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Monitoring Performance of Taiwan Coffee Chain Stores Using a Multidimensional Performance Management System

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Abstract

This study proposed a multidimensional performance management (MPM) system to monitor the performances of coffee chain stores (CCSs) in Taiwan. The essence of MPM system lies in combining the approaches of subjective judgment and objective evaluation to provide decision makers with accurate evaluation outcomes for surviving the intense competition in Taiwan. In this system, the fuzzy multiple criteria decision making model, the data envelopment analysis model and the super-efficiency model were respectively used to evaluate performances. The distinctive characteristic of this study is threefold. First, this study was a prior application of multidimensional evaluation viewpoint to monitor performances. Second, to provide multidimensional base for analyzing data, a Performance-Indication plane was constructed to appropriately locate CCSs according to their evaluation outcomes. Third, based on this plane, a 6-cell Performance-Strategy matrix was used to propose the initiatives of strategic planning for improvements. In case application, thirty six Taiwan CCSs were selected as the target units. By means of the proposed MPM system, these CCSs were classified into four groups and then received suitable improvement suggestions. Overall, the results revealed the good achievements in both providing accurate evaluation outcomes and suggesting improvement strategies.

Keywords: Performance management; Fuzzy multiple criteria decision making; Data envelopment analysis; Super-efficiency model; Coffee chain store

1. Introduction

Performance management serves a wide range of purposes within businesses, including monitoring internal systems and external performance, tracking the implementation of change, stimulating continuous improvement, tracking the overall financial performance, making critical decisions in firms, etc. (Austin, 1996; Neely, 1998). Also, performance management is expected to provide visions and strategic goals of a firm and supervise it to make profits (Pun, 2002; Lapide, 2003). In other words, performance management plays a key role for surviving intense competition (Harrison and New, 2002). However, on the other hand, many literatures revealed that lots of decisions fail due to inappropriate evaluation tools (Nutt, 2000). In fact, these researches shared the same situation that a single evaluation model was used. It is known that any one evaluation model was formulated from one idea-thinking approach. Usually, performance evaluation is a multiple criteria problem (Neely, 1998), which may result in a high dependence of evaluation outcomes on evaluation tool. As a result, the evaluation outcomes for making decisions may be not useful or even be wrong. Therefore, for providing accurate evaluation outcomes to avoid wrong decisions, this study proposed the idea– using a multidimensional performance management (MPM) system approaching from three different methodologies to monitor performances.

In this proposed system, two goals were set: (1) to give each evaluated unit an ‘appropriate’ appraisal according to its performances and (2) to establish a mechanism for suggesting improvement strategies. To achieve the first goal, subjective judgment and objective evaluation were considered as two different approaching methodologies and combined to realize MPM. The subjective judgment and the objective evaluation were conducted by using the fuzzy multiple criteria decision making (FMCDM) model (Zadeh, 1975), the data envelopment analysis (DEA) model (Charnes et al., 1978) and the super-efficiency model (Andersen and Petersen, 1993), respectively. A Performance-Indication plane was constructed to appropriately locate the evaluated units according to multidimensional evaluation outcomes. To achieve the second goal, a Performance-Strategy matrix that was constructed from the unit-location pattern on the plane was used to establish the mechanism for proposing the initiatives of improvement strategies easily.

In case application, thirty six coffee chain stores (CCSs) in Taiwan were selected as the target units. Seven performance measures that were approved of appropriateness by decision makers were used. As re-

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sults, in the Performance-Indication plane, the thirty six CCSs were categorized into four groups according to their corresponding evaluation outcomes. And, by means of the six-cell Performance-Strategy matrix, the initiatives of improvement strategies were respectively proposed for all the CCSs and then fed back for future improvements. In sum, all the results revealed the fact that this proposed MPM system could be used to establish the mechanism for giving accurate evaluation outcomes and providing deeper managerial insights to the decision makers of thirty six CCSs.

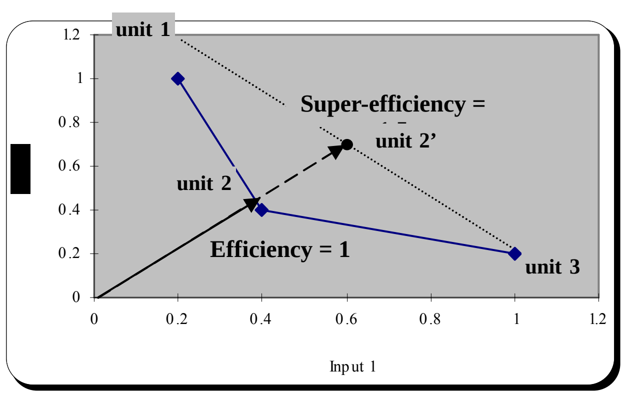
The rest of this research is organized as follows. Section 2 gives the review of literatures in brief. Section 3 introduces the research framework and method design in the MPM model. Section 4 presents the results and their corresponding discussions and Section 5 gives the conclusions.

2. Literature Review

The FMCDM model refers to making rankings among some alternatives in the presence of multiple criteria with the aid of fuzzy operations (Zadeh, 1975; Zimmermann, 1987). Basically, FMCDM models are based on a two-phase process (Chen and Hwang, 1992). In the first phase, triangular or trapezoidal fuzzy numbers are usually used to express the expert's assessments on alternatives' performance with respect to each criterion. Meanwhile, all the criteria are also weighted, and then the overall utilities of alternatives, known as fuzzy utilities, are aggregated by fuzzy algorithm. The second phase involves the ranking of the alternatives based on the comparison of their corresponding fuzzy utilities that are represented by fuzzy numbers. In fact, a number of literatures have already shown the achievements in modeling real world decision-making problems (e.g., Yeh et al., 2000; Chang et al., 2000; Cheng and Lin, 2002; Azad et al., 2005) The main feature of FMCDM lies in providing a more flexible framework to redress satisfactorily many of the obstacles of lacking precision. More specifically, it has the better capability in modeling the qualitative data used to represent the subjective and imprecise evaluations of decision problem.

The DEA model is a non-parametric linear programming model that converts multiple input and output measure variables into a single, comprehensive evaluation of efficiency without requiring specification or knowledge of priori weights or prices for the measure variables. Each measure variable can be measured independently in any useful units instead of being transformed into a single metric. All the advantages have verified the fact that the DEA model was emerging as the leading method for efficiency evaluation (Golany, 1988). Since the first DEA model, the DEA model has established itself as a popular analytical research instrument and practical decision-support tool (Seiford, 1996; Sueyoshi, 2005; Wu, 2005).

The super-efficiency model was developed to make up the insufficient capability of the DEA model in ranking efficient units discriminatively. Basically, the super-efficiency model involves rerunning the DEA model with the procedures of removing, in turn, each efficient unit and recalculating efficiency score of the resulting change (Andersen and Petersen, 1993). Because of the absence of a unit in its own DEA peer set, the efficiency score of an inefficient unit will not change, while that of an efficient unit may now be equal to or greater than 1. The units having efficiency scores greater than 1 are described as "super-efficient." Figure 1 presents an example (Yeh and Cheng, 2005) to illustrate the concept of super-efficiency. All three units are efficient. If unit 2 is removed from its own peer set, the efficient frontier moves away the origin, as represented by the dotted line, and unit 2' on the shifted efficient frontier will be the projection of unit 2. As seen in Figure 2, the position of unit 2' is 50% farther from the origin than the point of unit 2, and therefore its super-efficiency score is calculated as 1.5.



Source: Yeh and Cheng, 2005

Figure 1. Illustrative Example for Super-efficiency with 3 Units

It has been recognized that none evaluation model is good enough to conduct all kinds of performance evaluation cases. Therefore, the combination of two or more evaluation models based on different evaluating approaches seems being another better alternative. In fact, the concept of multidimensional evaluation was not a new approach. For example, in clinical and experimental medicine, the multidimensional evaluation has been applied to the health care of centenarians for providing accurate diagnosis (Infusino et al., 1996). In management field, on the other hand, two analogous applications were found. Hougaard (1999) suggested a special combination of fuzzy set theory and DEA model in order to extent the scores of technical efficiency from an index value to a fuzzy interval with the aim at giving a more consistent evaluation outcomes. Kao and Liu (2000) proposed a fuzzy DEA model for measuring efficiency under imprecise environment. However, the core intentions involved in the two researches were in a new methodology development, not in multi- dimensional evaluation.

The business portfolio matrix (Abell and Hammond, 1979) was used to formulate the initiatives of strategic planning for feedback improvements. The Performance-Strategy matrix proposed in this study was drawn upon this matrix with the same aim at strategies proposal. The applications of the Performance-Strategy matrix in proposing strategic planning could be found in other literatures, for examples, in Kopf et al. (1993) and Jose (1996).

3. Methodology Design: MPM System

In this system, MPM is realized by combining subjective judgment and objective evaluation. The employed methods include the FMCDM model, the super-efficiency model and the DEA model. Figure 2

shows the framework of methodology and analysis designs. The following sub-sections present the evaluation models for realizing MPM.

3.1 Subjective Judgment: FMCDM Model

(1) 1st phase

Basically, it is the fact that different linguistic weights may result in different weight distribution for the same measure set, and different weight distribution may lead to different evaluation results. For this sake, the employed linguistic weights have to satisfy certain conditions for their appropriate uses (Chen and Hwang, 1992). In general, trapezoidal shape of linguistic weights is one the ones that satisfy the listed conditions. Therefore, this study employed the trapezoidal fuzzy numbers to express the expert's judgments on both each measure weight and performance of an evaluated unit with respect to each measure variable. In expressing expert's judgment, 5-scale linguistic weighting variables (see Table 1(a)) were used to assess the importance of each measure variable, while 5-scale linguistic rating variables (see Table 1(b)) used to evaluate the ratings of each unit according to its performance on each measure variable. The opinion consensuses were achieved by the Delphi method (Anderson et al., 1998). The overall utilities of units were aggregated by the following simple algebraic calculation (Cheng and Lin, 2002):

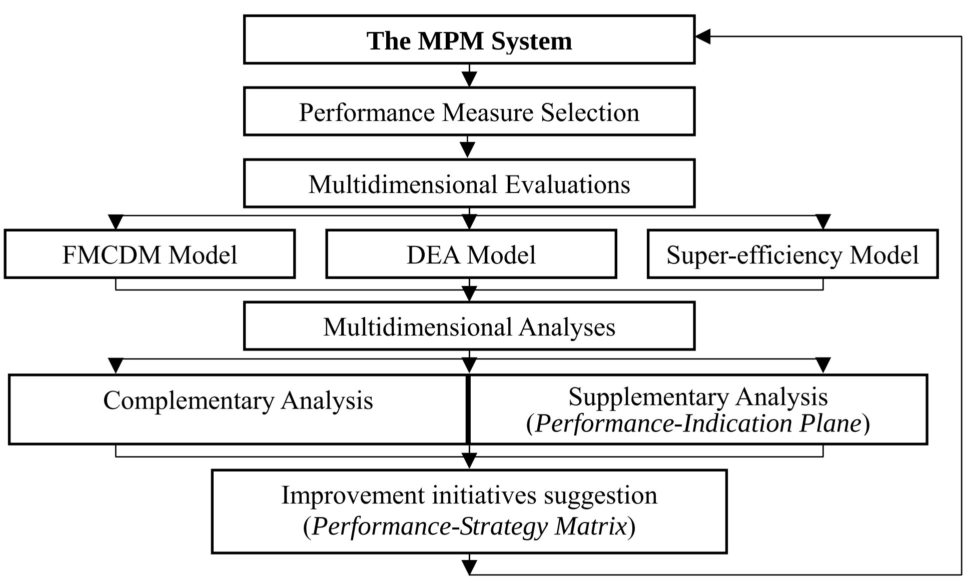
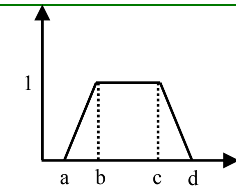


Figure 2. Framework of Methodology and Analysis Designs in the MPM System

Table 1. Linguistic Variables and the Corresponding Trapezoidal Fuzzy Numbers

(a) Linguistic weighting variable for importance weighting	Corresponding trapezoidal fuzzy numbers (a, b, c, d)
Very Low (VL)	(0.00, 0.00, 0.12, 0.22)
Low (L)	(0.12, 0.22, 0.34, 0.44)
Medium (M)	(0.34, 0.44, 0.56, 0.66)
High (H)	(0.56, 0.66, 0.78, 0.88)
Very High (VH)	(0.78, 0.88, 1.00, 1.00)



(b) Linguistic rating variable for performance rating	Corresponding trapezoidal fuzzy numbers (a, b, c, d)
Very Poor (VP)	(0.0, 0.0, 1.2, 2.2)
Poor (P)	(1.2, 2.2, 3.4, 4.4)
Fair (F)	(3.4, 4.4, 5.6, 6.6)
Good (G)	(5.6, 6.6, 7.8, 8.8)
Very Good (VG)	(7.8, 8.8, 10.0, 10.0)

Aggregated fuzzy utility $= \tilde{A}_i = [\tilde{x}_{ij}] \cdot [\tilde{w}_j]^t$,

$$i = 1, \cdots, n,\ j = 1, \cdots, m, \quad (1)$$

where $\tilde{x}_{ij}$ denote fuzzy performance rating of unit i at j measure variable, $\tilde{w}_j$ denote fuzzy importance weighting of j measure variable. *n* is the number of unit and *m* is the number of measure variable.

(2) 2nd phase

The second phase involves the ranking of all the units based on the comparison of their corresponding aggregated fuzzy utilities of A_i. For trapezoidal fuzzy number, the following formula defuzzifies the aggregated fuzzy utility (Kaufmann and Gupta, 1988; Cheng and Lin, 2002):

$$\text{Defuzzification value} = (a + b + c + d)/4. \quad (2)$$

3.2 Objective Evaluation: DEA and Super-efficiency Models

For the attention on resource control, the input-oriented CCR DEA model (Charnes et al., 1978) was employed to provide objective materials for analysis, in coordination with the overall-oriented evaluation given in subjective judgment. In brief, the following model was used to investigate the overall efficiency for each unit of the *n* units under evaluation:

$$\textbf{\textit{Min}} \quad \theta_k^* = \left\{ \eta - \varepsilon \left(\sum_{i=1}^{m} s_{ik}^- + \sum_{r=1}^{s} s_{rk}^+ \right) \right\} \quad (3)$$

subject to

$$\eta x_{ik} = \sum_{j=1}^{n} x_{ij} \lambda_j + s_{ik}^-, \quad \text{for } i = 1, \ldots, m,$$

$$y_{rk} = \sum_{j=1}^{n} y_{rj} \lambda_j - s_{rk}^+, \quad \text{for } r = 1, \ldots, s, \quad (4)$$

$$\lambda_j, s_{ik}^-, s_{rk}^+ \geq 0,$$

where y_{rk} denotes the r^{th} output of unit *k*, while x_{ik} denotes the i^{th} input of unit *k*. s_{ik}^-, s_{rk}^+ are the slack variables for input and output, respectively, while η is the efficiency score. λ_j represents the weight of unit *j* and ε is a non-Archimedean (infinitesimal) constant. *m* is the number of inputs and *s* is the number of outputs.

In formula (3), unit *k* will determine its slack variables so as to minimize the optimum function θ_k with the constraints given by formula (4). The efficiency score η may range from zero to one. If the conditions of $\eta = 1$ and all $s_{ik}^-, s_{rk}^+ = 0$ are satisfied, unit *k* is called CCR-efficient. Otherwise, unit *k* is called CCR-inefficient. In addition, if unit *k* is proved to be inefficient, a hypothetical unit *k*' can be composed as an aggregate of the efficient units (with $\lambda_j \neq 0$), referred to as the efficient peer set for inefficient unit k.

Finally, the super-efficiency model reruns the DEA model with the procedures of removing, in turn, each efficient unit and recalculating efficiency score of the resulting change as demonstrated in Figure 1.

4. Case Application

The consumption market of coffee chains in Taiwan has conveyed its full vitality through many quantitative evidences, including the average annual growth rate- of the amount of coffee chains over 30% and of grand total of coffee chain stores near 100%, and the annual coffee consumption potential closes to US$ 1 billion. However, other statistics have presented the average business survival rate of Taiwan eating and drinking places down to 46.68%. All these events make the curiosity reasonable about what kind of competences Taiwan coffee chain stores (CCSs) possess to survive those unprecedented competitions. Therefore, Taiwan CCSs were the targets used to examine the capability of the MPM system. This study focused on the intra-chain analysis of store efficiencies of a representative coffee chains in Taiwan. The consideration involved is threefold. First, the target coffee chain has achieved steady operation with a level of economic scale. Second, it lies in the misgiving about the unavailability of cross-company data. Last, it ensures the homogeneity in DEA model.

The target coffee chain company founded in the early of 1990s and possessed the amount of CCSs in franchising over seventy. In 2002, its annual revenue has achieved the level of 15 millions US dollars and shared 5% of the coffee chain market. In addition, the distribution of its CCSs concentrates in the urban regions of north and central Taiwan, and new competing battlefields are planned to open in the south Taiwan and the Mainland China with the ultimate amount of CCSs in franchising set up to 100. Thirty six CCSs of the target coffee chain were selected as the evaluated units.

4.1 Performance Measure Selection

To ensure the appropriateness of performance measure, the measure set were selected from daily operation data set of the CCSs under evaluation by the aid of the participation of the decision makers. Via the participations and confirmations of senior managers of the target coffee chain, seven performance measures were selected from daily operation data set. Table 2 shows the performance data. The seven performance measures are:

Output measure set: coffee turnover (O_1); gross profit (O_2); mean person-time a seat (O_3); and gross revenue growth rate based on the same month of last year (O_4).

Input measure set: operating and sales costs (I_1); accumulated business hours (I_2); and effort index on enhancing customer satisfaction (I_3).

Table 2. Performance Data of the 36 CCSs

CCS No.	I_1	I_2	I_3	O_1	O_2	O_3	O_4
1	0.3834	4.62	0.5	0.1509	73.74	0.213	0.00
2	0.4547	4.62	0.5	0.1524	52.62	0.189	-13.05
3	0.2674	4.62	0.5	0.1521	83.06	0.380	-19.94
4	0.0736	4.62	0.5	0.0386	84.15	0.088	0.00
5	1.5954	4.62	1.0	0.6261	72.36	0.570	50.00
6	1.1085	3.12	0.5	0.4322	74.99	0.372	-30.77
7	0.8808	4.62	0.5	0.3775	75.22	0.579	-24.63
8	0.4919	4.62	0.5	0.2410	86.43	0.528	-31.40
9	0.5187	4.62	0.5	0.2927	75.80	0.333	-3.12
10	0.5137	4.62	0.5	0.2545	74.98	0.280	-38.47
11	0.4750	4.62	0.5	0.2192	80.65	0.326	-3.97
12	0.3545	4.62	0.5	0.1545	76.12	0.363	-8.10
13	0.2617	4.62	1.0	0.1523	83.96	0.260	-4.56
14	0.2927	4.62	1.0	0.0935	51.50	0.097	0.00
15	0.6334	4.62	1.0	0.2066	73.63	0.293	0.00
16	0.5781	4.34	1.0	0.2987	77.10	0.353	-16.82
17	0.4687	4.62	1.0	0.2653	86.01	0.462	-3.10
18	0.5936	4.62	0.3	0.2675	75.18	0.229	-25.22
19	0.4417	4.62	0.5	0.2013	85.29	0.341	-27.80
20	0.4710	4.62	1.0	0.1972	73.67	0.409	-15.11
21	0.4371	5.60	0.3	0.1578	72.37	0.445	-14.62
22	0.5843	4.62	0.5	0.1487	76.04	0.244	-32.86
23	0.2979	5.46	0.5	0.1306	73.66	0.236	-4.93
24	0.1897	6.72	0.5	0.1200	85.77	0.356	-40.39
25	0.1747	4.50	0.5	0.0926	83.82	0.185	-11.54
26	0.2761	6.72	0.5	0.0667	54.17	0.270	0.00
27	0.4594	4.62	0.5	0.2246	84.49	0.482	-8.96
28	1.5935	6.72	0.3	0.0477	67.63	0.532	12.87
29	0.3628	4.62	1.0	0.1889	74.27	0.274	-1.63
30	0.4679	6.72	0.5	0.1248	69.85	0.322	0.85
31	0.3688	4.62	0.5	0.1092	72.78	0.324	-13.65
32	0.3131	4.62	0.5	0.1343	73.91	0.221	-5.16
33	0.2844	4.62	0.5	0.0865	69.43	0.159	-32.23
34	0.2424	4.62	1.0	0.1233	67.29	0.180	-6.04
35	0.1065	4.62	1.0	0.0534	79.03	0.091	-42.96
36	0.4822	4.62	0.5	0.1645	66.74	0.135	24.11

Table 3. Importance Weightings of the Seven Performance Measures

Performance measure	Expert's weighting				Mean importance weightings in trapezoidal fuzzy number
	E_1	E_2	E_3	E_4	
I_1	H	H	VH	VH	(0.670,0.770,0.890,0.940)
I_2	H	H	H	VH	(0.615,0.715,0.835,0.910)
I_3	H	H	H	H	(0.560,0.660,0.780,0.880)
O_1	H	VH	VH	VH	(0.725,0.825,0.945,0.970)
O_2	H	VH	VH	VH	(0.725,0.825,0.945,0.970)
O_3	M	M	H	H	(0.450,0.550,0.670,0.770)
O_4	M	H	H	H	(0.505,0.605,0.725,0.825)

Table 4. Collection of DEA, Super-efficiency and FMCDM Outcomes for the 36 CCSs

DEA and super-efficiency outcomes				FMCDM outcomes	
CCS No.	DEA scores	Super-efficiency scores	Ranking	Aggregate score	Ranking
1	0.9125	-	25	13.160	31
2	0.6379	-	35	12.394	33
3	1	1.110	11	16.076	12
4^{+}	1	3.316	1	14.822	20
5	1	1.935	3	17.923	2
6	1	2.518	2	16.449	10
7^{+}	1	1.005	17	17.844	3
8	1	1.221	8	16.981	8
9	1	1.155	9	16.613	9
10	0.9328	-	23	14.526	22
11	0.9895	-	19	15.597	15
12	0.9359	-	21	16.068	13
13	1	1.089	12	14.896	18
14	0.6080	-	36	9.810	36
15	0.8494	-	33	13.453	29
16	0.9965	-	18	15.278	17
17	1	1.245	7	16.404	11
18	1	1.344	6	17.114	7
19	0.9840	-	20	14.876	19
20	0.8529	-	32	14.296	25
21^{+}	1	1.068	14	17.367	4
22	0.8640	-	30	14.531	21
23	0.8659	-	28	14.367	24
24^{+}	1	1.023	16	17.298	5
25	1	1.123	10	15.357	16
26^{+}	1	1.061	15	11.933	35
27	1	1.617	4	17.160	6
28^{+}	1	1.078	13	18.774	1
29^{+}	0.9327	-	24	15.601	14
30	0.8642	-	29	14.477	23
31	0.8530	-	31	12.418	32
32	0.8752	-	26	13.658	28
33	0.8080	-	34	12.269	34
34	0.8699	-	27	13.336	30
35	0.9355	-	22	14.103	26
36^{+}	1	1.599	5	13.808	27

$^{+}$ CCS has large ranking differences ($\geq$ 10) between the two rakings.

4.2 Multidimensional Analysis Base

(1) Complementary analysis

(1.1) Elementary analysis

(1.1.1) FMCDM outcomes analysis

The expert group consists of four experts, one professor in university and three practitioners in the industy of coffee chains. The professor majors in operation researches over fifteen years. The practitioners consist of a general manager, a senior manager of the department of information system and the one has work experience over ten years in the public sector that is in charge of the matters of service industry in Taiwan. Group consensus was achieved by second round with the aid of the questionnaire. The questionnaire consists of two parts, expressing experts' subjective opinions on both the importance of each measure variable and the performance rating of each CCS with respect to measure variables. Table 3 shows the importance weightings of the seven performance measures. Using formulas (1) and (2), the last two columns of Table 4 present the aggregate results.

As seen in Table 4, the aggregate scores vary from 0.9810 to 18.774. According to these scores, a discriminate ranking can be found, as shown in the last column of Table 4. In subjective opinion, CCS Nos. 28, 5 and 7 are the top three best exemplars.

(1.1.2) DEA outcomes analysis

By formulas (3) and (4) and the super-efficiency model, the first five columns of Table 4 show the DEA and super-efficiency results for the 36 CCSs. 17 CCSs are DEA-efficient, while the remainders are DEA-inefficient with a mean efficiency score of 0.8720. As shown in the 5th column of Table 4, super-efficiency scores gives a discriminate ranking among the DEA-efficient CCSs. In objective viewpoint, CCS Nos. 4, 6 and 5 are the top three best exemplars. Usually, the DEA model provides a number of evaluation outcomes for analysis, e.g., slack analysis, target improvements for inefficient CCSs, etc. Instead, this study intends to put the main efforts on conducting the MPM. The remainder analysis outcomes do not be shown here and will be directly sent to the senior managers for advanced use.

(1.2)Macro-viewpoint analysis: Correlative relationship

As examining from the viewpoint of statistics, the Spearman's correlation coefficient between the two rankings is 0.69 (the statistically significant level at $p = 0.01$). In macro-viewpoint, these results reveal a good correlative relationship between the two rankings. Basically, the correlation examination gives powerful evidence on supporting the outcomes reliability for each other.

(1.3) Micro-viewpoint analysis: Ranking difference

Contrary evaluations (having ranking differences ≥ 10) take place between the two rakings of several CCSs, as shown in Table 4. For example, it can be found that Nos. 36 and 7 have the ranking differences 22 and 14. No. 36 is DEA efficient and ranks 5, but is judged as less efficient by the experts (ranks 27). Contrarily, No. 7 ranks 3 by the experts, but ranks 17 by the DEA model. Evidently, this phenomenon is interesting and deserves further examination. Examining weaknesses and strengths of original performance data of individual CCS may give the clue behind this phenomenon. Table 5 shows the weaknesses and strengths of CCSs 7 and 36. From Table 5, it is reasonably conjectured that the DEA model and the experts appreciate the performances of individual CCS from different viewpoints. In fact, the above conjecture stands as the same procedure is employed to examine other CCSs having contrary evaluations. It may be conceivable that the proposed MPM system provides the mechanism to appreciate performances of individual CCS from multidimensional viewpoints.

(2) Supplementary analysis: mapping onto the Performance-Indication plane

The Performance-Indication plane proposed in this study is shown in Figure 3. In the abscissa, three levels are classified according to the three divisions of FMCDM rankings, i.e., 'Inferior Performance in Opinion of Experts,' 'Ordinary Performance in Opinion of Experts,' and 'Good Performance in Opinion of Experts.' In the ordinate, two classifications are taken by DEA efficient (lower half plane) and inefficient (upper half plane) features. Based on these classifications, six cells labeled by **I~VI** exist in this plane. According to corresponding rankings shown in Table 3, Figure 3 presents the location of all the 36 CCSs on this plane. More specifically, the 36 CCSs can be respectively categorized into the four groups labeled by **A** ~ **D**. Basically, each group in this plane has its own distinctive characteristic, i.e.

Group A in Cell I: DEA-inefficient and Inferior Performance in Opinion of Experts, consisting of 8 CCSs, Nos. 1, 2, 14, 15, 31, 32, 33, 34;

Table 5. Weaknesses and Strengths of CCS Nos. 7 and 36

CCS	Strengths	Weaknesses
No. 7	(1)1st- high output$_3$: seat effect (2)3rd- high output$_1$: coffee turnover	(1)4th-high input$_1$: operating and sales cost
No. 36	(1)4th- low input$_3$: effort index on enhancing customer satisfaction	(1)4th- low output$_2$: gross profit (2)4th- low output$_3$: seat effect

Group B in Cell II: DEA-inefficient and Ordinary Performance in Opinion of Experts, consisting of 9 CCSs, Nos. 10, 11, 19, 20, 22, 23, 29, 30, 35;

Group C in Cell IV: DEA-efficient and Good Performance in Opinion of Experts, consisting of 12 CCSs, Nos. 3, 5, 6, 7, 8, 9, 17, 18, 21, 24, 27, 28; and

Group D in Cell V: DEA-efficient and Ordinary Performance in Opinion of Experts, consisting of 5 CCSs, Nos. 4, 13, 16, 25, 36.

Besides, CCS 12 and CCS 26 locate respectively in the conflicting evaluation cells **Cell III** and **Cell VI**. By means of this mapping, each CCS receives an appropriate appraisal about its own performances from different dimension standpoints. Based on this aspect, the CCSs in **Group C** are undoubtedly the best exemplars for other CCSs, while the CCSs in **Group A** should be the candidates for a large scope of improvements. Especially, the performances of CCSs, Nos. 12 and 26 should be further examined for their future improvements.

4.3 Improvement Initiatives Suggestion

(1) Strategy planning proposal

The ultimate purpose of the MPM system aims at extracting the more managerial implications from the evaluation outcomes. The Performance-Strategy matrix stemmed from the mapping on the Performance- indication plane is proposed to carry out this purpose.

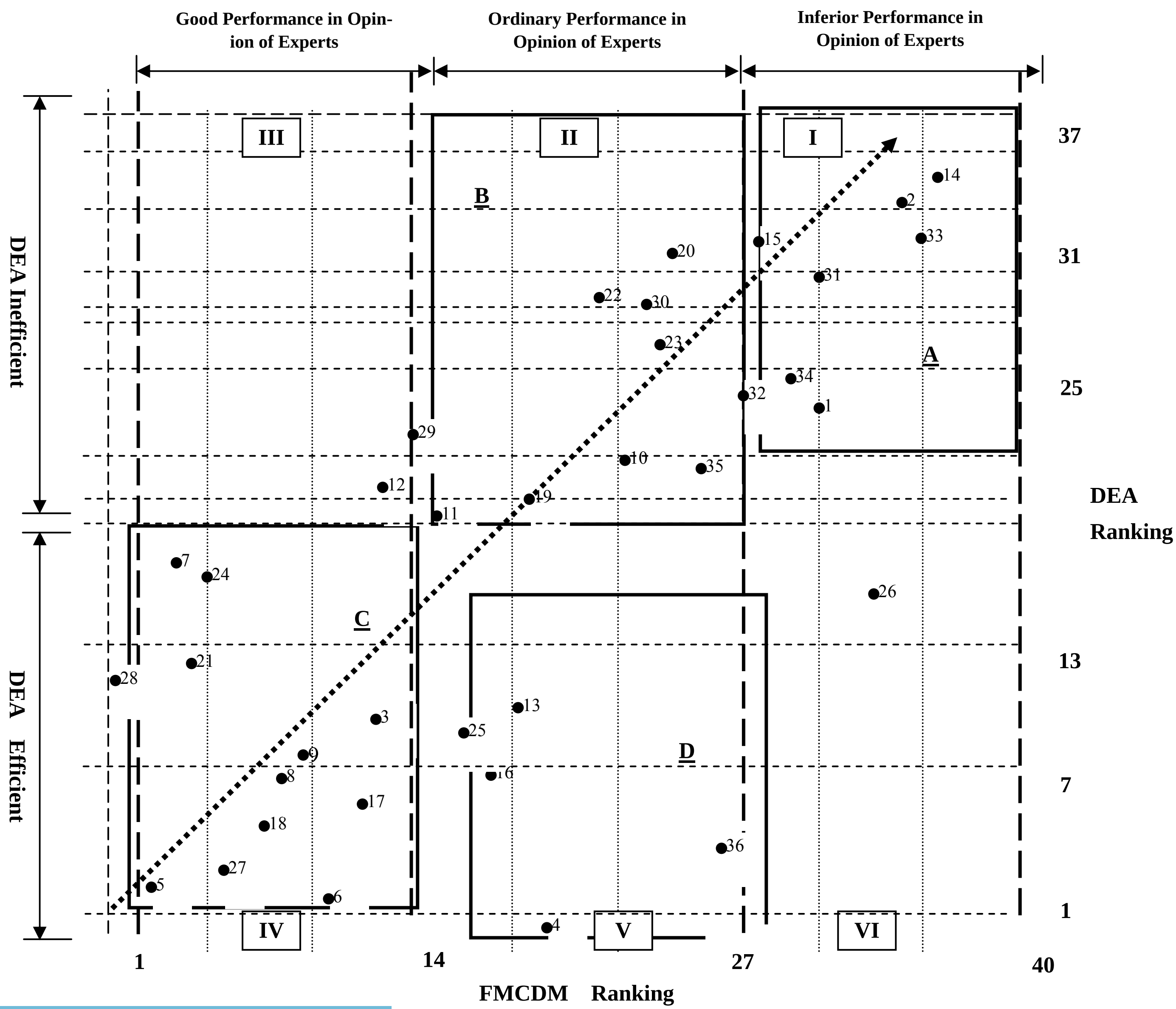


Figure 3. Location of 36 CCSs on the Performance-Indication Plane

planning for all the CCSs in response to their evaluation outcomes. The improvement initiatives for Figure 4 shows the feature. The Performance-Strategy matrix plays the role in suggesting the improvement initiatives of strategic the four specific groups are respectively depicted in Figure 4. The followings give the brief description about each group:

Group C: DEA efficient–High FE (Benchmarking protection)

The CCSs mapped in this group are normally the best exemplars for other CCSs. The strategy at this position should focus on protecting the role of benchmark by the efforts putting on the operation enhancements, e.g., capacity expansion, market expansion, and core strengths maintenance, etc. Furthermore, a stay-on-the-offensive strategy may perhaps be adopted when the exemplars try to be 'pioneers' to establish their sustainable competitive advantages. Hence, the title of '**Benchmarking protection**' is appropriate for the strategies adopted.

Group D: DEA efficient–Medium FE (Characteristic protection)

Although the CCSs in this group have better appraisal by the DEA evaluation than by the FMCDM evaluation, they are not good exemplars. However, they can adopt a fortify-and-defend strategy, i.e., the goal is to hold onto the present situation and protect whatever competitive advantages they have. In other words, they still have characteristic items that should be protected to keep their superiorities. Hence, the title of '**Characteristic protection**' is appropriate for the strategies adopted.

Essentially, the CCSs in this group are the most potential candidates for being good exemplars. Among them, CCS No. 36 that receives the best appraisals by the DEA evaluation should not only concentrate efforts on achieving the strategies of characteristic protection, but also strives to enhance their operation improvements suggested by the experts.

Group A: DEA inefficient–Low FE (Comprehensive reform)

This is the most inefficient segment. In this group, CCSs Nos. 1, 2, 14, 15, 31, 32, 33 and 34 are not efficient in the DEA evaluation nor perform well in the experts' opinions. Furthermore, as examined their gross profit, it shows that they also have relatively lower gross profit than others have. As a consequence, they may be the candidates for being divested. All the evidences almost reveal the fact that they should adopt the comprehensive reform strategies to bring back from the jaws of death. Hence, the title of '**Comprehensive reform**' is appropriate for the strategies adopted.

Group B: DEA inefficient–Medium FE (Superiority development)

A CCS in this group has no significant display in both the viewpoints of different evaluating approach. The CCSs in this group should stand at the pressing moment to find and develop their superiorities. Accordingly, the growth strategy can be employed to improve its inefficient condition. The strategies should lie in the differentiations which involve the matters in quality, technology, better customer service, or innovation, etc. Hence, the title of '**Superiority development**' is appropriate for the strategies adopted.

On the other hand, this study finds that all the CCSs have the longitudinal franchising relationship with one firm individually, but have no any latitudinal relationship with one another. Therefore, the establishment of strategic partnerships (Epstein and Henderson, 1989) between all the CCSs should also be one of the most potential strategies for improving the operation conditions and obtaining the consequential beneficial advantages at present.

(2) Transition barriers

The aim of improvement strategy proposal by the Performance-Strategy matrix lies in making a CCS move downwards and/or leftwards and achieve performance improvement. However, in reality, transition barriers do exist in the strategy formulations of some CCSs. The causes of transition barrier formation are external and internal in nature. After investigating the operation environment of Taiwan coffee chains, the external causes may come from the complex dependences on the managerial factors, for instances, regulatory trend, competitor strategy and financial viability (Thompson Jr. and Strickland III, 2001), on the non-managerial factors, such as overall coffee consumption scale, local market size and customer habit, or on the low level of barriers to entry. On the other hand, the internal causes may lie in the lack of an advanced information system for managing daily operation data and in the large improvement spaces to establish mechanisms for supporting the electronic data interchanges and e-commerce activities.

5. Conclusions

The MPM system proposed in this study were employed to monitor the performances of thirty six Taiwan CCSs. In this system, the FMCDM, super-efficiency and DEA models were used to conduct the subjective and objective evaluations, respectively. Several special analysis designs were elaborately conducted to provide accurate and high-quality evaluation outcomes and to extract more managerial implications from these outcomes by multidimensional

DEA Evaluation	FMCDM Evaluation (FE): High	FMCDM Evaluation (FE): Medium	FMCDM Evaluation (FE): Low
Ineffi-	(Conflicting evaluation)	**B. Superiority development** 1.Develop the superiority. 2.Adopt differentiation strategy.	**A. Comprehensive reform** 1. Adopt the comprehensive reform strategy to bring back from the jaws of death.
Effi-	**C. Benchmarking protection** 1. Concentrate efforts on maintaining core strengths. 2. Adopt a stay-on-the-offensive strategy to be pioneer.	**D. Characteristic protection** 1.Protect characteristic items. 2.Adopt a fortify-and-defend strategy.	(Conflicting evaluation)

Figure 4. Improvement Strategy Proposal in the Performance-Strategy Matrix

standpoint. These special analysis designs include the complementary analyses and the supplementary analyses. The complementary analyses consist of elementary analysis, correlative relationship and ranking difference analyses. In the supplementary analyses, a two-dimensional Performance-Indication plane and a 6-cell Performance-Strategy matrix were designed with the aims at providing high-quality evaluation outcomes and suggesting the strategic planning for future improvement, respectively.

In the Performance-Indication plane, the 36 CCSs were categorized into 4 groups according to their corresponding evaluation outcomes. By means of the 6-cell Performance-Strategy matrix, the strategies for future improvement were respectively proposed for the CCSs in the 4 groups. Furthermore, many suggestions have also been proposed for the 36 CCSs, such as the necessities for establishing the strategic partnerships between the CCSs and the mechanisms for supporting the electronic data interchanges and e-commerce activities. In sum, all the results revealed the evidence that the MPM model proposed in this study does provide the interesting possibility for giving varied and high-quality evaluation outcomes and extracting more managerial implications from these outcomes to the senior managers of CCSs in Taiwan. Basically, these concrete improvement suggestions would be expected bringing positive impacts on the regular operations of both the 36 CCSs under evaluation and their new stores opened in the Mainland China.

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