Performance Measurement By Efqm Excellence Model With Fuzzy Approach

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Abstract: The European Foundation for Quality Management (EFQM) excellence model has appeared to make in driving 'new' measurement practices especially in the use of 'soft' measures. Although the EFQM excellence model is so beneficial, its measures are in linguistic-vague forms expressed in linguistic parameters, implying so many doubts. Owning to this vagueness frequently represented in the EFQM Model criteria, the crisp values can not convey the real measures well. This study tries to develop the EFQM excellence model by fuzzy logic.

Key words: Performance Measurement (PM), EFQM Excellence Model, Fuzzy Logic.

INTRODUCTION

EFQM models have been designed to evolve as the assessment process matures over time and thus can be applied to most circumstances where measurement of organizational performance is required (Perrin, 1998). Perrin identified fallacies in the logic of PM and provides examples of ways in which PM is routinely misused. He also discussed about strategies for effective use of PMs (Stone and Banks, 1996). Stone and Banks examined the contribution quality frameworks or models such as EFQM have appeared to make in driving 'new' measurement practices especially in the use of 'soft' measures i.e. those with a particular emphasis on customers and employees. They concluded that EFQM can act as a driver for the organization's continuous improvement initiatives as well as enabling areas for improvement to be identified (Macleod and Baxter, 2001). However, owning to the vagueness frequently represented in the EFQM Model criteria, the crisp values can not convey the real measures well. Fuzzy logic allows taking into account the different meaning that we may give to the same linguistic expression and enables the EFQM auditors to use their own phrases to evaluate the criteria and make a more accurate analysis. Thus, in this paper a fuzzy EFQM excellence model is presented.

EFQM Excellence Model:

The European Foundation for Quality Management was founded in 1988 by leaders from fourteen companies to improve the quality of management in Western Europe (Rusjan, 2005). The EFQM Excellence Model was created in 1991 as a framework against which applicants for the European Quality Award are judged, and to recognize organizational excellence in European companies (Castresana and Ferna´ ndez-Ortiz, 2005). Nowadays, EFQM brings together more than 700 members located in many countries across the world. The EFQM Excellence Model is made up of nine elements grouped under five enabler criteria (leadership, policy and strategy, people, partnerships and resources and processes) and four result criteria (people results, customer results, society results and key performance results) (Bou-Llusar, *et al*., 2009). This model also consists of 32 sub-criteria. The criteria and their corresponding weights are demonstrated in Fig. 1.
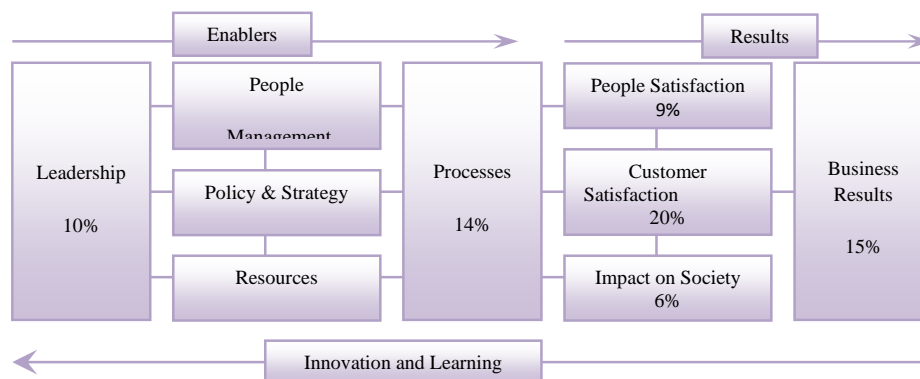

Fig. 1: The EFQM Model of Business Excellence.

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Enablers in the EFQM Excellence Model embrace the processes, structures and means that the organization can use to manage quality (Bou-Llusar, *et al*., 2009). The results concentrate on achievements relating to organizational stakeholders (Nabitz and Klazinga, 1999). The meaning of each criterion is summarized in Table 1. Each criterion is broken down into several sub-criteria and each sub-criterion is illustrated with various 'guidance points' exemplifying what the organization has to do in order to develop the criteria.

Table 1: The EFQM Excellence Model criteria.

Criterion	Definition
Leadership	Excellent leaders develop and facilitate the achievement of the mission and vision. They develop organizational values and systems required for sustainable success and implement these via their actions and behaviors.
Policy and strategy	Excellent organizations implement their mission and vision by developing a stakeholder focused strategy that takes account of the market and sector in which it operates. Policies, plans, objectives and processes are developed and deployed to deliver strategy.
People	Excellent organizations manage, develop and release the full potential of their people at an individual, team-based and organizational level. They promote fairness and equality and involve and empower their people.
Partnerships and resources	Excellent organizations plan to manage external partnerships, suppliers and internal resources in order to support policy and strategy and the effective operation of processes.
Processes	Excellent organizations design, manage and improve processes in order to fully satisfy, and generate increasing value for, customers and other stakeholders.
Customer results	Excellent organizations comprehensively measure and achieve outstanding results with respect to their customers.
People results	Excellent organizations comprehensively measure and achieve outstanding results with respect to their people.
Society results	Excellent organizations comprehensively measure and achieve outstanding results with respect to society.
Key performance results	Excellent organizations comprehensively measure and achieve outstanding results with respect to the key element of their policy and strategy.

Evaluation and scoring by RADAR:

The acronym 'RADAR' refers to different aspects of how the Excellence Model is practically applied within the organization: Results, Approach, Deployment, Assessment and Review. Fig.2. represents the structure of this logic. The RADAR tool, used in conjunction with the EFQM Excellence Model, permits a standardized scoring for how well the organization is doing in its mission to implement a sustainable strategy. This score can be used as the basis of comparison with all or parts of similar or very different organizations. When calibrated by external examiners, RADAR is the basis of determining award winning levels of performance (European Foundation for Quality Management. EFQM model for business excellence. EFQM, Brussels; 2003).

As mentioned before, the EFQM Excellence Model enablers are 'leadership, Policy and strategy, People, Partnerships and Resources, and Processes'. Each of the mentioned criteria is evaluated by the same way using RADAR logic and also scored. Scoring matrix of RADAR is brought in Table 2. Scoring a sub-criterion in the category of enablers is done by averaging the three scores obtained from Approach, Deployment, and Assessment and Review.
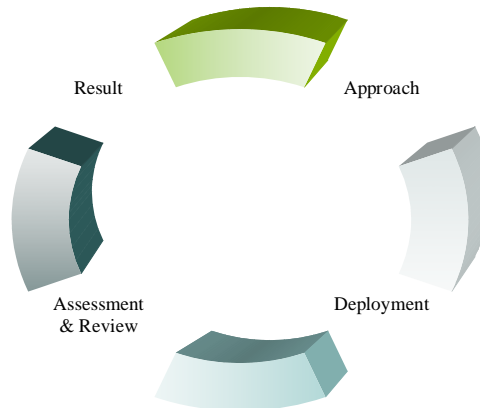

Fig. 2: The RADAR logic structure.

Fuzzy-EFQM Excellence Model:

The main advantage of the adoption of fuzzy logic is the opportunity to express ill-defined judgments (Chen, 2000). In the list of employing fuzzy logic we can underline metro control system in Japan in 1987. From that time no accident has been reported in that subway. Zadeh introduced the fuzzy set theory to deal with the uncertainty due to imprecision and vagueness (Kahraman and Ertay, 2006). He entered human logic into classical one. In mathematics, if we suppose black and white equal to 0 and 1, this logic doesn't recognize any

spectrum except these two colors. However in indistinct fuzzy sets, some spectrums are recognized between black and white. A major contribution of fuzzy set theory is its capability of representing vague data. A fuzzy set is a class of objects with a continuum of grades of membership. Such a set is characterized by a membership function, which assigns to each object a grade of membership ranging between 0 and 1 (European Foundation for Quality Management. EFQM model for business excellence. EFQM, Brussels; 2003; Zadeh and Fuzzy, 1965). In the EFQM, measures are in linguistic-vague forms expressed in linguistic parameters, implying so many doubts. Owning to this vagueness frequently represented in the EFQM Model criteria, the crisp values can't convey the real measures well. Fuzzy logic allows taking into account the different meaning that we may give to the same linguistic expression. As a matter of fact, this is why the fuzzy approach has been so widely adopted in different research fields, as witnessed by the massive literature on the subject (Bottani and Rizzi, 2006)

Table 2: RADAR scoring matrix.

Criterion	Element	Attributes
Results Criteria	Results	Procedures
		Goals
		Comparisons
		(with other organizations)
		Reasons
		Scope
Enablers Criteria	Approach	Fitness
		Integration
	Deployment	Stability
		System ability
	Assessment & Review	Measurement
		Learning
		Improvement

If a, b and c denote the smallest possible value, the most promising value and the largest possible value, respectively, that describe a fuzzy event, then the triangular fuzzy number (TFN) as shown in Fig. 3, can be denoted as a triplet (a,b,c) where, $a \leq b \leq c$. When $a = b = c$, it is a non-fuzzy number by convention. The membership function can be defined as (Zimmermann and. Fuzzy, 1991):

$$\mu_N(x) \; : \quad \begin{cases} (x-a)/(b-a), & x \in [a,b] \\ (c-x)/(c-b), & x \in [b,c] \\ 0 & \text{otherwise} \end{cases} \tag{1}$$
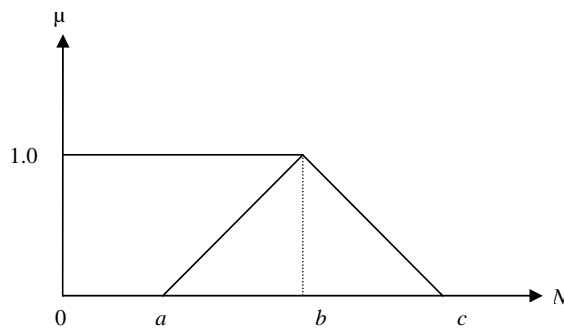

Fig. 3: Triangular Fuzzy Number (TFN).

If $M = (a_1, b_1, c_1)$ and $N = (a_2, b_2, c_2)$ represents two TFN, then required fuzzy calculations are performed as below:

Fuzzy addition: $\qquad M \oplus N = (a_1+a_2, b_1+b_2, c_1+c_2).$ $\qquad (2)$

Fuzzy multiplication: $\qquad M \otimes N = (a_1 \times a_2, b_1 \times b_2, c_1 \times c_2).$ $\qquad (3)$

$M \otimes 1 / N = (a_1/c_2, b_1/b_2, c_1/ a_2)$ $\qquad (4)$

Fuzzy and a natural number multiplication: $\quad r \otimes M = (r.a, r.b, r.c).$ $\qquad (5)$

Model:

The proposed model algorithm is represented in Fig. 4. First, auditors are asked to fill the Evaluation booklets and forms without paying attention to the RADAR logic scores. Then, by the corresponding linguistic phrases of the RADAR scoring spectrum and the presented model, final organization's scored are obtained. Finally, the fuzzy scores given by the auditors to the criteria are compared, defuzzied and each criteria status is then defined. After scoring the enablers and results criteria by the auditors, correspondence between the linguistic variables and fuzzy numbers was made.
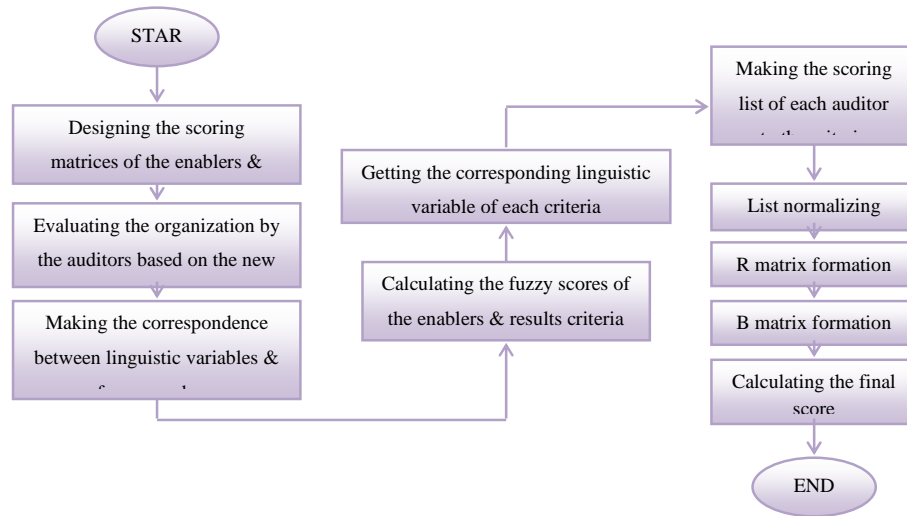
Fig. 4: Schematic representation of the algorithm.

Study limitations:

There are some limitations in implementing the proposed model in organizations. The final results i.e. organization's overall evaluation of sub-criteria, would be the basis of many major decision makings of the organizations; however, as many organizations, especially in the public sector, tend to magnify their performance and activities, so they might refuse to measure and evaluate their performance by the integrated model of Fuzzy-EFQM. The reason is that by integration of fuzzy logic into the EFQM excellence model, the mentioned magnifications might be prevented by the more actual measurement results obtained by this model.

Conclusions:

Performance measurement as a strategic and competitive need is considered in most business centers globally. This phenomenon has been a cause for development of multidimensional and integrated performance management systems. The EFQM excellence model is a framework against which applicants for the European Quality Award are judged, and is used to recognize organizational excellence all around the world. It has appeared to make in driving 'new' measurement practices especially in the use of 'soft' measures. Besides, the RADAR tool, used in conjunction with the EFQM excellence model, permits a standardized scoring for how well the organization is doing in its mission to implement a sustainable strategy.

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