Performance evaluation of branches Postbank of Iran management of district two branches using combination of clustering, and fuzzy TOPsis

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Abstract
Many countries and governments are trying to expand relations in various economic, political, social and cultural fields that is why new organizations are founded. Financial Post or Post Bank is one of these organizations. In today's economy and society, the banking industry is of significant importance for individual subjects. Any problem that occurs in current bank system directly affected stakeholders and general economy. According to functions and role of banks in the development of the country as well as their branches in measurement and performance scale are important issues. In recent years, performance management is considered as one of the strategies for the development and updating of human resources which leads to quality improvement and labor productivity. This study in connection with all branches in region two regarding Post Bank of Iran in Tehran intends to apply results of performance evaluation to make decisions in accordance with competitive and sophisticated situations by the use of combining clustering and fuzzy TOPSIS model. Therefore, data obtained from these parameters and indicators concerning branch manager performance using clustering method are combine and classified. Also, by the use of fuzzy TOPSIS method, hierarchy is prepared. The results indicate that the branch manager performance of region two regarding Post Bank of Iran with respect to indicators such as current assets, non-current assets, current liabilities, non-current liabilities and the number of customers using a combination of clustering and fuzzy TOPSIS evaluation is appropriate.

Here are twenty nine branches were evaluated according to criteria. The first cluster, which includes branches Shahrake-e-Gharb, Kooy-e-Daneshgah, Tajrish, Shahr-e-Rey and Shahid Mofateh is gained first place, The fifth cluster includes branches Ferdowsi, Mollasadra, Vanak, Damavand and Roodehen, second, The fourth cluster includes branches 15 Khordad, Resalat, Eastern Shush, Shahid Fallahi, Majles, Nabovat and firoozkooh,third, The third cluster includes branches Imam Khomeini, Afrigha Blvd, Pol-e-Chooobi, Piroozi, Shariati, Shahid Beheshti and Varamin, forth and second cluster includes branches Afsarie, Pars Navard,Rostam Abad, Sarcheshme and Pakdasht were gained fifth place.

Keywords: Branch performance, Post Bank, Clustering, Fuzzy TOPsis.
1 Introduction

The current era is called ultra-modern era. This era have characteristics of constant change and complexity in the structure. In this case, managers, who have adequate, up to date, comprehensive information of the performance of their organizations and make the right decision in an appropriate time to refine and improve their organizations in accordance with changes, can be successful. Performance appraisal, at organizational, sectional or individual level, is a response to the managers’ informational needs at the present time to take step towards developing the strengths and removing the weaknesses. Moreover, today, considering the competitive environment and technological improvement, which is performed in the process of offering service, banking industry has moved its strategic focus from price and technical aspects to the quality of services and customers’ satisfaction [14].

In today’s economy and society, banking industry is of great importance for each individual of the society. Any problem, which occurs in the current system of bank, directly affects the beneficiaries as well as general economy. Therefore, improvement in banking sector has a profound, cross-impact on other sectors of the economy. So, it is absolutely necessary to study the performance of the branches of banks. In recent years, performance management has been considered to be one of the strategies for developing and updating the human resources, and improving the quality and productivity of the workforce. It is clear that courageous and creative workforce is one of the most efficient elements of the organization in terms of producing and offering service to the customers. The development of the tasks in the organization has made performance appraisal inevitable. Also, dramatic developments of the knowledge management have influenced the evaluation mechanisms. What is now known as performance appraisal has investigated monitoring with a guiding view, and seeks to develop performance. According to this development, it is necessary to design the appraisal systems in consistence with the statuses and functions of the organizations. To gain and maintain a competitive advantage, the organizations should seriously evaluate their performance and pay attention to financial and non-financial dimensions (whether qualitative and quantitative). Measuring the performance of an organization is so important that the knowledge management experts believe that what cannot be measured cannot be managed. Accordingly, many methods and techniques are presented to evaluate the performance, but what is more important is to have a systematic approach to the performance of an organization. Byars and Rue defined performance appraisal as the process of evaluating and communicating with employees in how they can do their tasks and improve their performance. In this case, performance appraisal not only allows the employees to know how their performance is but also affects their level of effort and future [1]. Foot and Hook believed that personnel appraisal is a formal process of evaluating and providing feedback to the employees about the features and the method of doing their job and recognizing their potential talents to flourish in the future [6]. Moreover, Carell et al defined performance appraisal as ongoing process of evaluation, human behavior and output management and in workplace [3]. Neely et al noted that performance measurement literally is the process of quantifying action, where measurement is the process of quantification and action leads to performance [10]. In investigating the philosophy of the existence, we face two points of view. The first one is a traditional view the most important goal of which is to evaluate, judge and recall the performance, and the latter is a new approach to evaluation the most important goal of which is to evaluate, judge and recall the performance. Investigating different approaches to the performance appraisal indicates that the evaluation system should be in consistence with the growth and development of the organizations, and respond to their different, various dimensions. The development of technology, the role of the critical factors of the success in performance, the structure of the domestic and global competition, the advantage of the quality, the position of the organizations and the products and services offered by them to the market and customers, etc. are factors which should be considered in performance appraisal. Another point to which a considerable attention is paid is that there is a considerably important relationship between the results (outputs), processes evaluation and inputs. Today, the prevailing thought is that modifying the inputs and the operation process logically leads to offer
appropriate services and goods. In many organizations, performance evaluation is an integral part of the human resource management programs and a very efficient tool for professional development, and is used for multiple purposes. According to Bernadin et al, data from the performance measurement is widely used for compensation, performance improvement and documentation. It can be also used for making decisions about the employees (e.g. promotion, transfer, dismissal, dismissal from service), analyzing training needs, developing employees, conducting research and program evaluation. One of the methods to calculate the efficiency for units with multi-inputs and multi-outputs is Data Envelopment Analysis (DEA)[2]. Using this method, efficient and inefficient branches can be distinguished, inefficient branches can be ranked, and a reference can be selected from among the efficient branches to achieve the efficiency frontier. Also, the effect of each variable on the level of efficiency can be identified. CAMEL, which is another model to evaluate the performance of the banks and non-bank credit institutions, investigated and evaluates five areas of the managerial and financial areas. These five areas are capital adequacy, asset quality, management, earnings and liquidity. In 1995 the Federal Reserve and the OCC replaced CAMEL with CAMELS, adding the “S” which stands for financial (S) system. This covers an assessment of exposure to market risk and adds the 1 to 5 rating for market risk management [4].

2 Literature review

Some of the studies conducted on evaluating the performance appraisal of foreign and domestic banks are as follows:

Manandhar and Tang believed that the existing studies on efficiency evaluation of bank branches using a data envelopment analysis (DEA) technique have not considered intangible aspects associated with resource inputs in the branches. The intangible aspects of resource inputs in a branch characterize the effectiveness of service delivery system in supporting efficient and quality service delivery to external customers. In order to fill this gap, they developed a framework for incorporating this aspect into a DEA framework in the form of internal service quality. They suggested that the simultaneous benchmarking of the performance of bank branches along multiple dimensions using a modified DEA formulation. The dimensions of performance considered were internal service quality, operating efficiency, and profitability [9]. Paradi and Schaffnit focused on evaluating the performance of the commercial branches of a large Canadian bank using data envelopment analysis. They considered two production models in their country-wide evaluation. One model, looking directly at resource usage, was most useful to the branch manager. The other model, incorporating financial results, was more geared towards senior management [11]. Delghani et al investigated ranking and evaluating the performance of Shahr bank located in Iran using balanced scorecard approach and TOPSIS. They used three questionnaires were used including paired comparisons, employees’ satisfaction and customers’ satisfaction. The results of AHP paired comparison showed that from among the four dimensions of balanced scorecard, the dimension of customer was of a great importance following the financial dimension. The dimensions of internal process, and learning and growth had a same importance [5]. Salehi et al presented a comprehensive model for evaluating the performance of the Ghavamin bank located in Iran. After the approval of the mode, they assessed the performance of the branches of Tehran. The model was presented in three dimensions but finally two dimensions were confirmed. The most important aspects of innovation in their study was paying attention to the dimensions of customers’ and employees’ satisfaction as well as indices which are used somehow less in banking industry in Iran [13]. Sarabadani et al examined and developed a strategic program to assess feasibility of business logic development. They attempted to explain the necessary feasibility for this development process of bank using data relating to post bank [14]. Therefore, using SWOT model, making comparison and IT-IS support assistance tools, the field for making optimal decision was provided. According to SWOT analysis, weakness had the greatest importance from the respondents’ points of view, and post bank management should strive hard to strengthen the weaknesses.
3 Models and methodology

3.1. Cluster analysis

Cluster analysis is the task of grouping a set of objects in such a way that objects in the same group (called a cluster) are more similar (in some sense or another) to each other than to those in other groups (clusters). Clustering differs from classification. This difference is related to the labeled or non-labeled groups. In clustering, groups are not determined in advance [16].

One of the applied methods of clustering is k-means clustering which can be defined as the k-cluster centers and assign the objects to the nearest cluster center, such that the squared distances from the cluster are minimized. One of the problems of KM algorithm is that the results of clustering are sensitive to the selection of initial cluster centers and converge to the local optima [7]. The algorithm performs well when the clusters are as the separate, dense clouds. This method is effective and upgradable for relatively large databases but it often leads to a local optimum. Disadvantages of this method are determining the number of clusters which should be pre-determined and no efficient is proposed for determining it. Furthermore, it is not suitable for determining the clusters with complex forms. One of the disadvantages of this method is its sensitivity to data which are not close to the center. These data easily change the centers, and may not yield good results [16].

K-Harmonic Means (KHM) is an algorithm which was proposed in 2002 and aimed at minimizing the harmonic average from all points in N to all centers in K. KHM algorithm attempts to solve the initiation problem in KM algorithm. Therefore, to achieve a better clustering algorithm, we should find a way to overcome the problem of falling prey to local optimum [7].

3.2. Fuzzy TOPSIS

When multiple variables are considered for multiple criteria decision-making, it is called Multi-Criteria Decision-Making (MCDM). Any type of decision-making problem with m option, which is calculated with n criteria, can be considered as a geometrical system of m points in an n-dimensional space.

A decision-making problem with m options and n criteria can be expressed as follows:

\[
G = \begin{bmatrix}
A_1 & C_1 & C_2 & \cdots & C_n \\
A_2 & G_{11} & G_{12} & \cdots & G_{1n} \\
\vdots & \vdots & \vdots & \ddots & \vdots \\
A_m & G_{m1} & G_{m2} & \cdots & G_{mn}
\end{bmatrix}, W = [W_1, W_2, \ldots W_n]
\]

Where A1,A2,...,Am are the options, C1,C2,...,Cn are the criteria of evaluation, Gij is the rate of option evaluation, Ai is influenced by Cj, and Wj denoted the weight of Cj [12].

Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS) was originally developed by Yoon and Hwang in 1981. TOPSIS is based on the concept that the chosen alternative should have the shortest geometric distance from the positive ideal solution and the longest geometric distance from the negative ideal solution [17]. Both library and field study were used as data collection tools.

4 Inputs and Outputs data

As we know, for clustering features and criteria should be considered that the separation of the branches to the different groups and clusters can be possible. The criteria used for clustering twenty-nine branches of Postbank of Iran management of district two branches with regard to the measures introduced by the institute of Iran banking, which is under the supervision of the Central Bank, are: number of customers, current assets (cash, receivables from central banks, receivables from banks and other credit institutions, receivables from government facilities and the demands of non-governmental entities, investments in stock), non-current
assets (fixed assets, both tangible and intangible and other assets, items on the way), current liabilities (the central bank debt, debt to banks and other credit institutions, credit unions, savings and other deposits, profits, stock payable, taxes payable), non-current liabilities (deposits, investment deposits term, other deposits and advance receipts, deposits and other liabilities, reserve staff termination benefits, shareholders equity)

5 Using clustering and Fuzzy TOPSIS

In this method, first, the branches of banks were divided into several main clusters using multi-mean clustering method. Then, the performance of these clusters was evaluated using fuzzy TOPSIS. As it was mentioned above, some features and criteria are considered to make it possible to divide the branches into groups and clusters.

After scaling the data using Simple k-means, data were clustered respectively as k=1,k=2,k=3,…k=n. in each step, the results were assessed. Finally, with 5 clusters, 29 samples were selected from branches to form the following table is clustered:

<table>
<thead>
<tr>
<th>Criteria</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current assets</td>
<td>4.50</td>
<td>2.48</td>
<td>3.54</td>
<td>3.19</td>
<td>3.64</td>
</tr>
<tr>
<td>Non-current assets</td>
<td>4.33</td>
<td>2.60</td>
<td>3.59</td>
<td>3.27</td>
<td>3.69</td>
</tr>
<tr>
<td>Current liabilities</td>
<td>4.17</td>
<td>2.56</td>
<td>2.80</td>
<td>3.14</td>
<td>3.95</td>
</tr>
<tr>
<td>Non-current liabilities</td>
<td>4.15</td>
<td>2.92</td>
<td>3.47</td>
<td>3.22</td>
<td>3.60</td>
</tr>
<tr>
<td>Number of customers</td>
<td>4.17</td>
<td>2.50</td>
<td>3.04</td>
<td>3.26</td>
<td>3.80</td>
</tr>
</tbody>
</table>

here we have the criteria weight vector matrix that asset and number of customers have positive utility and liabilities has negative utility:

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Current assets</th>
<th>Non-current assets</th>
<th>Current liabilities</th>
<th>Non-current liabilities</th>
<th>Number of customers</th>
</tr>
</thead>
<tbody>
<tr>
<td>criteria</td>
<td>(0.2,0.2,0.2)</td>
<td>(0.14,0.15,0.18)</td>
<td>(0.20,0.2,0.20)</td>
<td>(0.20,0.2,0.20)</td>
<td>(0.25,0.22,0.2)</td>
</tr>
</tbody>
</table>

Here are the numbers achieved in the first row are positive ideal and the numbers achieved in the second row are ideal counter:

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Current assets</th>
<th>Non-current assets</th>
<th>Current liabilities</th>
<th>Non-current liabilities</th>
<th>Number of customers</th>
</tr>
</thead>
<tbody>
<tr>
<td>(0.14,0.18,0.2)</td>
<td>(0.09,0.14,0.18)</td>
<td>(0.02,0.06,0.1)</td>
<td>(0.14,0.18,0.2)</td>
<td>(0.17,0.19,0.2)</td>
<td></td>
</tr>
<tr>
<td>(0.02,0.06,0.1)</td>
<td>(0.01,0.04,0.09)</td>
<td>(0.14,0.18,0.2)</td>
<td>(0.18,0.2,0.2)</td>
<td>(0.12,0.15,0.18)</td>
<td></td>
</tr>
</tbody>
</table>

And now we have relative closeness to the positive ideal solution matrix:
Table 4: Relative closeness to the positive ideal solution matrix.

<table>
<thead>
<tr>
<th></th>
<th>Positive ideal</th>
<th>Final ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td>First cluster</td>
<td>9.210609</td>
<td>1</td>
</tr>
<tr>
<td>Second cluster</td>
<td>2.378114</td>
<td>5</td>
</tr>
<tr>
<td>Third cluster</td>
<td>3.094706</td>
<td>4</td>
</tr>
<tr>
<td>Forth cluster</td>
<td>3.727658</td>
<td>3</td>
</tr>
<tr>
<td>Fifth cluster</td>
<td>4.490053</td>
<td>2</td>
</tr>
</tbody>
</table>

And this the ranking chart:

![Figure 1: Ranking for clusters.](image)

### 6 Conclusion

In this paper, 5 criteria to 5 clusters in clustering has been found, except the current liabilities criterion, other criteria such as current assets, non-current assets, non-current liabilities and the number of customers, in the first cluster has more average than other clusters. Indicators intended for clustering centers have been determined. in the 5 clusters compared, the first cluster of the criteria have been better. The most effective clustering for measures by ANOVA analysis, be determined by number of customers and current liabilities. Finally according to review of Fuzzy TOPSIS, the first cluster was ranked first, the fifth cluster was in the second place, the forth cluster was in the third place, the third cluster was in the forth place and the second cluster was in the last and fifth place.

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