuzzy TOPSIS was used for ranking Qazvin municipalities, and determining the best one. Though several studies have been conducted to evaluate the performance of municipalities, most of them have ignored citizens' (customer's) opinions. In addition to taking new applicable indices into account, the present study considered a proper rating for the indicators, and then compared the evaluating of the performance of municipal regions. Hence, the selected approach is a new comprehensive work, and can be a useful and effective tool for evaluating the performance of public organizations and services.

Keywords: FMCDM, Balanced Scorecard (BSC), Fuzzy Analytic Hierarchy Process (FAHP), TOPSIS.
Introduction:
Since the municipality, as other cities and countries, is the trustee of management of Qazvin city, paying attention to how Qazvin Municipality is managed, and also to its performance is very important. Competent management of any organization, including Qazvin Municipality, will not be achieved unless by planning, implementation, monitoring, evaluation and appropriate review in order to create the suitable atmosphere for improving the performance. Due to the complexity of any municipality, and the impact of its important role as an executive body of the country’s urban system, as well as rapid developments in the field of municipality, and the interconnectedness of them, no one denies the necessity of attention to the evaluation of the municipality's performance. Managing and evaluating the performance, allows an organization like the municipality to amend its route based on changing conditions, and make it dynamic.
In addition to the necessity of a favorable evaluating of performance, one of the most important requirements of effective evaluation of the organizations' performance, especially municipalities, is to consider a system in which, a favorable assessment is done, and the results of the assessment are effective in a desirable way, and in an appropriate mechanism (Lusthaus Charles &et al., 1385).
Therefore, the necessity of managing and evaluating the performance of Qazvin Municipality in order to compare the performance of this municipality with its past, and to provide solutions to improve its performance, is quite evident. Previous studies show that, so far, Qazvin Municipality has not used global performance evaluation models to assess its performance in the organizational dimension, and has just been satisfied with statistical reports. Therefore, reviewing and evaluating the performance of Qazvin Municipality, and providing an appropriate model to use in order to evaluate the performance of this municipality is a necessity.

1. performance assessment methods
Over the years, various methods and theories have been applied to guide performance assessments in different organizations. This approaches include ratio analysis, total production analysis, regression analysis, Delphi, Balanced Scorecard, Analytic Hierarchy Process (AHP), Data envelopment analysis (DEA) and other methods, each of which, has its own basic concepts, goals, advantages and disadvantages (Dessler, 2000). However, all successful organizations have some features in common, including a special perspective, positive actions, and effective performance evaluation.
After Bellman and Zadeh (1970) developed behavioral decision theory in fuzzy environment, different related models were developed, and multi-criteria decision making (MCDM) model was used in a variety of fields, such as engineering control, artificial intelligence, and management science. The concept of combining fuzzy theory and MCDM is referred to as Fuzzy Multiple Criteria Decision Making (FMCDM).
Selecting an appropriate method for evaluating measures in the case evaluation process could help the analysts and assessors select the best solution. To evaluate the performance, like most case assessments, a number of measures should be considered. As a result, evaluating the performance of municipalities can be considered as MCDM problems. Furthermore, multiple criteria used in the BSC are more comprehensive and objective than the use of only one of them. In the present study, FMCDM approach is used which is based on four dimensions of the BSC, and has been created as a performance evaluation model for the service institutions.
2. Performance Evaluation and Balanced Scorecard (BSC)

2-1) Performance Evaluation
Evaluation is a continuous and ongoing review which should flow in all human activities, whether individual or collective. Performance evaluation means to ensure about the compliance of the performance with the plan, and to compare actual performance with the predetermined targets. If there are significant differences between expected and actual performance targets, managers must take corrective measures. Without management and monitoring of performance indicators, organization's targets cannot be achieved.

With the help of performance evaluation, manager is informed about achieving the goals, and accomplishing the processes based on the expected methods, and gains the ability for tracking, measuring and reforming them if necessary. Monitoring and evaluation of performance are managers' tools at different levels of the organization from superiors to supervision ranks, and its necessity in various levels of the organization is clearly visible. The absence of an effective system of performance monitoring, leads an organization to failure in achieving its missions, and it cannot properly use its own resources (Tavalaee, 1386).

2-2) Performance Evaluation Process
The main steps in the performance evaluation process are as follows:
1. Developing the indicators, dimensions and related topics, and determining their measurement unit
2. Determining weights of the indicators, in terms of their importance and boundaries of the related scores
3. Setting the standards and determining the optimal status of each indicator
4. Informing the one who is going to be evaluated about expectations and the indicators
5. Assessing and comparing the actual performance at the end of the evaluation period with the pre-determined appropriate standards.
6. Extracting and analyzing the results.

2-3) Balanced Scorecard (BSC) Method
Robert Kaplan and David Norton (1992) in the early nineties, after revealing the need for an integrated performance management system, which covers both traditional / quantitative and subjective / qualitative performance indexes, introduced a performance measurement tool called Balanced Scorecard BSC, which is now known as the most famous performance management framework (Niven P., R., 2006).

Balanced Scorecard is a management system which can manage the implementation of the strategies, and can measure the organizational performance in four dimensions: financial, customer, internal processes and learning and growth. These dimensions transfer and explain the mission, vision, strategies and performance expectations to all internal and external stakeholders of the organization. In other words, Balanced Scorecard can show the vision and mission of the organization in the form of a set of cause and effect relationships between the aforementioned four aspects (the same source).

1-2-2) introducing the Balanced Scorecard evaluating method
Balanced Scorecard as a performance measurement system, in addition to traditional financial evaluation, evaluates the organizational performance by adding three other dimensions i.e. the customer, internal business processes, learning and growth. Since they are not linked with the
organization's strategy, many of the institutional reform programs lead to disappointing outcomes.

By translating the vision and strategy of the organization to understandable phrases, this method prevents from different interpretation, and by aligning individual and organizational goals helps in successful implementation of the strategy. This method as a new approach in strategic management enables managers to express the organization's vision and strategy through measurable indices, and as a result, enables them to provide the organization's management system and performance evaluation with reliable and valid assessment tools.

The system is composed of four dimensions. First dimension translates the customer's point of view about the organization as a service to customers, and reflects specific measures of those cases that are important to customers. These measures are usually associated with time, quality, performance and service costs. Second dimension considers those internal processes which deal with performance measures that are vital for internal operations, and thus enables the organization to meet customer needs. Measures of this section include concepts such as quality, employee skills and productivity. Third dimension i.e. learning and development, describes the ability of an organization for innovation, improvement and the learning in relation to customer needs. Measures of this section usually focus on creating more value for customers, and creating continuous improvement in operating efficiency. Fourth dimension i.e. the financial perspective represents that targeting, implementation and performance help in improvement. Measures of this section are completed with the productivity and growth.

![Figure 1](figure1)

**Figure (1) dimensions of the Balanced Scorecard (Kaplan and Norton, 1940, p. 15)**

### 3.2) Framework of Performance Evaluation and analytical models

Analytical structure of the study has been shown in Figure 2. Performance analysis is done based on selected evaluation criteria. First, to calculate the weights related to performance evaluation indexes, FAHP approach was used. Then according to the obtained weights, two MCDM analytical tools, including SAW and TOPSIS was employed to rank and improve municipal performance, and to determine the best method as well. Fuzzy set theory concepts will be explained in details in the following sections.
4.2) Summary of previous studies on performance evaluation systems in different cities of the world

The result of the survey indicates that most of the developed countries use the balanced performance evaluation models to evaluate the performance of the organizations.

<table>
<thead>
<tr>
<th>Number</th>
<th>Municipality of Performance Evaluation System</th>
<th>Performance Evaluation Models Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Municipalities of Ontario State, Canada</td>
<td>Benchmarking</td>
</tr>
<tr>
<td>2</td>
<td>Municipality of Charlotte</td>
<td>Balanced Scorecard (BSC)</td>
</tr>
<tr>
<td>3</td>
<td>Municipality of Seattle</td>
<td>Balanced Scorecard (BSC)</td>
</tr>
<tr>
<td>4</td>
<td>Municipalities of Spain</td>
<td>EFQM and TQM</td>
</tr>
<tr>
<td>5</td>
<td>Municipalities of Philippines</td>
<td>Logical model</td>
</tr>
<tr>
<td>6</td>
<td>Municipalities of England</td>
<td>Balanced Scorecard (BSC)</td>
</tr>
<tr>
<td>7</td>
<td>Municipalities of Australia</td>
<td>Balanced Scorecard (BSC)</td>
</tr>
<tr>
<td>8</td>
<td>Municipalities of Finland</td>
<td>Balanced Scorecard (BSC)</td>
</tr>
</tbody>
</table>

In the past, more attention focused on evaluating the performance of staff, which is entitled as Personnel assessment in Iran. Today management science scholars pay a particular attention to the issue of performance management and the improvement of this management, and this is accomplished through organizational performance evaluation. These studies also show that, municipalities in developed countries, give a special attention to issues of strategic management, and basically set performance of their organization based on this strategic plan. As a result, the performance evaluation is defined based on strategic goals, objectives based action plans, indicators and quantitative targets.

History of performance evaluation in municipalities

Since 1359, the municipality personnel performance evaluation, was conducted only on the municipality's official personnel. Administration of municipal departments sent a list of personnel evaluation forms for official administrative units of regions, organizations and sub-offices at the beginning of March each year. And finally these forms with scores were entered in the recruitment file of personnel.

The evaluation of the performance of Qazvin Municipality is done based on Articles 81, 82 and 83 of Civil services management Act.

During a study conducted by Yüksel et al., 2010, entitled the use of fuzzy ANP for Balanced Scorecard; Case Study of a manufacturing company, the performance level of the business was determined based on an integrated model of the Balanced Scorecard with the fuzzy ANP and based on its vision and strategy. The proposed model showed that different measurement units which are related with the performance of the balanced scorecard and other performance measures can be integrated with fuzzy ANP technique. Based on the results, this model is capable of evaluating of a business performance in terms of a strategy, using both the results of past and current indicators and progress. In a study, Tsai and colleagues, 2008, used the combination of two ANP methods and TOPSIS to assess the performance of insurance companies in Taiwan. In their research, they used network analysis process ANP to achieve the criteria weights and TOPSIS method for ranking the obtained results from the previous step in insurance companies. To determine
their own criteria, they applied non-financial factors, such as quality of services of assurance and customer satisfaction as well.

In a study by Chiang in 2005, a dynamic approach based on BSC and AHP was proposed for vendor selection issues.

During their study, Clinton and Weber Vhasl, 2002, used AHP in implementing BSC. To assess key capabilities and competencies within the organization based on BSC, Hafiz, Zhang and Malik, 2002, used AHP (Mehregan and Neary, 2009).

In terms of objectives the present study is a functional one, and in terms of method it is a descriptive-analytic one, and the results will be used in evaluating the performance of municipalities in three regions of Qazvin municipality.

Analytical methods and Performance Assessment Framework

Analytical structure of the study has been described in Figure 2. First, using the library sources and field studies, as well as the opinions of the experts, municipal managers and mayors of Qazvin province, basic criteria were determined. Then, according to derived criteria, and using fuzzy multi-criteria decision-making methods (FAHP), criteria and sub-criteria were weighted, and then, based on these weights, and using analytical tools, the criteria were transferred to fuzzy multi-criteria decision-making, and finally using SAW and TOPSIS models, central and three municipal areas of Qazvin, were ranked in terms of improved performance, and the best option was chosen.

Performance evaluation of the municipal areas of Qazvin

In this paper, the four dimensions of the Balanced Scorecard have been used as a framework for evaluating the performance indicators (Figure 2). Balanced Scorecard Performance Assessment Framework hierarchical criteria, the results, the analyses and the discussions related to Qazvin Municipality in the areas are listed below.

Hierarchical framework of Balanced Scorecard Performance Evaluation Index

Using the four perspectives of BSC, and reviewing research literature, performance evaluation indicators of municipality were summarized, and then after screening the suitability of the indexes, 52 evaluating indices were selected by academic experts and the mayors of Qazvin province. The 52 indexes of evaluation were grouped in four dimensions of BSC, each dimension consisting of 13 indexes. BSC performance evaluation index hierarchy of the municipality and the labels of the indexes are shown in Figure 3.

Figure 3, BSC performance evaluation index hierarchy of the municipality
Weighting the evaluation criteria
The relative importance (fuzzy weights) of each of the performance indicators has been listed by FAHP. The results showed that the most important dimension, from among the four dimensions of BSC, is that of the internal processes (0.261), then the customer dimension (0.259) and the next one is the financial dimension (0.241), and finally the dimension of learning and development (0.239) goes at end of the rank.
Rating the Performance of municipalities

In this study, three regions and the central municipal council of Qazvin have been studied by experts based on the evaluation criteria. Although there are subjective differences in the ways in which experts see the assessment indicators in terms of the judgment, for combining the ideas of different experts, in order to achieve a rational and objective assessment, overall insight into the fuzzy assessment has been used in this study. In this study, to measure the performance of municipalities in accordance with the evaluation criteria, the five linguistic variables i.e. "strongly disagree", "disagree", "No comment", "agree", "strongly agree", were used. Each of these linguistic variables falls in the range of 0-100, and is displayed by TFN. The average amount of each of fuzzy indicators of municipality has been integrated with different experts' opinions.

Then based on the fuzzy weighted evaluation criteria which have been calculated based on FAHP, TOPSIS analytical tool has been used to rank the performance of the municipalities. Graph 1 represents the rankings of the municipalities, and Graph 2 shows the rankings of the dimensions of BSC.

Graph 1: the rankings of the municipalities

Graph 2: the rankings of the dimensions of BSC
In the final stage we consider the research hypotheses.

The main hypothesis: It is possible to evaluate the performance of municipalities of Qazvin City using the Balanced Scorecard (BSC) model, with Fuzzy Multi-Criteria Decision- Making (FMCDM) approach.

Sub-Hypotheses:
1. The possibility of making indexes for assessing the municipal performance has been fulfilled in terms of the financial dimension.
2. The possibility of making indexes for assessing the municipal performance has been fulfilled in terms of the citizens (customers) dimension.
3. The possibility of making indexes for assessing the municipal performance has been fulfilled in terms of the internal dimension.
4. The possibility of making indexes for assessing the municipal performance has been fulfilled in terms of the learning dimension.

Among all hypotheses, 132 cases are located above 0.70 percent (i.e. above the median), and in 40 cases, smaller or equal to the median. Thus, it is expected that the zero hypotheses to be rejected. Based on the obtained p value, which is equal to 0.002, at the level of 0.05, the null hypothesis is rejected, and the hypotheses of the study are confirmed. Using Friedman test the rank and the degree of strength of the hypotheses can be compared.

Table (2) test results of comparing the rating average of the hypotheses using Friedman

<table>
<thead>
<tr>
<th>hypothesis</th>
<th>rating average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Third hypothesis</td>
<td>2.78</td>
</tr>
<tr>
<td>Second hypothesis</td>
<td>2.70</td>
</tr>
<tr>
<td>First hypothesis</td>
<td>2.29</td>
</tr>
<tr>
<td>Fourth hypothesis</td>
<td>2.23</td>
</tr>
</tbody>
</table>

Table (3) test statistic and the significance level of Friedman test for comparing the Ratings of the hypotheses

<table>
<thead>
<tr>
<th>Number</th>
<th>Statistic value</th>
<th>Degree of freedom</th>
<th>significance level</th>
</tr>
</thead>
<tbody>
<tr>
<td>132</td>
<td>18.96</td>
<td>3</td>
<td>0.000</td>
</tr>
</tbody>
</table>

Since the p value is zero, and this value is less than 0.01, it can be concluded that at the level of 99 percent of confidence, the null hypothesis is rejected. Thus, as it is obvious, H0 is rejected, that is, the ranks’ averages of the hypotheses are not the same. Using this test, one can determine the possibility of fulfillment of different hypotheses (for example, comparing the possibility of making indexes in terms of different dimensions, and then finding out which one is the most possible one to be fulfilled). According to this study, and based on the Friedman test, it was observed that the possibility of indexing from internal dimension is higher.

Conclusion
One of the problems in the traditional way of evaluating the performance, is its one-dimensionality. For example, the area where has earned more income in one year, is placed in a better place. And the amount of its contribution to public services of the municipality will never be considered.

Besides, since the new method of performance evaluation is comprehensive, it provides analysts with further analysis as well as forecasting the future. According to the above analysis, municipality of District 2 has won the first place.
1. Any area is different from other areas of Qazvin city in terms of capacity, functionality, characteristics and needs, so priorities and mechanisms of quantitative and qualitative municipal services will vary, and in assessing the performance of municipal services, we cannot compare these three municipal areas together.

2. Based on the framework of the regulations, the district mayor and his deputies have the authority needed for regional development in different fields, including: urban services, green space affairs, cultural and social, transport and traffic, construction affairs, urban planning and architecture, budgeting and gaining revenue, however; in this framework of duties has nothing been envisaged on defining strategies, reforming the practices and processes, and reforming the systems related to human resources management.

3. The organizational structure of municipality areas, like the central municipality of Qazvin, is widespread in the deputy level, and the mayor's supervision domain is vast. Since administrative and personnel costs are high in comparison to the total funds ratio of municipalities of regions, is a sign of inefficiency in existing structure.

4. At the present time, municipalities' performance is elaborated by providing statistics of the different fields of activities. Provided statistics demonstrate the amount and the growth of activities in various fields. However; some statistics should also be provided about the quality parameters of such efforts.

5. Considering that so far, operating budgeting has not been implemented in the municipality of Qazvin, none of the sub-municipalities use operating budgeting system, and thus the cost of municipal services has not been calculated in any of the areas.

6. Reviewing the documents showed that in the majority of sub-municipalities have not taken significant actions on documentation, modification of the procedures. In some areas, over the years, all business processes have been documented. However, business procedures have not been amended and revised, and just the urban system has been mechanized.

2-5) Executive suggestions

According to the results of this research, suggestions which can be presented to the municipalities of our study are as follows:

1. Codification of qualitative and quantitative standards for each service
2. Conducting regular surveys on citizens' satisfaction of the services provided by the municipalities, and using the feedback to improve services
3. Documentation and standardization of business procedures (including steps to perform each method, time spent in each part of the activities, and the operators of the activities), and establishment of quality management systems rather than individual and subjective management.
4. Mechanizing the procedures.
5. Enhancing the quality of human resources, through recruiting and professional work force, and providing training programs and modules for each municipality job.
6. Using the comments and participation of employees of the municipality to resolve problems and improve the municipality.
7. Establishing an operating budgeting system, and determining the cost of services for the proper allocation of financial resources
8. The optimal use of available resources, and avoid wasting them
and finally
9. A kind of reverse engineering is done with the pilot implementation of this system, in identifying strengths and weaknesses of municipalities and Beautification Organization.

(B) suggestions for further research
If you are interested in the selection of research of this kind, the following topics are also recommended:
1. The necessity of obtaining certificates of quality, safety and occupational health, environmental and other quality standards, and its effect on employee motivation and citizens' satisfaction of performance.
2-In this study the assumption was that the political and economic conditions are stable, and the emergence of unstable states in political and economic conditions, such as a sudden increase in the dollar exchange rate was not considered.
3. The researchers of future researches are recommended, if possible, to use more indicators in decision-making. This leads them to more powerful decision-making, and the results will be more accurate.

3-5. Limitations of the study
1. The instrument of collecting information was limited to a questionnaire.
2. Latency and delay of authorities to verify the questionnaire in terms of the security
3. Lack of the access to more updated information
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