Online Access: www.absronline.org/journals

Management and Administrative Sciences Review

Volume 4, Issue 2
Pages: 423-428
March 2015

e-ISSN: 2308-1368
p-ISSN: 2310-872X

Design of an organizational quality performance evaluation model by combining EFQM-SIX SIGMA

Kamaleddin Rahmani[1], Ardeshir Bazrkar[2]*, Mohammad Abedzadeh[3]

1. Department of Management, Tabriz Branch, Islamic Azad University, Tabriz, Iran
2.3 Department of Industrial Management, Tabriz Branch, Islamic Azad University, Tabriz
2.3 Department of Industrial Management, East Azerbaijan Science and Research Branch, Islamic Azad University, Tabriz, Iran

Current changes in the global economy and efforts by WHO in line with economic globalization and increasing competition, have believed both developed and developing countries that for the presence and survival in the global, regional and local markets, the competitiveness of their industries and organizations should be increased. Models for excellence of organizational performance and business excellence are used as a powerful tool for assessing the implementation of the different systems. The purpose of this research is to design a model to evaluate the performance of institutional quality by combining efficient EFQM and the SIX SIGMA models. For this purpose, at the first step, a conceptual model was developed, and then projects, which are obtained from process EFQM model and are used as input to the SIX SIGMA, were prioritized and for the selection of projects of model improvement, the supply chain improvement projects of Saipa was used. Finally, after designing the model and prioritize results, the project of improving the selection of suppliers based on merit, was placed at the first priority.

Keywords: Organizational quality performance evaluation model, Six Sigma, improving project, fuzzy TOPSIS

INTRODUCTION

Current changes in the global economy and efforts by WHO in line with economic globalization and increasing competition, have believed both developed and developing countries that for the presence and survival in the global, regional and local markets, the competitiveness of their industries and organizations should be increased (Castillo,2008).Models for excellence of organizational performance and business excellence are used as a powerful tool for assessing the implementation of the different systems. Using these models, organizations can evaluate their success in implementing improvement programs at various points. They can also compare their performance with other organizations (Davies, 2008). The main advantages of using process management are continued reduction of costs and shortening the work cycle time, due to the efficient

*Corresponding author: Ardeshir Bazrkar
Department of Industrial Management, East Azerbaijan Science and Research Branch, Islamic Azad University, Tabriz, Iran
E-Mail: Ardeshir.Bazrkar@iauasrb.ac.ir

Manag. Adm. Sci. Rev.
e-ISSN: 2308-1368, p-ISSN: 2310-872X
Volume: 4, Issue: 2, Pages: 423-428

use of resources, improving operations results and also consistent and predictability of results; and providing opportunities to engage the actions that are in the process of applying the approach taken, including the definition and systematic actions necessary to achieve a desired result, clearly defining the responsibilities and accountability for managing key activities, analyzing and measuring the important activities, evaluate the risks, consequences and impacts of activities on customers, suppliers and other interested parties (Castillo, 2008).

LITERATURE REVIEW

EFQM Excellence Model

One of the best ways for organizational assessment is self-assessment that the EFQM model has special attention to it. The foundation of EFQM was established in 1989 and was approved by the Europe Commission. In 1991, the EFQM model was produced, and then the first award of quality for Europe was presented in 1992. From then, the model of excellence regularly reviewed and updated to reflect the best proven management thinking and practices (Davies, 2008 Key message of excellence model is based on the answers to two questions:

1.How this model as an appropriate management structure and logic can be detected?

2.Who can play an essential role in the chain of communication and interaction?

At the first level of this model, the overall goals are analyzed and at the next level the goals in degrees and quantitative and measurable scales.

Self-assessment survey indicates on comprehensive, systematic and orderly operation of the organization and the outcome of the excellence model.

All organizations of varying sizes, including governmental, charitable, military, hospitals, and private companies are applying this model.

Some of the organization use self-assessment for the overall organization and other organizations used it for specific units or operating units.

A model that supports the National Award of Productivity and business excellence, has nine criteria. Five criteria are enabling criteria (leadership, policy and strategy, people, partnerships and resources, processes) and four additional criteria are results (results of customers, results of employees, results of the community, key results of performance). Enabling" criteria cover what is done by the organization and the criteria of "results", cover what an organization achieves.

In other words, the results obtained based on the implementation of the "enabling" and enabling criteria are improved by feedback from results (Castillo, 2008).

Six Sigma

Six Sigma is a disciplined, data-driven approach and methodology for eliminating defects (driving toward six standard deviations between the mean and the nearest specification limit) in any process – from manufacturing to transactional and from product to service.

Recently that the competition world need for the best to survive in a competitive situation, the Six Sigma methodology as a systematic way to apply consistent quality of different tools was introduced (Jenicke, 2008). The methodology aims to reduce the deviation of the process. The main purpose of its use can include reducing the changes, reducing the errors, improving productivity, enhancing customer satisfaction and improving financial issues.

Six Sigma would be as a powerful and effective tool when the short-term or long-term corrective and preventive actions are not able to improve the process.

If you need to recognize the fundamental causes of chronic distortion inherent in the process, this method is very useful. From a commercial standpoint, Six Sigma in the business world is defined as a business strategy to improve the profitability of the business to improve the effectiveness and efficiency of all operations that contribute to meeting the needs and expectations of the customer. In another definition it explained as below:

Six Sigma is a rigorous and systematic approach to reform the process of the development of new products and services which for the reduction of the customer-defined faults, are based on statistical methods and practice. In this definition the

Manag. Adm. Sci. Rev.
e-ISSN: 2308-1368, p-ISSN: 2310-872X
Volume: 4, Issue: 2, Pages: 423-428

importance of improving is emphasizes based on the definition of customer for error (Kumar, 2007).

To solve the basic and chronic problems, Six Sigma methodology is used.

If Sigma level goes higher, the exponential increase in the deficit reduction is necessary, so that by resolving the root problems that are not identified by qualitative simple tools, sigma level increases.

METHODOLOGY

This study is a descriptive survey. To investigate the mechanism of the the study, four methods were used, including: Study of literature, Interviews with experts, Use of documents in SAIPA and Questionnaires.

First, based on the previous research and literature review, data associated with the topic, were extracted. This information then confirmed by experts in the field, and then further investigation was applied which resulted in an innovative model.Then, by providing a framework, the considering society of the study was evaluated. Finally, by concluding the previous steps, the research data were obtained, which was investigated and compared as the mentioned model.

THE ANALYSIS OF THE CONCEPTUAL MODEL

According to studies, communication and organizational excellence and Six Sigma process model is presented in Figure 1. As can be seen in the model, organizational performance excellence models can be considered as a system, so that, its output is defined as improvement projects and Six Sigma can be regarded as another system that its input is the output obtained by the model and the output of the Six Sigma approach can be regarded as one of the inputs to the model of performance excellence, because, the degree of improvement that can be obtained from Six Sigma, is depicted in EFQM.

In this case, prioritizing the EFQM outputs to choose it for Six Sigma is of importance.

In this study, fuzzy TOPSIS method was used to prioritize

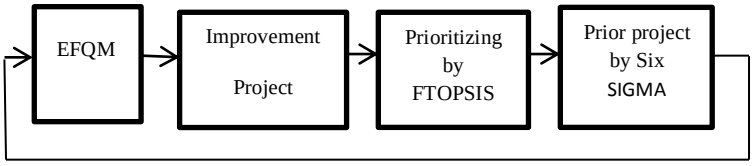

Figure 1: Quality process model of EFQM – Six SIGMA

Introduction to Fuzzy TOPSIS technique

Fuzzy TOPSIS approach is fuzzy evaluation of the options based on all of the criteria and all the steps of definitive TOPSIS described in the previous section by the difference that we use the fuzzy numbers in fuzzy TOPSIS, that it changes the calculations.After presenting TOPSIS model by Huang and Yuan and also with the use of fuzzy sets that were presented by Lotfi Zadeh in 1965, many fuzzy TOPSIS models were developed (Kahraman et al., 2007).

Fuzzy TOPSIS models can be used to solve a variety of fuzzy numbers that, depending on the numbers, the model computations is changing.Here fuzzy TOPSIS method of dealing with triangular fuzzy numbers which was proposed by Chen in 2000, is described (Awasthi, et al., 2010).

The first step is to calculate the decision matrix .

To calculate the decision matrix, options are evaluated by individual criteria, then based on the used on the set of fuzzy numbers are assigned.

The second step is to normal fuzzy decision matrix. There are several methods to normalize, that in this way we use the following method:

$$\tilde{r}_{ij} = \left(\frac{a_{ij}}{c_j^*}, \frac{b_{ij}}{c_j^*}, \frac{c_{ij}}{c_j^*} \right); c_j^i = \operatorname{Max}_i c_{ij}; \forall j^+$$

$$\tilde{r}_{ij} = \left(\frac{a_j^-}{c_{ij}}, \frac{a_j^-}{bij}, \frac{a_j^-}{a_{ij}} \right); a_j^- = \operatorname{Min}_i a_{ij}; \forall j^-$$

Third step is to calculate the weighty non-scale matrix $(\tilde{V})$.

$$\tilde{v}_{ij} = \tilde{r}_{ij}.(\tilde{w}_j)$$

In calculating the weighty non-scale matrix, weight of fuzzy numbers or criterion can be fuzzy or crisp.Fourth step is to calculate the fuzzy

Manag. Adm. Sci. Rev.
e-ISSN: 2308-1368, p-ISSN: 2310-872X
Volume: 4, Issue: 2, Pages: 423-428

positive ideal solution (FPIS) and fuzzy negative ideal solution (FNIS).

Method of calculation is as follows:

$$A_j^+ = (\tilde{v}_1^+, \tilde{v}_2^+, ..., \tilde{v}_n^+ = \underset{i}{Max}[v_{ij3}]; i = 1,2,..., m; j = 1,2,..., n$$

$$A_j^- = (\tilde{v}_1^-, \tilde{v}_2^-, ..., \tilde{v}_n^- = \underset{i}{Min}[v_{ij3}]; i = 1,2,..., m; j = 1,2,..., n$$

Fifth step is to calculate distance between any choice of positive and negative ideal solution.

Method of calculation is as follows:

$$d_i^+ = \sum_{j=1}^{m} d(\tilde{v}_{ij}, \tilde{v}_j^+), i = 1,2,..., m$$

$$d_i^- = \sum_{j=1}^{m} d(\tilde{v}_{ij}, \tilde{v}_j^-), i = 1,2,..., m$$

The distance between two triangular fuzzy numbers is calculated as follows:

$$d(\tilde{a}, \tilde{b}) = \sqrt{1/3[a_1 - b_1)^2 + (a_2 - b_2)^2 + (a_3 - b_3)^2]}$$

Sixth step is to calculate the relative closeness index .The final stage of fuzzy numbers is converted to numbers and is calculated as follows:

$$cci = \frac{d_i^-}{(d_i^- + d_i^+)}$$

Step seven is ranking options based on .

It should be noted that the number and range of CCi fuzzy based on the descending phase used in this study, are the numbers introduced by Chen.

These numbers are shown in Table (1).

Table (1): Set of fuzzy numbers by Chen (Chen, 2000)

Verbal expression	Fuzzy numbers
Very low	(0,0,1)
Low	(0,1,3)
Fairly low	(1,3,5)
Medium	(3,5,7)
Fairly high	(5,7,9)
High	(7,9,10)
Very high	(9,10,10)

Model Implementation

Model of organizational performance excellence and organizational excellence implemented as a self-assessment approach in SAIPA in 2011, and improvement projects, according to the different parts of the organization, has been extracted.

In this study, supply chain unit for SAIPA, was selected and process organizational performance excellence model and Six Sigma were implemented in the unit.

Improvement projects derived from the model of organizational performance excellence in supply chain unit are as follows:

Table 2: Improving projects extracted from organizational performance excellence model in supply chain unit

Organizational Improvement Project	**Row**
Select suppliers based on merit	1
Database of contractors and suppliers	2
Promoting understanding of suppliers as stakeholders	3
Transparency, accountability and trust in suppliers	4
Ability to identify key suppliers	5
Accelerate the performance of contracts with suppliers	6
Better use of information technology in the relationship with suppliers	7

In the next stage, the extracted improvement projects, presented in Table 2, by TOPSIS fuzzy technique tailored questionnaires, was provided to all employees of the supply chain and their views on the priorities of the project were collected and also to increase the accuracy and efficiency of the model, employee comments predetermined degree of importance was modified. Weight of comments, obtained from similar studies related to this study (Table 3).

It should be noted that the degree of importance of the views expressed here is different with those stated earlier (in the TOPSIS method stages); In TOPSIS method the opinion of the perceptions and expectations were considered equal, but here importance of people is considered

Manag. Adm. Sci. Rev.
e-ISSN: 2308-1368, p-ISSN: 2310-872X
Volume: 4, Issue: 2, Pages: 423-428

After the calculation of the priority improvement projects, using fuzzy TOPSIS (Table 4) are presented.Finally, based on the calculations were made; the priority of projects is presented in Table (5).

Table (3): The importance of ideas in assessments

People position	Degree of importance (Weight)
unit Management	2
Unit Deputy	1.5
Unit Expert	1

Table (4): prioritize projects to improve the supply chain unit using fuzzy TOPSIS

Row	Improvement projects	CC_i	Priority
1	Select suppliers based on merit	0.825	1
2	Promoting understanding of suppliers as stakeholders	0.773	2
3	Database of contractors and suppliers	0.752	3
4	Ability to identify key suppliers	0.739	4
5	Accelerate the performance of contracts with suppliers	0.704	5
6	Clarification of responsibilities and trust in suppliers	0.685	6
7	Better use of information technology in the relationship with suppliers	0.625	7

Based on the obtained results of improvement projects, we choose supply chain unit to base on fuzzy TOPSIS prioritize technique, as input for six sigma model.

CONCLUSION AND RECOMMENDATIONS

In this study which was conducted with the aim to design a process approach to management concepts and techniques, a model was presented combining organizational performance excellence model and Six Sigma.

As can be seen in the model, organizational performance excellence models can be considered as a system, so that, its output is defined as improvement projects and Six Sigma can be regarded as another system that its input is the output obtained by the model and the output of the Six Sigma approach can be regarded as one of the inputs to the model of performance excellence, because, the degree of improvement that can be obtained from Six Sigma, is depicted in EFQM.

In this model, output organizational performance excellence model were prioritized using fuzzy TOPSIS and the highest priority projects and improvement, was recognized as input in Six Sigma approach. Also supply chain unit of Sipa Company identified as the case study and the model was implemented in this unit.

In this unit, 7 improvement projects were taken to improve the organizational performance excellence model and these projects prioritized by using a questionnaire that was designed to fit the fuzzy TOPSIS technique. Based on the results, the selection of suppliers based on the priority projects identified for Six Sigma.

In the past, the decision to select a project to implement Six Sigma or other management approaches, qualitative and several meetings were conducted; Problems such as time consuming, lack of consensus decision-making, involvement in decision-making personal opinion, the problem of intellectual and predictable. Therefore, to overcome these problems and conflicts resulting from the selection of projects to be implemented was the main motivation of this research.

Increasing speed and saving time and increasing accuracy in decision making to a thousand times, agreement on selected projects, no need for multiple sessions, establishment of a system and a process approach to solving organizational problems were achievements of this model.

REFERENCES

Martín-Castillo, J. I. (2008). EFQM model: knowledge governance and competitive advantage. *Journal of Intellectual Capital, 5:133-156*.

Manag. Adm. Sci. Rev.
e-ISSN: 2308-1368, p-ISSN: 2310-872X
Volume: 4, Issue: 2, Pages: 423-428

Davis, J. (2008). Integration: is it the key to effective implementation of the EFQM Excellence Model? *International Journal of Quality &Reliability Management, 2:383-399.*

Jenicke, L. O. (2008). a framework for applying six sigma improvement methodologies in an academic environment. *The TQM Journal, 4:453-462.*

Kumar U. D. (2007). Six sigma project selection using data envelopment analysis. *The TQM Magazine, 2:419-441.*

Dehghan, N. M. (2009). The role of knowledge management in organizational innovation. *Monthly of automobile engineering and related industries, 1(10), 47-53.*

Kahraman, c., et al., 2007, Fuzzy multi criteria evaluation of industrial robotic system. *Computer & Industrial Engineering, 52(4):414-4330.*

Awasthi, A., Chauhan, s., Goyal, S. (2010). A Fuzzy multi criteria approach for evaluating environmental performance of suppliers. *International Journal of production, 126(2):370-378.*

Chen, C.-T. (2000). Extensions of the TOPSIS for group decision-making under fuzzy environment. *Fuzzy Sets and Systems: 1–9.*