**International Journal of Human Capital in Urban Management**
(IJHCUM)

Homepage: http://www.ijhcum.net/

ORIGINAL RESEARCH PAPER

# Constructing the organizational excellence model using technique for order of preference by similarity to ideal solution and Analytic hierarchy process

**K. Fahimi*, M. Amirabadi**

*Planning, Human capital development and Council Affairs department, Tehran municipality, Tehran, Iran*

**ARTICLE INFO**

***Article History:***
Received 23 June 2023
Revised 18 August 2023
Accepted 23 September 2023

***Keywords:***
Analytic hierarchy process (AHP)
European Foundation for Quality Management (EFQM)
Excellence model
Performance assessment
Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS)

**ABSTRACT**

**BACKGROUND AND OBJECTIVES:** Excellence models are essential for organizations to improve performance. Deming Prize, Canada Awards for Excellence, Malcolm Baldrige National Quality Award, and European Quality Award are the most well-known excellence models worldwide. These models do not present any mathematical model in accordance with a comprehensive step-by-step roadmap for implementation. Moreover, they are general models and have not been customized for a specific organization. So, this article presents a comprehensive, graphical, step-by-step roadmap to implement an excellent model for Tehran Municipality that is elevated by Technique for order of preference by similarity to ideal solution and analytical hierarchical process to make decisions by mathematical analysis.

**METHODS:** Different excellence and performance models have been studied, and then an excellence model for deputies of Tehran Municipality is designed. Also, an Analytical hierarchical process for weight extraction and a Technique for order of preference by similarity to an ideal solution for ranking is applied.

**FINDINGS:** A novel excellence model for deputies of Tehran Municipality has been developed. Strategies, goals, objectives, targets, critical success factors, and general, proprietary, and transaction indexes are defined. Analytic hierarchy process calculates weights of indexes based on arbitrary data, and results are presented in 11 Tables. The most important index was the proprietary index, with a weight of 70% for the deputy of technical and construction. The less important index was the general index for the deputy of planning, human capital development, and council affairs, weighing 8%. Moreover, deputies of Tehran Municipality have been ranked by TOPSIS. The best deputy got 71%, and the worse got 7% scores.

**CONCLUSION:** This study constructed a customized five-step excellence model for Tehran Municipality to reach excellence. The model can help Tehran Municipality for better urban planning. Step one constructs the performance assessment team. Step two extracts indexes by brainstorming method with the help of the European foundation for quality management model. Step three collects, cleans and loads the data in the data warehouse. In step four, weights of the indexes and facets are calculated based on AHP, and then facets, indexes, and goals are ranked by technique for order of preference by similarity to ideal solution as an effective multi-criteria decision making tool. Finally, the model has been implemented at offices of plan monitoring, project control, and performance evaluation in planning, human capital development, and council affairs department at Tehran Municipality.

DOI: 10.22034/IJHCUM.2024.01.11

| NUMBER OF REFERENCES | NUMBER OF FIGURES | NUMBER OF TABLES |
|---|---|---|
| 43 | 5 | 17 |

*Corresponding Author:
Email: *fahimikaveh@gmail.com*
Phone: +9896014560
ORCID: 0000-0001-9012-0097

Note: Discussion period for this manuscript open until Aptil 1, 2024 on IJHCUM website at the "Show Article.

## INTRODUCTION

Performance management is essential for each company to improve performance and achieve excellence (Tomaževič *et al.*, 2017; Bdour *et al.*, 2023). Organizations need an integrated model to identify opportunities and problems to help them improve their processes, achieve their goals and make steps toward their missions and visions (Mendes *et al.*, 2012). Performance management uses an integrated system and technology to measure and improve the performance of organizations according to their missions and visions (Wongrassamee *et al.*, 2003; Mansour, 2023). In addition to conventional management practice, finding success criteria is essential to obtaining excellence (Andersen *et al.*, 2000). Standard organizational improvement tools include enterprise resource planning, supply chain management, business intelligence systems, performance management systems, business process modeling, project management, total quality management, lean management, performance management, and strategic management. Through these models, excellence models concentrated mainly on showing the way to reach excellence, and each country usually developed its customized model (Andersen *et al.*, 2000). Fig. 1 presents the Deming Prize, globally known as the first excellence model introduced by the Union of Japanese Scientists and Engineers in 1951 (Union of Japanese Scientists and Engineers, 2010). Fig. 2 presents the Canada Awards for Excellence (National Quality Institute, 2007) as the next excellence model. Malcolm Baldrige National Quality Award (MBNQA) (Fig. 3) was introduced in the USA in 1987 (National Institute of Standards and Technology, 2010). The European Quality Award (known as the ''European Excellence Award'' since 2004), based on the European Foundation for Quality Management (EFQM) model (Fig. 4), was established in 1991 (European Foundation for Quality Management, 2019). Many more excellence models were developed based on the EFQM and MBNQA in various countries like India in 1994, Singapore and Japan in 1995, the Philippines in 1997, Fiji in 1998, and Thailand in 2001 (Talwar, 2011).

Excellence models consider processes, customers, and stakeholders and try to improve the performance of the organizations. However, they are general and not customized for a specific organization and do not have explicit, step-by-step, and comprehensive guidelines for customization. The excellence models primarily consider leadership, strategic planning, people, supplier/partner, customer, knowledge and information management, processes, society, and business results (Andersen *et al.*, 2000). In addition, the Balanced Score Card (BSC) (Kaplan and Norton, 1992) can translate an organization's mission and strategic objectives into a set of performance measures in four general perspectives: financial, customer satisfaction, internal processes, and learning and growth. So, BSC can help managers to have an operational view of their organization's perspectives. Wongrassamee *et al.* (2003) compared EFQM and BSC as prominent performance management tools. Santos-vijande and Alvarez-gonzalez (2007) developed an instrument for measuring Total Quality Management (TQM) implementation following the EFQM excellence model. They provided empirical evidence on the relationship between management practices and measures of business performance. Vukomanovic *et al.* (2007) introduced an integrated model for performance management in a construction company based on EFQM and BSC principles in the construction industry. Belvedere *et al.* (2018) used the EFQM model as a reference framework for designing a multi-objective performance measurement system for the procurement function of a company. Andersen *et al.* (2000) compared EFQM and BSC as the two primary tools for assessing the performance of an organization. Shahin *et al.* (2012) found the weaknesses and strengths of EFQM and BSC models and then proposed an integrated model based on them. Westerveld (2003) described the project excellence model adapted from the EFQM model. Bou-Llusar *et al.* (2009) analyzed how the EFQM excellence model captures the main assumptions involved in the TQM concept. Doeleman *et al.* (2014) have done a literature review on empirical evidence on applying the EFQM model. Ritchie and Dale (2000) have done a study of self-assessment practices in 10 organizations. The research was carried out by semi-structured interviews directed toward various issues related to the process, practice, and management of self-assessment. Den Hartog *et al.* (2004) presented a model for performance management combining insights from strategic human resource management and work and organizational psychology. Folan and Browne (2005) reviewed performance management and described

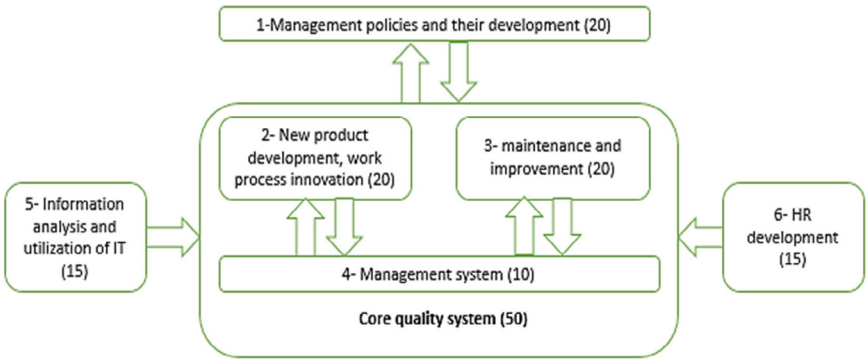


Fig. 1: Evaluation items of basic categories under the Deming application Prize (Union of Japanese Scientists and Engineers, 2010)

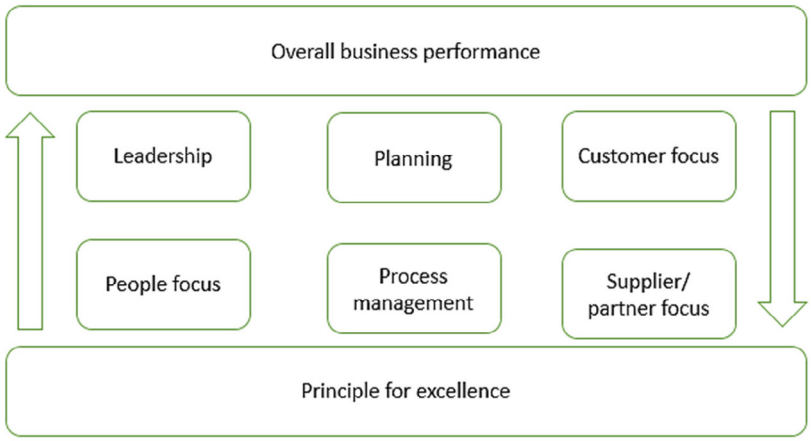


Fig. 2: Framework of Canadian award for excellence (National Quality Institute, 2007)

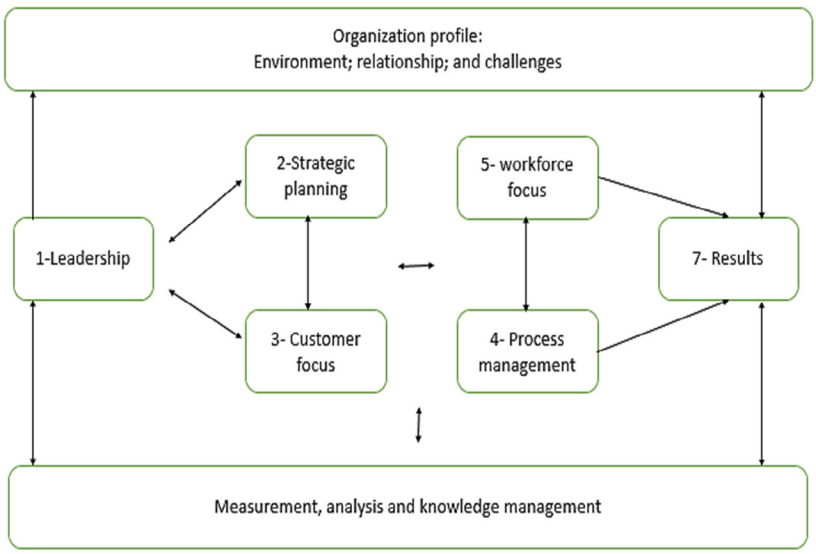


Fig. 3: Framework of the MBNQA (National Institute of Standards and Technology, 2010)


Fig. 4: Framework of the EFQM model (European Foundation for Quality Management, 2019)

the evolution of performance measurement in four sections: recommendations, frameworks, systems, and inter-organizational performance measurement. Kagioglou *et al.* (2001) presented a framework that ensured effective strategies were deployed to form the performance management system that construction organizations could adopt. Kloot and Martin (2000) used four dimensions of the Balanced Scorecard (Finance, Community, Internal Business Processes, Innovation, and Learning) to research local government performance management systems. Flapper *et al.* (1996) have explored baselines for moving from performance measurement to performance management. Kanji and Wong (1999) reviewed the relationships between TQM and Supply Chain Management (SCM) and concluded that existing supply chain models have inadequacies that TQM principles and concepts can enrich. Khalif and Hassan (2022) used fuzzy logic to improve the performance of the EFQM. Rodríguez-González *et al.* (2020) described the value of the EFQM model as a quality framework for improving the performance of a hospital pharmacy department. Liu Y *et al.* (2021) confirmed the need to adjust the EFQM model, used the restaurant industry as an example and applied Fuzzy AHP (FAHP) to give each attribute and sub-attribute a new, accurate score. e Sá and Fernandes (2020) validated and refined the use of the EFQM model in the municipality of the center region of Portugal. Keshtegar *et al.* (2021) analyzed the impact of business intelligence on enablers of the EFQM excellence model with the mediating role of knowledge sharing. Regarding the literature review, none of the above-mentioned models explicitly mention the application of the Multi-Criteria Decision Making (MCDM) model. Moreover, the weights of the elements are fixed, and the aggregation method to reach a final score is not explained. MCDM models can be used for weight calculation and score aggregation. The AHP, as proposed by Saaty (1987), which reduces complex decisions to a series of pairwise comparisons and can extract weights of indexes, is a common technique in MCDM to extract the weights. Vukomanovic and Radujkovic (2013) used AHP for setting priorities among competitive strategic objectives and afterward for selecting criteria for the construction industry and then integrated EFQM and BSC to conduct benchmarking, identify best practices, align strategy with the competitive surroundings and selecting strategy aligned with the selected criteria. Araujo *et al.* (2018) applied a two-stage approach of TOPSIS in public hospitals in 92 Rio de Janeiro municipalities. Sun (2010) developed an evaluation model based on the FAHP and Fuzzy TOPSIS (FTOPSIS)

to help industrial practitioners evaluate performance in a fuzzy environment. Yadav *et al.* (2018) have reviewed industrial applications of the TOPSIS approach. Sehhat *et al.* (2015) have developed an evaluation model considering the indicators identified; in assessing seven insurance companies in the ranking and weighting of these criteria and companies, the AHP and TOPSIS technique has been used. Kumar *et al.* (2020) prioritized attributes for successfully implementing agile manufacturing using a combined AHP and TOPSIS approach in the Indian manufacturing industry. Aydin *et al.* (2012) proposed an integrated approach based on AHP and EFQM models to evaluate business performance excellence. Golpîra (2014) employed an FTOPSIS to evaluate project management standards based on the criteria introduced by EFQM to have a framework to compare standards as a comprehensive method. Azar *et al.* (2011) presented an integrated model with the BSC framework for supplier selection strategy. Mirfakhredini *et al.* (2013) proposed a model to assess the performance of sports organizations with BSC and TOPSIS. Gholipour and Ebrahimi (2018) used TOPSIS to rank alternative municipal districts based on the weighted human capital criteria. Table 1 compares this study with the related literature.

According to the literature review, no study shows how to customize and apply an excellence model in a decentralized organization. Also, none of the above-mentioned articles integrated an excellence model and performance management system. Municipalities are institutions of state administrations characterized by high specificity of functioning. So, most of the time, they are decentralized. Therefore, this study presented a customized, comprehensive, step-by-step excellence model for Tehran Municipality as a decentralized organization. The main questions are: How can an excellence model and a performance management system be used in Tehran Municipality? How an excellence model and performance management system can be integrated? How multi-criteria decision-making tools can be applied in an excellence model? How can an excellent model be customized to be implemented in Tehran Municipality? The current study has been carried out in offices of plan monitoring, project control, and performance evaluation in planning, human capital development, and council affairs department at Tehran Municipality in 2023.

## MATERIALS AND METHODS

The excellence model for deputies of Tehran Municipality is presented here.

### *Survey design and data collection*

The excellence model for deputies of Tehran Municipality is depicted in Fig. 5. EFQM enhances the proposed model. AHP and TOPSIS as MCDM tools are used for mathematical calculations. The model is constructed based on five steps. Step one constructs the performance assessment team. Step two extracts indexes by brainstorming method with the help of the

Table 1: literature comparison by the study

| AHP/FAHP | TOPSIS/FTOPSIS | EFQM | Sources |
|---|---|---|---|
| ✓ | | ✓ | Vukomanovic and Radujkovic, 2013 |
| | ✓ | | Yadav *et al*., 2018 |
| ✓ | ✓ | | Sun, 2010 |
| ✓ | ✓ | | Sehhat *et al*., 2015 |
| ✓ | ✓ | | Kumar *et al*., 2020 |
| | ✓ | | Araujo *et al*., 2018 |
| ✓ | | ✓ | Aydin *et al*., 2012 |
| | | ✓ | Belvedere *et al*., 2018 |
| | ✓ | ✓ | Golpîra, 2014 |
| | ✓ | | Gholipour and Ebrahimi, 2018 |
| | | ✓ | |
| | | ✓ | |
| ✓ | | ✓ | |
| ✓ | ✓ | ✓ | |

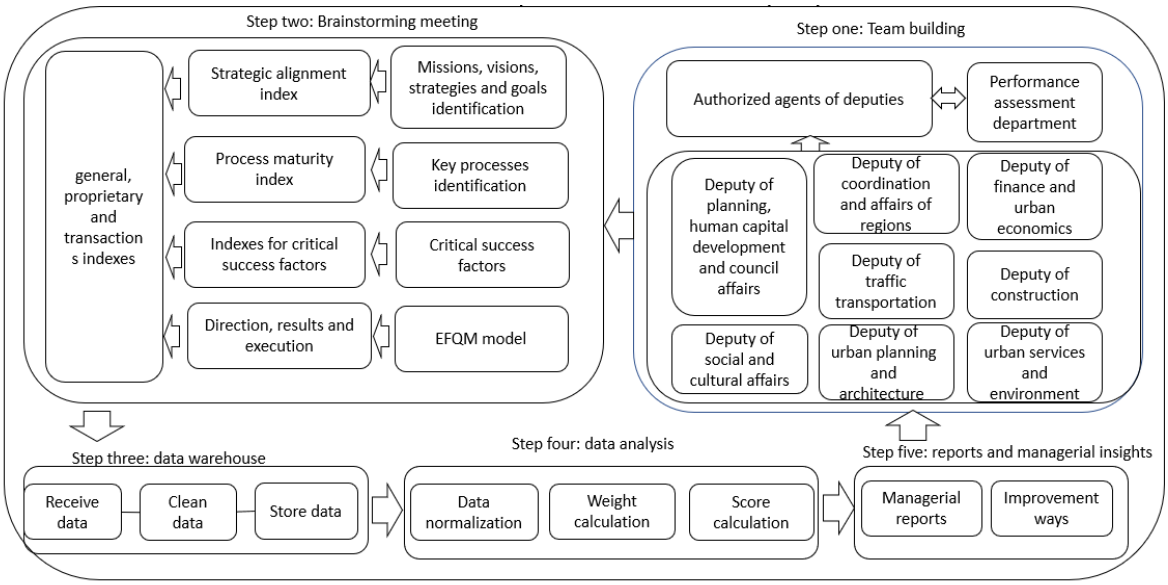


Fig. 5: Excellence model for deputies of Tehran Municipality

EFQM model. Step three collects, cleans and loads the data in the data warehouse. In step four, weights of the indexes and facets are calculated based on AHP, and then facets, indexes, and goals are ranked by TOPSIS as an effective MCDM tool. Improvement strategies can be provided in step five.

*Step 1: Team building*

Tehran Municipality is a decentralized organization in which different tasks are assigned to different deputies. Finance and urban economics; coordination and affairs of regions; planning, human capital development, and council affairs; technical and construction; traffic transportation; social and cultural affairs; urban services and environment; urban planning and architecture are the leading deputies of Tehran Municipality. The deputies have different buildings in the city, each with its strategies, missions, visions, and tasks. All the deputy's strategies should be aligned with each other and with Tehran Municipality's strategies, missions, and visions. Also, their tasks should be evaluated and improved by the improvement methods. Creating a team, where one representative from each deputy shall be invited, is thus the first step. This team shall analyze the situation of deputies and, to improve it will work with them. In the end, it would lead to an improvement in the overall situation of the Tehran Municipality.

*Step 2: Brainstorming meeting*

The team needs to have meetings to establish and decide on the proper indexes to evaluate different data types. Each deputy determined specific measures using primary goals, visions, plans, procedures, and_duties. General indexes are usually extracted from the EFQM model, concerning the fact that the deputies are not in an isolated environment and have a lot of transactions with each other. So, related transactional indexes are defined to improve these transactions.

*Step 3: Data warehouse*

The data of the defined indexes should be collected, cleaned, and stored in the data warehouse. Data on general and proprietary indexes are achieved in a self-assessment manner, but data on transaction indexes are collected through brainstorming by deputies who have transactions with each other.

*Step 4: Data analysis*

Obtained structured data has been analyzed in this step. Over the years, several methods have been proposed for estimating the weights from a matrix of pairwise comparisons, including Additive

Normalization (AN), Eigenvector (EV), Logarithmic Least Squares (LLS), Weighted Logarithmic Least Square (WLS), Logarithmic Goal Programming (LGP), Fuzzy Preference Programming (FPP), and others.

This study implemented the AHP method to extract weights of criteria. AHP uses the following steps:

*Define the problem and its related goal*

Construct the hierarchy of the problem. All the elements in every level of the hierarchy should be compared by each other in pairwise comparison.

*Construction of a set of pairwise comparison matrices*

Let $A=\left[a_{ij}\right]$ for $i \text{ and } j=1,,,n$ denote a pairwise comparison matrix where $a_{ij}$ shows the amount of preference of element $i$ to element $j$. All the entries have a positive value $a_{ij}>0$ in a reciprocal manner $a_{ji}=\frac{1}{a_{ij}}$. The defined criteria in each level and following the above level element should be compared two by two according to the 1-9 scale of pairwise comparisons as shown in Table 2. The total number of pairwise comparisons is $\frac{n(n-1)}{2}$.

The vector of weights $(W_1,..,W_n)$ related to $A$ can be extracted by normalization of the geometric mean method. Let $W_i$ denotes the weight of element $i$ in matrix A, Eq. 1 represents the geometric mean:

$$W_i=\frac{\left(\prod_{j=1}^{n}a_{ij}\right)^{\frac{1}{n}}}{\sum_{i=1}^{n}\left(\prod_{j=1}^{n}a_{ij}\right)^{\frac{1}{n}}},\qquad i,j=1,\ldots,n. \tag{1}$$

*Calculation of consistency index*

Consistency is checked to ensure that the evaluation of the pairwise comparison matrix is reasonable and acceptable. Imagine C is an n-dimensional column vector describing the sum of the weighted values for the importance degrees of elements in A matrix, then: $C=\left[c_i\right]_{n*1}=A.W^T,\ i=1,\ldots,n$. The consistency value can be represented by $CV=\left[cv_i\right]_{1*n}$ where $cv_i=\frac{c_i}{w_i},\ i=1,\ldots,n$. The inconsistency index to evaluate the effectiveness of measurements can be calculated. Saaty (1987) proposed the maximum eigenvalue $\gamma_{max}$ b: $\gamma_{max}=\frac{\sum_{i=1}^{n}cv_i}{n},i=1,\ldots,n$. With the maximal eigenvalue $\gamma_{max}$, a Consistency Index (CI) can then be determined by $CI=\frac{\gamma max-n}{n-1}$ then a Consistency Ratio (CR) is defined by $CR=\frac{CI}{RI}$. Table 3 shows the average amount of Random Index (RI) with the value obtained by different orders of the pair-wise comparison matrices. If the CR is below 0.1, the matrix is considered consistent, the evaluation is rational, and the weights are valid. The judgments should be reviewed and improved in the case of CR>0.10.

The criteria and their related weights in every deputy have been extracted. MCDM tools can calculate the score of each of them. TOPSIS considers the best and the worst alternatives and ranks the alternatives by distance to these two reference points; TOPSIS is used here to calculate the scores. Meaningful scores and distances are calculated. A decision matrix ($D=\left[x_{ij}\right]_{mn}$) is constructed where the alternatives are set in the rows, and the columns show the criteria and $x_{ij}$ presents the score of alternatives $i$ in criteria $j$. By vector normalization way, the matrix

Table 2: The scale of pairwise comparisons

| Degree of Importance | Definition | Explanation |
|---|---|---|
| 1 | Equal importance | Two criteria have equal importance according to the objective. |
| 2 | Weak or slight | According to the objective, the first criterion has weak or slight importance to the second criterion. |
| 3 | Moderate importance | The first criterion has moderate importance to the second criterion according to the objective. |
| 4 | Moderate plus | Between 3 and 5 |
| 5 | Strong importance | The first criterion has strong importance to the second criterion according to the objective. |
| 6 | Strong plus | Between 5 and 7 |
| 7 | Very strong | The first criterion has very strong importance to the second criterion according to the objective. |
| 8 | Very, very strong | The first criterion is very important to the second criterion according to the objective. |
| 9 | Extreme importance | The first criterion has extremely strong importance to the second criterion according to the objective. |

Table 3: Consistency ratio

| Matrix size | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| Random consistency | 0 | 0 | 0.58 | 0.9 | 1.12 | 1.24 | 1.32 | 1.41 | 1.45 | 1.49 |

can be normalized by Eq. 2.

$$R_{ij} = \frac{x_{ij}}{\sqrt{\sum_{i=1}^{m} x_{ij}^{2}}} \quad \text{for all } i = 1,\ldots,m \text{ and for all } j = 1,\ldots,n. \quad (2)$$

The extracted weight from AHP is multiplied by its corresponding $R_{ij}$ to calculate the weighted normalized matrix as Eq. 3.

$$V_{ij} = W_j R_{ij}. \quad (3)$$

The positive ideal solution, the maximum value of alternatives in each attribute ($V^{+} = V_1^{+}, V_2^{+}, \ldots, V_n^{+}$), and the negative ideal solution, minimum value of alternatives in each attribute ($V^{-} = V_1^{-}, V_2^{-}, \ldots, V_n^{-}$), can be found. The separation measure can be calculated by Eq. 4 and Eq. 5.

$$S_i^{+} = \sqrt{\sum_{j=1}^{n} \left(V_{ij} - V_j^{*}\right)^2} \quad \text{for all } i = 1,\ldots,n. \quad (4)$$

$$S_i^{-} = \sqrt{\sum_{j=1}^{n} \left(V_{ij} - V_j^{-}\right)^2} \quad \text{for all } i = 1,\ldots,n. \quad (5)$$

The relative closeness to the ideal solution can be calculated by Eq. 7.

$$C_i^{+} = \frac{S_i^{-}}{S_i^{+} + S_i^{-}} \quad \text{for all } i = 1,\ldots,n. \quad (7)$$

The final ranking is achieved.

*Step 5: Reports, managerial insights*

The data converted into information and knowledge is now achieved through different mathematical analyses. Through the experiences of authorized agents of the deputies, much wisdom can be obtained during different brain-storming and studying the reports.

## RESULTS AND DISCUSSION

The proposed model has run at Tehran Municipality, and the obtained results are presented and discussed here.

*Step 1: Team building*

A performance assessment team is constructed at the team-building step.

*Step 2: Brainstorming meeting*

Strategies, goals, objectives, targets, critical success factors, and proprietary and transaction indexes are defined here through brainstorming. Proprietary indexes are shown in Table 4.

In order to calculate the strategic alignment of 8 Deputies and extract all the strategies and goals of the vices, as well as the CSFs of the vices, specific indicators are extracted during the processes. Process maturity is considered in the EFQM model.

*General indexes extracted by EFQM*

The EFQM model is a non-prescriptive, well-known framework based on the enablers and results, so it has been used to extract general indexes. The enablers criteria cover what the deputies do, and the results criteria cover the achievements of the deputies. The following questions adapted from the EFQM model (European Foundation for Quality Management, 2019) extract general indexes.

Transactions indexes

Time and quality of the received data from deputies are the two most transactional indexes for deputies interacting with each other. The following questions extract transactional indexes:

- Which deputies have essential interaction with your deputies?
- What kind of interactions do you have with each other?
- What is the best index to measure and improve the quality of interactions?

*Step 3: Data warehouse*

The defined indexes' data should be gathered, cleaned, and stored in the data warehouse.

*Step 4: Data analysis*

In this section, required data are achieved by

Table 4: Proprietary indexes of deputies

| Deputies | Main strategies | Goals | Indexes |
|---|---|---|---|
| Deputy of technical and construction | Implements technical and construction projects to improve Tehran's infrastructures and facilities | Optimizes usage of resources during project implementation | Cost performance index |
| | | Develops Tehran's facilities and infrastructures | Schedule performance index |
| Deputy of planning, human capital development, and council affairs | Implements intelligence planning and develops professional experts for Tehran Municipality | Develop an intelligence system for the Tehran Municipality | Efficiency of planning |
| | | | Variation of assigned budget Amounts of process improvement |
| | | | Amount of teaching hours for personnel |
| Deputy of urban planning and architecture | Implements urban planning and Iranian architecture | Develops an intelligent urban planning | Amounts of reconstruction of historical places |
| | | Develops Iranian architecture throughout the city | The efficiency of urban planning |
| Deputy of urban services and environment | Develops sustainable urban services | Improve environment quality | Amounts of environmental pollution |
| | | | Amounts of satisfaction from urban services |
| Deputy of finance and urban economics | Develops cost and revenue management system | Create sustainable economy | Amounts of sustainable revenue fulfillment |
| | | | Amounts of cost reduction |
| Deputy of traffic transportation | Develops green public transportation | Improve transportation quality of Tehran city | Improve the scheduling of public transportation Decrease the amount of used fuel |
| | | | Increase using of bicycles |
| Deputy of social and cultural affairs | Develops Iranian culture | Makes a sustainable community | The mental health of society Innovation rate of society Improvement of lifestyle |
| | | | Supportive community |
| Deputy of coordination and affairs | Make integration between the deputies and affairs | Coordination between the deputies and members of council affairs | Amount of solved conflict between the deputies and council affairs |

interviewing team members. Each deputy has three categories: proprietary, transactions, and general. Also, each category has its related indexes. The weights of indexes and categories can be different according to the deputies. The weights are extracted by pair-wise comparison, and the final score of deputies in each category is obtained with the help of TOPSIS. Because of the Tehran Municipality policies, the real data cannot be used here, so arbitrary data is used to show the analysis here (Tables 5-12).

Table 13 shows the weights of each category extracted by AHP.

Table 5: Weights of indexes for deputy of technical and construction

| Categories | Weights of categories | Indexes | Weights of indexes |
|---|---|---|---|
| Proprietary indexes | 70% | | |
| | | Cost performance | 70% |
| | | Schedule performance | 30% |
| General indexes | 20% | | |
| | | Leadership | 3% |
| | | Policy and strategy | 5% |
| | | People | 7% |
| | | Partnership and resources | 6% |
| | | Processes | 4% |
| | | Customer results | 5% |
| | | People results | 5% |
| | | Society results | 52% |
| | | Key results | 13% |
| Transactions indexes | 10% | | |
| | | Time of responses | 60% |
| | | Quality of responses | 40% |

Table 6: Weights of indexes for deputy of planning, human capital development, and council affairs

| Categories | Weights of categories | Indexes | Weights of indexes |
|---|---|---|---|
| Proprietary indexes | 51% | | |
| | | Efficiency of planning | 35% |
| | | Variation of assigned budget | 37% |
| | | Amounts of process improvement | 16% |
| | | Amount of teaching hours for personnel | 12% |
| General indexes | 8% | | |
| | | Leadership | 26% |
| | | Policy and strategy | 5% |
| | | People | 13% |
| | | Partnership and resources | 4% |
| | | Processes | 11% |
| | | Customer results | 2% |
| | | People results | 12% |
| | | Society results | 6% |
| | | Key results | 20% |
| Transactions indexes | 41% | | |
| | | Time of responses | 20% |
| | | Quality of responses | 80% |

Table 7: Weights of indexes for deputy of urban planning and architecture

| Categories | Weights of categories | Indexes | Weights of indexes |
|---|---|---|---|
| Proprietary indexes | 83% | | |
| | | Amounts of reconstruction of historical places | 80% |
| | | Efficiency of urban planning | 20% |
| General indexes | 12% | | |
| | | Leadership | 5% |
| | | Policy and strategy | 9% |
| | | People | 2% |
| | | Partnership and resources | 9% |
| | | Processes | 23% |
| | | Customer results | 14% |
| | | People results | 9% |
| | | Society results | 5% |
| | | Key results | 23% |
| Transactions indexes | 5% | | |
| | | Time of responses | 10% |
| | | Quality of responses | 90% |

Table 8: Weights of indexes for deputy of urban services and environment

| Categories | Weights of categories | Indexes | Weights of indexes |
|---|---|---|---|
| Proprietary indexes | 28% | | |
| | | Amounts of environmental pollution | 41% |
| | | Amounts of satisfaction from urban services | 59% |
| General indexes | 63% | | |
| | | Leadership | 10% |
| | | Policy and strategy | 15% |
| | | People | 16% |
| | | Partnership and resources | 1% |
| | | Processes | 10% |
| | | Customer results | 11% |
| | | People results | 7% |
| | | Society results | 18% |
| | | Key results | 12% |
| Transactions indexes | 9% | | |
| | | Time of responses | 54% |
| | | Quality of responses | 46% |

Table 9: Weights of indexes for deputy of finance and urban economics

| Categories | Weights of categories | Indexes | Weights of indexes |
|---|---|---|---|
| Proprietary indexes | 44% | | |
| | | Amounts of sustainable revenue fulfillment | 91% |
| | | Amounts of cost reduction | 9% |
| General indexes | 38% | | |
| | | Leadership | 22% |
| | | Policy and strategy | 22% |
| | | People | 6% |
| | | Partnership and resources | 1% |
| | | Processes | 16% |
| | | Customer results | 23% |
| | | People results | 1% |
| | | Society results | 6% |
| | | Key results | 4% |
| Transactions indexes | 18% | | |
| | | Time of responses | 24% |
| | | Quality of responses | 76% |

Table 10: Weights of indexes for deputy of Traffic transportation

| Categories | Weights of categories | Indexes | Weights of indexes |
|---|---|---|---|
| Proprietary indexes | 27% | | |
| | | Improve the scheduling of public transportation | 19% |
| | | Decrease the amount of used fuel | 18% |
| | | Increase using of bicycles | 63% |
| General indexes | 51% | | |
| | | Leadership | 17% |
| | | Policy and strategy | 3% |
| | | People | 6% |
| | | Partnership and resources | 8% |
| | | Processes | 19% |
| | | Customer results | 3% |
| | | People results | 22% |
| | | Society results | 8% |
| | | Key results | 14% |
| Transactions indexes | 22% | | |
| | | Time of responses | 70% |
| | | Quality of responses | 30% |

Table 11: Weights of indexes for deputy of social and cultural affairs

| Categories | Weights of categories | Indexes | Weights of indexes |
|---|---|---|---|
| | 33% | | |
| 30% | | The mental health of society | |
| 12% | | Innovation rate of society | |
| 28% | | Improvement of lifestyle | |
| 30% | | Supportive community | |
| | 43% | | |
| 18% | | Leadership | |
| 2% | | Policy and strategy | |
| 12% | | People | |
| 17% | | Partnership and resources | |
| 12% | | Processes | |
| 2% | | Customer results | |
| 8% | | People results | |
| 11% | | Society results | |
| 17% | | Key results | |
| | 25% | | |
| | | Time of responses | 89% |
| | | Quality of responses | 11% |

Table 12: Weights of indexes for deputy of coordination and affairs

| Categories | Weights of categories | Indexes | Weights of indexes |
|---|---|---|---|
| Proprietary indexes | 63% | | |
| | | Amount of solved conflict between the deputies and affairs | 100% |
| General indexes | 8% | | |
| | | Leadership | 8% |
| | | Policy and strategy | 4% |
| | | People | 16% |
| | | Partnership and resources | 8% |
| | | Processes | 3% |
| | | Customer results | 21% |
| | | People results | 19% |
| | | Society results | 10% |
| | | Key results | 12% |
| Transactions indexes | 29% | | |
| | | Time of responses | 62% |
| | | Quality of responses | 38% |

Table 13: Related weights for deputies

| Deputy's name | Proprietary indexes | General indexes | Transactions indexes |
|---|---|---|---|
| Deputy of Technical and construction | 70% | 20% | 10% |
| Deputy of planning, human capital development, and council affairs | 51% | 8% | 41% |
| Deputy of urban planning and architecture | 83% | 12% | 5% |
| Deputy of urban services and environment | 28% | 63% | 9% |
| Deputy of finance and urban economics | 44% | 38% | 18% |
| Deputy of Traffic transportation | 27% | 51% | 22% |
| Deputy of social and cultural affairs | 33% | 43% | 25% |
| Deputy of coordination and affairs | 63% | 8% | 29% |

Table 14: Performance of the deputies in the categories

| Deputy's name | Proprietary indexes | General indexes | Transactions indexes |
|---|---|---|---|
| Deputy of technical and construction | 91% | 69% | 28% |
| Deputy of planning, human capital development, and council affairs | 25% | 20% | 23% |
| Deputy of urban planning and architecture | 10% | 31% | 47% |
| Deputy of urban services and environment | 3% | 57% | 7% |
| Deputy of finance and urban economics | 69% | 10% | 73% |
| Deputy of traffic transportation | 45% | 51% | 38% |
| Deputy of social and cultural affairs | 8% | 48% | 64% |
| Deputy of coordination and affairs | 5% | 76% | 11% |

Table 14 is obtained by evaluating the performance of each index within a category, multiplying the weight associated with that performance, and summing the weighted scores for each category.

The weighted performance of the deputies in the categories is represented in Table 15.

Table 16 shows the final ranking of each deputy, and proper improvement strategies for each one can be proposed in the next step.

*Step 5: Reports, managerial insights, and improvement ways*

Improvement strategies and managerial insights can be developed from the achieved data. Step two categorized indexes into three main categories: general, proprietary and transactions indexes. The deputies' Weaknesses and strengths can be obtained regarding the weights and scores of the deputies in each index. For example, the deputy of coordination and affairs was the weakest, and the deputy of technical and construction was the strongest deputy of Tehran Municipality. Proprietary indexes are the most important index for the deputy of coordination and affairs. The amount of solved conflict between the deputies and affairs is the only index in This category. So, suppose the deputy wants to improve its score and help the municipality in the road to excellence. In that case, it should significantly improve the amount of solved conflict between the deputies and affairs. Transactions indexes are the second important category for this deputy, containing time and response quality. They showed that the deputy

Table 15: Weighted performance of the deputies in the categories

| Deputy's name | Proprietary indexes | General indexes | Transactions indexes |
|---|---|---|---|
| Deputy of technical and construction | 64% | 14% | 3% |
| Deputy of planning, human capital development, and council affairs | 13% | 2% | 9% |
| Deputy of urban planning and architecture | 8% | 4% | 2% |
| Deputy of urban services and environment | 1% | 36% | 1% |
| Deputy of finance and urban economics | 31% | 4% | 13% |
| Deputy of traffic transportation | 12% | 26% | 8% |
| Deputy of social and cultural affairs | 3% | 21% | 16% |
| Deputy of coordination and affairs | 3% | 6% | 3% |

Table 16: Final ranking of deputies

| Deputy's name | Scores | Ranks |
|---|---|---|
| Deputy of technical and construction | 0.71 | 1 |
| Deputy of finance and urban economics | 0.41 | 2 |
| Deputy of urban services and environment | 0.35 | 3 |
| Deputy of traffic transportation | 0.34 | 4 |
| Deputy of social and cultural affairs | 0.28 | 5 |
| Deputy of planning, human capital development, and council affairs | 0.19 | 6 |
| Deputy of urban planning and architecture | 0.11 | 7 |
| Deputy of coordination and affairs | 0.07 | 8 |

may had not good transactions with other deputies. So, the deputy should consider to promote the level of interactions with others. Similarly, all the deputies should review their categories and indexes and find ways to plan and implement the improvement. The excellence model will be rerun to help the municipality to reach excellence. This process is a never-ending process and should be run constantly. A comparison of the proposed model with the EFQM and BSC models as the two famous performance management models can be helpful. EFQM uses 9 general and nonprescriptive facets not customized for a specific organization. BSC is also nonprescriptive and uses 4 proper facets for a centralized organization. The proposed model categorizes organization activities into general, proprietary, and transactional. The general category uses EFQM criteria by the adjusted weights according to the organization's specifications and needs. The proprietary category uses strategies and goals to define specific indexes to measure the organization's operations following strategies and goals that are not necessarily in 4 facets of BSC. The transactional category uses indexes that help a decentralized organization make a better relationship between its parts. The EFQM and BSC methods do not consider mathematical calculations and ignore mathematical analysis. EFQM considers fixed weights for its criteria, and BSC does not propose any weights for the facets. However, in the proposed model, AHP, as a powerful mathematical tool, is used to extract the weights of criteria and categories to understand better the value of improvement in each section of the organization. TOPSIS is applied to measure performance and rank the organization's different

Table 17: Comparison between EFQM, BSC, and the proposed model

| Aspects | EFQM | BSC | The Proposed Model |
|---|---|---|---|
| | Direction<br>Execution<br>Results | Financial,<br>Customer satisfaction,<br>Internal processes,<br>Learning and growth | General category (integral by EFQM model),<br>Proprietary category (based on strategies and goals of deputies)<br>Transaction category (used for decentralized organizations) |
| Proper for | | | |
| | Centralized organizations | Centralized organizations | Centralized and decentralized organizations |
| Weighting method | | | |
| | Fixed weights are used, which is an unrealistic assumption for different organizations | Not mentioned | Used AHP as a powerful weighting method to calculate the real weights of different categories and indexes |
| Ranking method | | | |
| | Not mentioned | Not mentioned | It used TOPSIS as a powerful MCDM method to rank different organizations, and help managers have more insights to produce improvement strategies |
| Improvement strategies | | | |
| | Not mentioned | Not mentioned | It has one step to develop improvement strategies based on mathematical analysis and brainstorming meetings |

deputies to understand better how to create managerial insights and improvement actions. Table 17 shows the comparison. It is worth answering the mentioned questions here: How can an excellence model and a performance management system be used in Tehran Municipality? And how an excellent model can be customized to implement in Tehran Municipality?

Regarding the proposed model, by identifying strategies, goals, objectives, targets, critical success factors, general, proprietary, and transaction indexes and conducting several meetings with deputies throughout the process, all the deputies aligned and worked like a centralized organization.

How an excellence model and performance management system can be integrated?

Excellence models have some defined indexes and scoring systems, but performance management systems define indexes and use the appropriate scoring system. The proposed model used both ways. It used the EFQM excellence model indexes as general indexes and defined the proprietary and transaction indexes to have comprehensive and customized assessment indexes. Moreover, AHP and TOPSIS, as commonly used techniques, are used for scoring systems.

How multi-criteria decision-making tools can be applied in an excellence model?

As shown in step 3 of the proposed model, the criteria weights are driven by AHP, and TOPSIS does their ranking.

## CONCLUSION

Deming Prize, Canada Awards for Excellence, Malcolm Baldrige National Quality Award, and European Quality Award are the most well-known excellence models worldwide. But, these excellence models are nonprescriptive and not customized for a specific organization. Also, they ignore decentralized organizations. On the other hand, performance management systems define criteria and use mathematical models as their scoring system. However, they ignore the excellence models. Therefore, this study combined the EFQM as one of the most reputable excellence models and performance management systems and applied

the model in Tehran Municipality. This presented a comprehensive, graphical, step-by-step excellence model run for deputies of Tehran Municipality. The proposed model has five steps. Step one is to construct the team. The Tehran Municipality is a decentralized organization that has 9 deputies: deputy of finance and urban economics; deputy of coordination and affairs of regions; deputy of planning, human capital development, and council affairs; technical and construction deputy; traffic transportation deputy; deputy of social and cultural affairs; deputy of urban services and environment; deputy of urban planning and architecture so it is essential that a team including of at least one agent of each deputy constructed in the first step. Step two extracts related indexes to each deputy's general, proprietary, and transaction categories. The general category used the EFQM model, the proprietary category used the mission, vision, processes maturity model, critical success factors, and the task of deputies to define indexes, and the transactional category used time and quality of response as two main indexes in this category. Step three collects, cleans and stores the related data on indexes in the data warehouses by the defined indexes and categories. Step four uses AHP to calculate the weights of indexes and categories for each deputy and then, with the help of TOPSIS, ranks the deputies to find the best and the worst deputy. By the obtained analysis, step five can create reports, managerial insights, and improvement ways. Finally, the proposed model is run at the office of plan monitoring, project control, and performance evaluation in planning, human capital development, and council affairs department at Tehran Municipality; then, the outcomes are shared with others. Regarding the mathematical analysis, Sample Weighted Method (SWM), or other mathematical analysis by different normalization ways can be used and may lead to different solutions. How to select the best solution can be a good question to be answered in future research. Different strategy improvement methods can be used for constructing performance improvement scenarios.

## AUTHOR CONTRIBUTIONS

K. Fahimi performed the literature review, conducted the conceptual model and numerical results, compiled the data, analyzed and interpreted the data, and prepared the manuscript text and edition. M. Amirabadi performed the literature review and applied the model in Tehran Municipality.

## ACKNOWLEDGMENT

This research received no specific grant from funding agencies in the public, commercial, or not-for-profit sectors. The authors are very grateful to all the experts who cooperated in conducting this research.

## CONFLICT OF INTEREST

The authors declare no potential conflict of interest regarding the publication of this work. In addition, the authors have witnessed ethical issues, including plagiarism, informed consent, misconduct, data fabrication and, or falsification, double publication and, or submission, and redundancy.



## ABBREVIATIONS

| | |
|---|---|
| *EFQM model* | European Foundation for Quality Management model |
| *BSC* | Balanced Score Card |
| *TOPSIS* | Technique for Order of Preference by Similarity to Ideal Solution |

| | |
|---|---|
| *AHP* | Analytical Hierarchical Process |
| *FTOPSIS* | Fuzzy Technique for Order of Preference by Similarity to Ideal Solution |
| *FAHP* | Fuzzy Analytical Hierarchical Process |
| *ELECTRE* | Elimination and ChoiceExpressingREality |
| *SWM* | Sample Weighted Method |
| *MBNQA* | Malcolm Baldrige National Quality Award |
| *MCDM* | Multi-Criteria Decision-Making |
| *TQM* | Total Quality Management |
| *CI* | Consistency Index |
| *CR* | Consistency Ratio |
| *RI* | Random Index |
| $A=\left[a_{ij}\right]$ | Pairwise comparison matrix. |
| $a_{ij}$ | Amount of preference of element $i$ to element $j$. |
| $(W_1,..,W_n)$ | Vector of weights. |
| *C* | An n-dimensional column vector. |
| $CV=\left[cv_i\right]_{1*n}$ | Consistency value. |
| $\gamma_{max}$ | Maximum eigenvalue. |
| *CI* | Consistency index. |
| *RI* | Average random index. |
| $D=\left[x_{ij}\right]_{mn}$ | Decision matrix. |
| $x_{ij}$ | A score of alternatives $i$ in criteria $j$. |
| $R_{ij}$ | Normalized amount of $x_{ij}$. |
| $V_{ij}$ | Weighted normalized amount of $x_{ij}$. |
| $(V^+=V_1^+,V_2^+,\ldots,V_n^+)$ | The maximum value of alternatives in each attribute. |
| $(V^-=V_1^-,V_2^-,\ldots,V_n^-)$ | The minimum value of alternatives in each attribute. |
| $S_i^+$ | Positive separation measure. |
| $S_i^-$ | Negative separation measure. |
| $C_i^+$ | Relative closeness to the ideal solution. |

## REFERENCES


Andersen, H.; Lawrie, G.; Shulver, M., (2000). The balanced scorecard vs. the EFQM business excellence model. Maidenhead, UK: 2GC Limited. Retrieved May, 12. **p.2004.**

Araujo, C.A.S.; Wanke, P.; Siqueira, M.M., (2018). A performance analysis of Brazilian public health: TOPSIS and neural networks application. Int. J. Product. Perform., 67(9): 1526-1549 **(24 pages).**

Aydin, S.; Kahraman, C.; Kaya, I., (2012). A new fuzzy multi-criteria decision making approach: an application for European quality award assessment. Knowledge-Based Syst., 32: 37-46 **(10 pages).**

Azar, A.; Olfat, L.; Khosravani, F.; Jalali, R., (2011). A BSC method for supplier selection strategy using TOPSIS and VIKOR: a case study of part maker industry. Manage. Sci. Lett., 1(4): 559-568 **(10 pages).**

Bdour, A.; Hejab, A.; Almakhadmah, L.; Hawwa, M. (2023). Management strategies for the efficient energy production of brackish water desalination to ensure reliability, cost reduction, and sustainability. Global J. Environ. Sci. Manage., 9(SI): 173-192 **(20 pages).**

Belvedere, V.; Grando, A.; Legenvre, H., (2018). Testing the EFQM model as a framework to measure a company's procurement performance. Total. Qual. Manage. Bus. Excell., 29(5-6): 633–651 **(19 pages).**

Bou-Llusar, J.C.; Escrig-Tena, A.B.; Roca-Puig, V.; Beltrán-Martín, I., (2009). An empirical assessment of the EFQM excellence model: evaluation as a TQM framework relative to the MBNQA model. J. Oper. Manage., 27(1): 1-22 **(22 pages).**

Den Hartog, D.N.; Boselie, P.; Paauwe, J., (2004). Performance management: a model and research agenda. Appl. Psychol., 53(4): 556-569 **(14 pages).**

Doeleman, H.J.; ten Have, S.; Ahaus, C.T.B., (2014). Empirical evidence on applying the European foundation for quality management excellence model, a literature review. Total Qual. Manage. Bus., 25(5-6): 439-460 **(22 pages).**

e Sá, P.M.; Fernandes, C., (2020). An assessment of a municipal physical activity programme for seniors based on the EFQM model: integrating the views of internal and external stakeholders. Eval Program Plann., 80: **p.101796.**

European Foundation for Quality Management. (2019). The EFQM model - EFQM.

Flapper, S.D.P.; Fortuin, L.; Stoop, P.P.M., (1996). Towards consistent performance management systems. Int. J. Oper. Prod. Manag., 16(7): 27-37 **(11 pages).**

Folan, P.; Browne, J., (2005). A review of performance measurement: towards performance management. Comput. Ind., 56(7): 663-680 **(18 pages).**

Golpîra, H., (2014). A method for evaluating project management standards, based on EFQM criteria, using FTOPSIS method. Int. J. Ind. Eng., 3(3): 1-12 **(12 pages).**

Gholipour, A.; Ebrahimi, E., (2018). Fuzzy multi-criteria decision making approach for human capitalevaluation of municipal districts. Int. J. Hum. Capital Urban Manage., 3(1): 1-8 **(8 pages).**

Kagioglou, M.; Cooper, R.; Aouad, G., (2001). Performance management in construction: a conceptual framework. Constr. Manage. Econ., 19(1): 85-95 **(11 pages).**

Kanji, G. K.; Wong, A., (1999). Business excellence model for supply chain management. Total Qual. Manage., 10(8): 1147-1168 **(20 pages).**

Kaplan, R.S.; Norton, D.P., (1992). The balanced scorecard: measures that drive performance. 83: Harvard Business Review.

Keshtegar, A.; Ghasemi, M.; Hosseini, A.; Ahang, F.; Ghaffari, H., (2021). The impact of business intelligence on enablers of EFQM excellence model with mediating role of knowledge sharing. Int. J. Hum. Capital Urban Manage., 6(2): 173-184 **(12 pages).**

Khalif, M.H.; Hassan, K.R., (2022). The application of fuzzy Logic in improving the Performance of the European foundation for quality management (EFQM). JQCM., 14(3): 144-154 **(11 pages).**

Kloot, L.; Martin, J., (2000). Strategic performance management: a balanced approach to performance management issues in local government. Manage. Account. Res., 11(2), 231-251 **(21 pages).**

Kumar, R.; Singh, K.; Jain, S.K., (2020). A combined AHP and TOPSIS approach for prioritizing the attributes for successful implementation of agile manufacturing. Int. J. Product. Perform., 69(7): 1395–1417 **(23 pages).**

Liu, Y.L.; Pen-Fa, K.; Chiang, J.T.; Shyr, W.J., (2021). Should the EFQM excellence model be adapted for specific industries? A restaurant sector example. Int J Hosp Manage., 92: **p.102694.**

Mansour, M., (2023). The influences of environmental awareness on green performance. Global J. Environ. Sci. Manage., 9(4): 899-914 **(16 pages).**

Mendes, P.; Santos, A.C.; Perna, F.; Teixeira, M.R., (2012). The balanced scorecard as an integrated model applied to the Portuguese public service: a case study in the waste sector. J. Clean. Prod., 24: 20-29 **(10 pages).**

Mirfakhredini, H.; Peymanfar, M.H.; Khatibi Oghada, A.; Alimohammadi, H., (2013). Performance assessment of sports organization with BSC–Topsis integrated model. J. Sport Manage., 5(16): 77-96 **(20 pages).** (In Persian)

National Institute of Standards and Technology. (2010). Criteria for performance excellence.

National Quality Institute. (2007). Canada awards for excellence - excellence Canada.

Ritchie, L.; Dale, B.G., (2000). Self-assessment using the business excellence model: a study of practice and process. Int. J. Prod. Econ., 66(3): 241-254 **(14 pages).**

Rodríguez-González, C. G.; Sarobe-González, C.; Durán-García, M. E.; Mur-Mur, A.; Sánchez-Fresneda, M. N.; de las Mercedes Pañero-Taberna, M.; Pla-Mestre, R., Herranz-Alonso, A.; Sanjurjo-Sáez, M., (2020). Use of the EFQM excellence model to improve hospital pharmacy performance. Res. Social Adm. Pharm., 16(5): 710-716 **(7 pages).**

Saaty, R.W., (1987). The analytic hierarchy process-what it is and how it is used. Math. Model., 9(3-5): 161–176 **(16 pages).**

Santos-vijande, M.; Alvarez-gonzalez, L., (2007). TQM and firms performance : an EFQM excellence model research based survey. IJBSAM, 2(2): 21-42 **(21 pages).**

Sehhat, S.; Taheri, M.; Sadeh, D.H., (2015). Ranking of insurance companies in Iran using AHP and TOPSIS techniques. Am. J. Res. Commun., 3(1): 51-60 **(10 pages).**

Shahin, A.; Dolatabadi, H.R.; Kouchekian, M., (2012). Proposing an integrated model of BSC and EFQM and analyzing its influence on organizational strategies and performance the case of isfahan Municipality complex. Int. J. Acad. Res. Econ. Manage. Sci., 1(3): 41-57 **(17 pages).**

Sun, C.C., (2010). A performance evaluation model by integrating fuzzy AHP and fuzzy TOPSIS methods. Expert Syst. Appl., 37(12): 7745-7754 **(10 pages).**

Talwar, B., (2011). Comparative study of framework, criteria and criterion weighting of excellence models. Meas. Bus. Excell., 15(1): 49-65 **(17 pages).**

Tomaževič, N.; Tekavčič, M.; Peljhan, D., (2017). Towards excellence in public administration: organisation theory-based performance management model. Total. Qual. Manage. Bus. Excell., 28(5-6): 578-599 **(22 pages).**

Union of Japanese Scientists and Engineers. (2010). Deming prize.

Vukomanovic, M.; Ceric, A.; Radujković, M., (2007). BSC-EFQM based approach for performance benchmarking in construction industry. Proceedings 23rd annual ARCOM conference. 631-640 **(10 pages).**

Vukomanovic, M.; Radujkovic, M., (2013). The balanced scorecard and EFQM working together in a performance management framework in construction industry. J. Civ. Eng. Manage, 19(5): 683-695 **(13 pages).**

Westerveld, E., (2003). The project excellence model: linking success criteria and critical success factors. Int.

J. Proj. Manage., 21(6): 411-418 **(9 pages).**

Wongrassamee, S.; Simmons, J.E.L.; Gardiner, P.D., (2003). Performance measurement tools: the balanced scorecard and the EFQM excellence model. Meas. Bus. Excell., 7(1): 14-29 **(16 pages).**

Yadav, S.K.; Joseph, D.; Jigeesh, N., (2018). A review on industrial applications of TOPSIS approach. Int. J. Serv. Oper. Manage., 30(1): 23-38 **(6 pages).**



**HOW TO CITE THIS ARTICLE**

*Fahimi, K.; Amirabadi, M., (2024). Constructing the organizational excellence model using Technique for order of preference by similarity to ideal solution and Analytic hierarchy process. Int. J. Hum. Capital Urban Manage., 9(1): 157-176.*

**DOI:** 10.22034/IJHCUM.2024.01.11

**URL:** https://www.ijhcum.net/article_707967.html