An Enhanced EFQM Methodology for Evaluating the Performance of Organization

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Abstract: Previous studies show that traditional scoring system in EFQM model is not robust and is suffering a problem causing deviation in assessing the performance of an organization. This study aims to establish a realistic scoring system and accurate using one of the MCDM methods. AHP method is used in order to consider the effect of interaction EFQM criteria. Moreover, traditional scoring of EFQM model is used in this analysis. Results show that new scoring system is more efficient than the traditional scoring system. This is because that the traditional scoring system of EFQM is based on additive calculations whereas AHP method considers interaction effects of criteria and sub criteria in EFQM model. Also the efficiency and effectiveness of the new scoring system were confirmed by the data obtained from the performance evaluation of 35 organizations in a case study. The integration EFQM and AHP models can create a new scoring system to help prevent the deviation of organization performance assessment.
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1. Introduction

The European Foundation for Quality Management (EFQM) model of business excellence was introduced in 1992 as a framework for evaluating the performance of organization. The model is a non-prescriptive framework that acknowledges the many approaches for achieving sustainable excellence. The framework is based on nine criteria, five of which are *Enablers* and four are *Results* (EFQM, 2010). The relationship between these criteria is shown in Figure 1.

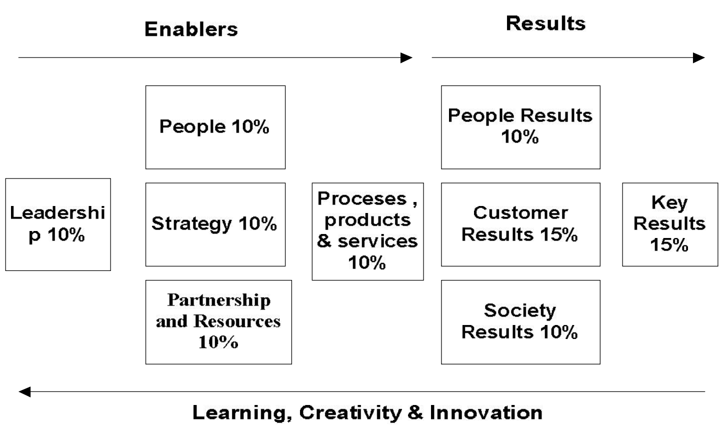


Figure 1. EFQM excellence model,2010

In spite of the general acceptance of the EFQM model among academics and practitioners, researchers warn that organization have encountered problems in applying the model. Kanji (2001) despite the fact that Total Quality Management (TQM) and EFQM model for business excellence have become very popular ideas during the last decade, organization face considerable difficulties and problems when trying to measure their overall performance in a bid to identify strengths, as well as areas for improvement in line with the efforts to prioritise activities. These problems, among others, are attributed to the simplicity of the process involved in computing these performance scores. Interactions of criteria and sub-criteria are ignored, which can lead to wrong score assignments and eventually to a discrepancy in the assessment result.

Most of the previous research on EFQM model focused on the conceptual developments or reflections on the applications. For example, Li and Yang (2003) studied the problems associated with the self-assessment methodology used in the EFQM model. Castresana and Fernandez-Ortiz (2005) explored the usefulness of the EFOM model in identifying resources and capabilities that represent most of the organization. Bou-Llusar *et al*. (2009) analysed the extent to which the EFQM model capture the main assumptions involved in the TQM concept. Tutuncu and Kucukusta (2010) also analysed the relationship between job satisfaction and EFQM business excellence model. In addition, several studies have reported the suitability of EFQM model in other organizations, such as the education (Tari, 2006) and health care sectors (Stewart, 2003).

Reports on the integrative use of EFQM model with other established models are very limited. Among them are the studies of Zerafat *et al*. (2008) and Podobnik and Dolinsek (2008). Zerafat *et al*. (2008) exploited an input-output structure in EFQM and proposed a DEA model to highlight the proportional imbalance between Enablers and the Results of organization which may occur due to hidden problems and obstacles from within. On the other hand, Podobnik and Dolinsek (2008) combined the EFQM model with the Balanced Score card (BSC) Model in coming up with a better, more effective and simpler to use management model for competitiveness and performance development.

The purpose of this study is to enhance the use of the EFQM model for assessing and comparing the performances of organization. The enhancement is done by exploiting the inherent hierarchal relationship between TQM criteria and criteria of EFQM model. Analytic Hierarchy Process (AHP) is then used to synergise this relationship.

2. Material and Methods

In order to find interaction between TQM and EFQM criteria based on Table 1 AHP method is used as follows:

1- Prepare a hierarchical structure
2- Calculate the weights of paired comparisons
3- Determine final weights

There is, however, an inherent systematic relation between fundamental values and concepts of TQM criteria as well as sub-criteria of EFQM model, which provides the possibility of a hierarchical structural design that can significantly contribute to a more realistic evaluation of the organisation status (see Table 1).

Table 1: Links between fundamental concepts of TQM and EFQM criteria

EFQM Criteria	Sub-criteria: Score	TQM Principle Criteria							
		RO	CF	LCP	MPF	PDI	CLII	PD	CSR
	1a: 20			X			X		X
	1b: 20			X	X				
L	1c: 20		X	X			X	X	X
	1d: 20			X		X	X		X
	1e: 20			X			X		
	2a: 25	X	X		X	X		X	X
S	2b: 25	X			X		X		X
	2c: 25	X	X	X		X		X	X
	2d: 25	X			X				
	3a: 20				X	X			X
	3b: 20	X				X	X		
P	3c: 20					X	X		
	3d: 20					X	X		
	3e: 20					X			X
	4a: 20							X	X
	4b: 20								X
PRE	4c: 20								X

	4d: 20								**X**
	4e: 20				**X**		**X**		
PPS	**5a: 20**	**X**			**X**				**X**
	5b: 20	**X**			**X**		**X**		
	5c: 20		**X**				**X**	**X**	
	5d: 20		**X**						
	5e: 20		**X**					**X**	
CR	**6a: 112.5**	**X**	**X**		**X**				
	6b: 37.5	**X**	**X**		**X**				
PR	**7a: 75**	**X**		**X**	**X**	**X**			
	7b: 25	**X**			**X**	**X**			
SR	**8a: 50**	**X**			**X**				**X**
	8b: 50	**X**			**X**				**X**
KR	**9a: 75**	**X**			**X**			**X**	
	9b: 75	**X**			**X**			**X**	

L-leadership, S-strategy, P-people, PRE-partnerships and resources, PPS-processes, Product & services CR-customer results, PR-people results, SR-society results, KR-key results, RO-result orientation, CF-customer focus, LCP-leadership and constancy of purpose, MPF-management by processes and facts, PDI-people development and involvement, CLII-continuous learning innovation and improvement, PD-partnership development, CSR-corporate social responsibility (EFQM, 2010).

The achievement levels of these criteria are measured via certain sub-criteria of the EFQM model as indicated in Table 1. For example, CF is measured via sub-criteria 1c, 2a, 2c 5c, 5d, 5e, 6a and 6b, which also indicate the relationship between criteria CF of the TQM achievement and criteria L, S, PPS and CR of the EFQM model. The sub-criteria are relevant items from the questionnaire about quality practices that are used to rationalise each EFQM criteria. Each sub-criterion is allocated a certain score as indicated in the second column of Table 1. With this relationship, an AHP model is constructed. The general goal at the top level is the achievement of total quality management. The second level contains 8 principle criteria for TQM achievement and the 9 criteria of the EFQM model are laid at the third level. Linkages between criteria at the second and third level are based on the relationship indicated in Table 1.

The pair-wise comparison of criteria at the second level of the hierarchy that reflects the relative importance of the TQM criteria can be determined based on information that is given in Table 1.

Table 2: Matrix $A^{(2)}$ - Ratios indicating the relative importance of the TQM criteria

TQM Criteria	RO	CF	LCP	MPF	PDI	CLII	PD	CSR	w_1
RO	**1**	**660/280**	**660/200**	**660/675**	**660/270**	**660/225**	**660/280**	**660/375**	**132/593**
CF	**280/660**	**1**	**280/200**	**280/675**	**280/270**	**280/225**	**280/280**	**280/375**	**56/593**
LCP	**200/660**	**200/280**	**1**	**200/675**	**200/270**	**200/225**	**200/280**	**200/375**	**40/593**
MPF	**675/660**	**675/280**	**675/200**	**1**	**675/270**	**675/225**	**675/280**	**675/375**	**135/593**
PDI	**270/660**	**270/280**	**270/200**	**270/675**	**1**	**270/225**	**270/280**	**270/375**	**54/593**
CLII	**225/660**	**225/280**	**225/200**	**225/675**	**225/270**	**1**	**225/280**	**225/375**	**45/593**
PD	**280/660**	**280/280**	**280/200**	**280/675**	**280/270**	**280/225**	**1**	**280/375**	**56/593**
CSR	**375/660**	**375/280**	**375/200**	**375/675**	**375/270**	**375/225**	**375/280**	**1**	**75/593**

Table 2 demonstrates the elements of matrix $A^{(2)}$. For instance, in a pair-wise comparison of criteria CSR and LCP (*i.e.*, in determining $a_{83}^{(2)}$), the column corresponding to criteria CSR in Table 1 indicates that 15 of the EFQM sub-criteria (*i.e.*, 1a, 1c, 1d, 2a, 2b, 2c, 3a, 3e, 4a, 4b, 4c, 4d, 5a, 8a and 8b) are related to the CSR criteria. As for the LCP criteria, the corresponding column indicates that 7 of the EFQM sub-criteria (*i.e.*, 1a, 1b, 1c, 1d, 1e, 2c and 7a) are related to the LCP criteria.

Therefore, the pair-wise comparison matrix $A^{(2)}$ is completely consistent and the weights corresponding to this matrix are calculated by normalising each column (e.g. column one). The last column of Table 2 shows the weight vector for this matrix that has been calculated using the AHP process.

Table 3: Matrix $A^{(31)}$ - The relative importance of the EFQM criteria with respect to criteria 1 (i.e., RO) of TQM

CRITERION	S	P	PPS	CR	PR	SR	KR	w_{RO}
S	1	100/20	100/40	100/150	100/100	100/100	100/150	5/33
P	20/100	1	20/40	20/150	20/100	20/100	20/150	1/33
PPS	40/100	40/20	1	40/150	40/100	40/100	40/150	2/33
CR	150/100	150/20	150/40	1	150/100	150/100	150/150	5/22
PR	100/100	100/20	100/40	100/150	1	100/100	100/150	5/33
SR	100/100	100/20	100/40	100/150	100/100	1	100/150	5/33
KR	150/100	150/20	150/40	150/150	150/100	150/100	1	5/22

S- strategy, P-people, PPS-processes, Product & services, CR-customer results, PR-people results, SR-society results, KR-key results.

Table 3 demonstrates the elements of matrix $A^{(31)}$, *i.e.*, the relative importance of the EFQM criteria with respect to criteria RO of TQM. The last column shows the weight vector calculated using the AHP process. The matrix size is 7×7 as only seven of the EFQM criteria are related to criteria RO of TQM (based on column RO of Table 1). In a pair-wise comparison of EFQM criteria S and P with respect to criteria RO of TQM (*i.e.*, in determining $a_{12}^{(31)}$), column RO of Table 1 indicates that for criteria S, sub-criteria 2a, 2b, 2c and 2d are involved, whereas, for criteria P, only sub-criteria 3b is involved.

It can be easily shown that the pair-wise comparison matrixes $A^{(3k)}$ for $k = 1,2,\ldots 8$ are completely consistent in this study and the weights corresponding to these matrixes are calculated by normalising each column of the matrixes.

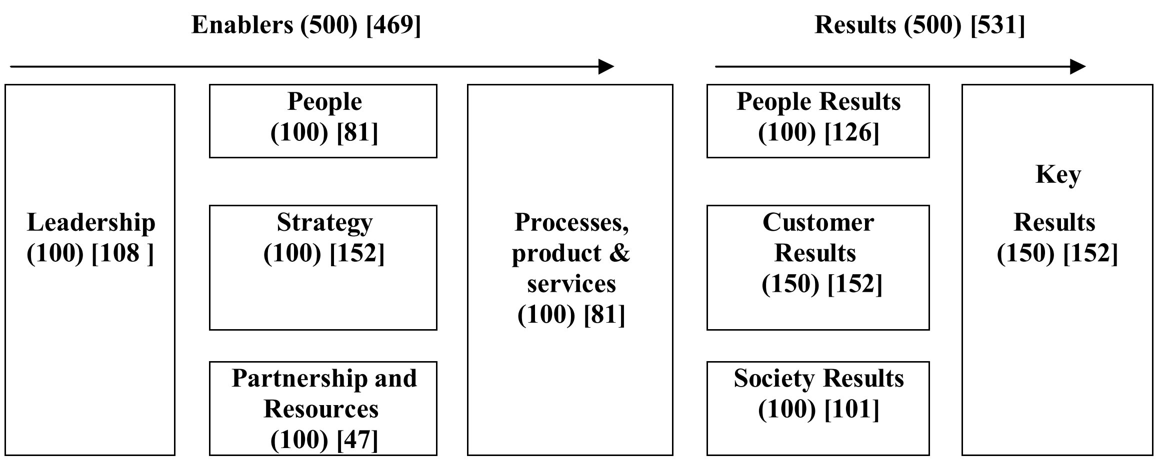
Based on the weight vectors that have been determined for the pair-wise comparison matrixes $A^{(2)}$ and $A^{(3k)}$ for $k = 1,2,\ldots 8$, the weight vector for the 9 EFQM criteria is calculated using the AHP method as follows:

W_j / Criteria	W_{RO}	W_{CF}	W_{LCP}	W_{MPF}	W_{PDI}	W_{CLII}	W_{PD}	W_{CSR}	w_1	AHP_W
L	0	1/14	0.5	4/135	2/27	16/45	1/14	4/25	0.223	0.108
S	5/33	5/28	1/8	1/9	5/27	1/9	5/28	1/5	0.094	0.152
P	1.33	0	0	4/135	10/27	4/15	0	8/75	0.067	0.081
PRE	0	0	0	4/135	0	4/45	1/14	16/75	0.228	0.047
PPS	2/33	3/14	0	8/135	0	8/45	1/7	4/75	0.91	0.081
CR	5/22	15/28	0	2/9	0	0	0	0	0.076	0.152
PR	5/33	0	3/8	4/27	10/27	0	0	0	0.094	0.126
SR	5/33	0	0	4/27	0	0	0	4/15	0.094	0.101
KR	5/22	0	0	2/9	0	0	15/28	0	-	0.152

3. Results

The result demonstrates weighting of the 9 EFQM criteria that differ from original weights. These new weights challenge the validity of the relative importance of the criteria in the original weights. Figure 2 and 3 illustrate the differences in terms of weights between the AHP method and the original EFQM model.

Significant differences can be seen in the weights of Strategy (an increase from 100 to 152), Partnership and Resources (a reduction from 100 to 47), Processes, product &services (a reduction from 100 to 81) and People Results (an increase from 100 to 126) criteria. More importance is now placed on Results (total weights of 531) compared to Enablers (total weights of 469).



(*) weights from the EFQM model; [*] weights from the AHP model

Figure 2: Weights obtained from the traditional EFQM and the AHP models

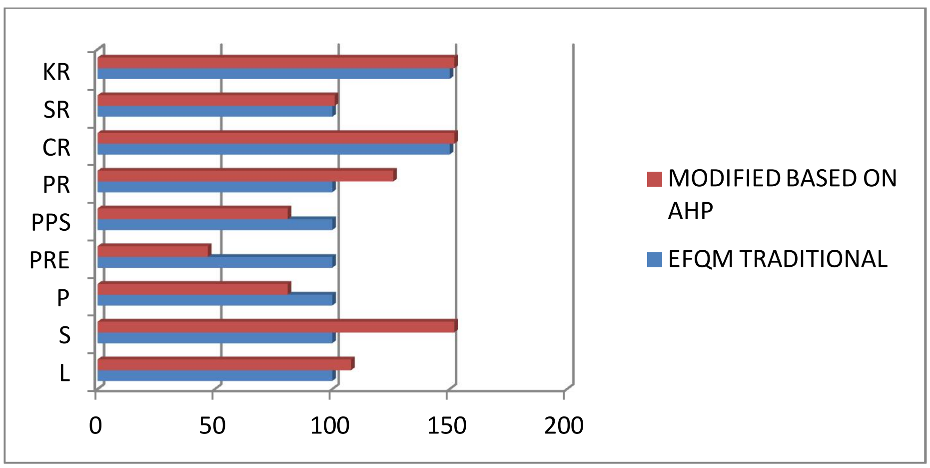


Figure 3: Comparison between the weights obtained from the traditional EFQM and the AHP models

4. Numerical example

We consider the example taken from Zerafat *et al*. (2008) in which 35 organization participated in an exercise of evaluating their performances using the EFQM model. Columns 2-10 in Table 4 represent the scores of the 9 criteria of EFQM for these 35 organizations. Using the traditional EFQM method, these scores are summed-up and the organizations are ranked based on the total scores. Column 11 shows the total score for each organisation and column 12 shows the ranking.

In comparing the performances of the organization using the proposed AHP/EFQM method, the traditional method would be to introduce a fourth hierarchy to the AHP model shown in Figure 4. This new hierarchy consists of the 35 organization that are to be compared and each of them linked to the 9 EFQM criteria in the third hierarchy. Pair-wise comparisons of the organization based on each EFQM criteria would have to be performed and this would require the construction of nine 35×35 pair-wise matrixes. To avoid this tedious process, the EFQM criteria scores are normalised and a weighted-sum (using the new weights of the EFQM criteria) of these normalised scores is calculated instead. The weighted-sum value (denoted as AHP score) of each organisation is listed in column 13 of Table 4 and the ranking of the organization based on this value is given in column 14.

Notice that there is a difference in ranking of organization based on these two methods. This, among others, is due to the interaction effect of criteria that are taken into consideration in the AHP model. The traditional EFQM model, on the other hand is merely an additive model.

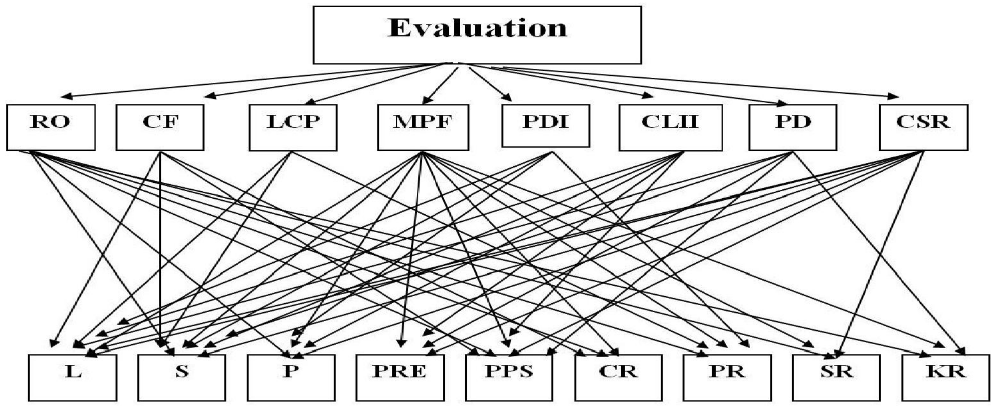


Figure 4. AHP model based on relationship between fundamental concept of TQM and EFQM criteria

Table 4: Data collected by EFQM experienced assessors from organization.

Organisation	L	S	P	PRE	PPS	CR	PR	SR	KR	Sum	EFQM Rank	AHP scores	AHP Rank
1	50	40	44	45	70	105	44	31	74	503	25	0.0240	26
2	65	49	55	57	68	129	56	38	97	614	16	0.0300	15
3	70	53	65	67	80	141	63	40	103	682	10	0.0330	10
4	55	42	45	46	73	112	43	34	83	533	23	0.0260	23
5	60	47	52	54	75	119	52	37	92	588	21	0.0285	21
6	70	50	64	68	79	142	64	41	101	679	11	0.0325	11
7	74	53	70	73	83	150	74	43	112	732	9	0.0352	9
8	80	65	76	77	90	159	79	47	118	791	6	0.0382	6
9	75	63	72	74	80	151	75	43	114	747	7	0.0362	7
10	55	45	46	49	69	110	47	35	80	536	22	0.0261	22
11	64	49	53	54	69	127	55	39	95	605	17	0.0296	17
12	85	68	80	82	110	169	82	52	126	854	1	0.0411	1
13	80	63	77	79	95	161	79	47	121	802	5	0.0387	5
14	40	31	35	37	62	75	38	22	63	403	30	0.0195	30
15	35	24	30	33	51	71	31	22	53	350	33	0.0170	31
16	51	40	45	46	71	104	43	30	73	503	26	0.0240	28
17	65	51	56	58	69	128	55	37	96	615	15	0.0298	16
18	71	52	64	69	79	141	63	40	100	679	12	0.0325	12
19	65	49	54	55	69	126	54	38	94	604	18	0.0291	18
20	86	63	78	80	96	160	79	46	120	808	4	0.0391	4
21	36	25	31	34	51	70	30	21	53	351	32	0.0169	32
22	83	67	79	81	108	163	80	48	122	831	2	0.03993	2
23	42	31	36	37	63	74	37	22	63	405	29	0.0196	29
24	57	43	46	48	69	110	45	34	79	531	24	0.0256	24
25	75	54	73	75	83	149	77	43	113	742	8	0.0358	8
26	32	26	29	28	45	45	28	19	48	300	35	0.0145	35
27	65	49	54	55	69	126	54	38	94	604	19	0.0290	19
28	71	50	64	69	79	140	63	41	99	676	13	0.0324	13
29	65	50	52	56	73	125	52	35	90	598	20	0.0290	20
30	49	45	42	45	76	63	37	20	53	430	28	0.0210	27
31	37	25	35	39	56	70	25	21	50	358	31	0.0168	33
32	87	73	75	80	109	156	75	48	121	824	3	0.03990	3
33	51	41	46	46	70	104	42	29	74	503	27	0.0243	25
34	72	54	64	69	80	126	53	37	93	648	14	0.0310	14
35	35	27	29	45	46	44	44	31	47	305	34	0.0147	34

L-leadership, S-policy and strategy, P-people, PRE-partnerships and resources, PPS-processes, Product & services, CR-customer results, PR-people results, SR-society results, KR-key results.

5. Discussion

The results obtained from this study showed that the new scoring system resulted from the integration of the two models AHP and EFQM, is much more realistic and more accurate than traditional EFQM scoring system for performance organizational assessment and it prevails seriously over any deviation of the assessment.

AHP is a flexible decision making tool for multiple criteria problems. In the last two decades, AHP has gained significant popularity and there are many reported real life applications in business, energy, health, transport and housing (Vaidya and Kumar, 2006). This is mainly due to its mathematical and methodological simplicity and its ability to cope with multiple criteria involving intuitive, logical, quantitative and qualitative aspects. AHP is also supported by the availability of reliable computer software.

One advantage of a hierarchy is that it allows us to focus judgement separately on each criterion. After decomposing the problem into hierarchies, elements at a given hierarchy level are compared in pairs to assess their relative preference with respect to each and every elements at a higher level. This procedure is repeated at each level in a descending direction.

One of the major advantages of AHP is that it calculates inconsistency index (Ertay *et al*., 2006). This index is important for the decision maker to assure oneself that the judgement made is consistent and that the final decision is also soundly arrived at. It should be mentioned that an inconsistency index value lower than 0.10 is acceptable whereas a higher value of inconsistency index requires re-evaluation of the pair-wise comparisons.

Another major advantage of the AHP is that it helps the decision maker to cope with complex problems by decomposing it into a hierarchical structure. The weights of decision criteria and the priorities of alternatives are determined by comparing only two elements at a time. Both qualitative and quantitative elements of the hierarchy are allowed to be pair-wise compared with ease (Vaidya and Kumar, 2006).

Besides being used as a stand-alone tool, AHP has been integrated with other tools for many real applications. For example, Ozdemir and Gasimov (2004) studied a faculty course assignment problem using binary non-linear programming model. They reduced the multiple objective functions to a single objective function and used AHP to determine the relative importance weightings of the objectives or the preferences of the instructors and administrators. The objective was to select the best assignment that would maximise the satisfaction of instructors and administrators.

In a survey by Ho (2008) on integrated AHP model and its applications, it was reported that the five tools that are commonly combined with AHP are mathematical programming, quality function deployment, meta-heuristics, SWOT analysis and data envelopment analysis (DEA). In this paper, another integrated AHP model is described. The model combines the criteria and assumptions of the EFQM model with the AHP model to enhance the use of the EFQM model in order to compare the performance of organization.

The EFQM model is actually an additive model with simple mathematical manipulation of the inputted information in coming up with the performance scores to reflect the status of an organisation. This simplicity sometimes caused considerable difficulties and problems to organization in their bid to identify strengths as well as areas for improvement and to prioritise efforts (Kanji, 2001).

6. Conclusion

An enhanced version of the EFQM model of business excellence has thus been presented. The model exploits the inherent relationship between criteria of TQM and criteria of EFQM model by integrating them into an AHP model. The AHP model places the TQM criteria in one hierarchy and the EFQM criteria in another hierarchy. Assessments of criteria during the pair-wise comparisons are done based only on the inherent information of the EFQM model, without relying on external expert opinion. The interaction effect between the criteria resulted in a new set of weights to better reflect the relative importance of the 9 EFQM criteria. With this, it would also be more sensible to compare organization of differing nature and functions against similar indexes/criteria.

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