Data Envelopment Analysis in Evaluating Taiwan's International Tourist Hotel's Operating Performance

Yi-Fang Chen, Hui-Chin Tang

Abstract**—**This study uses Data Envelopment Analysis (DEA) of Context-dependent DEA model to measure the inputs and outputs of the relative operating performance in order to understand Taiwan's international tourist hotel performance and relative competitive advantage. The data is compiled by assessing 67 international tourist hotels in Taiwan of 2011. In this study in accordance with the values of the efficiency of international tourist hotels, it will distinguish between different classes of efficient frontier. Subsequently using the different layers of the efficient frontier as the assessment of background, to obtain the value of relative attractiveness and the value of relative progress. Then by sorting its high and low efficiency values in order to achieve an objective analysis on the performance of international tourist hotels. This distinguishes the existing competitors and potential competitors. According to the hotel of the relative attractiveness of different values of short and long term, adjustments are made in management strategies to enhance business performance. The empirical results show that in order to form a five investment-oriented benchmarking of performance levels. According to the efficient frontier layers attractive value distribution: the first level consists of 17 best hotels; second level with 11; third level with 19; fourth level with 14; fifth level with 5; and the sixth level with 1. Best performance Level 1 in the hierarchy, the Taipei area hotels accounted for 58.8%, whereas sightseeing hotels accounted for 29.4%. This shows the superiority of interest in the Taipei area, as compared to other metropolitan areas with higher operating performance and sightseeing hotels.

Keywords**—**Context-dependent DEA, Data Envelopment Analysis DEA, International Tourist Hotels

I. Introduction

ACCORDING to the United Nations World Tourism Organization (UNWTO), the tourism is the star industry in the 21st century. By August 2010 "World Tourism Barometer" data show that Asia Pacific international tourists population growth rate has reached 14%, far better than Europe, the United States and Africa and other regions [23]. According to UNWTO, in the first half of 2010 data shows that the growth rate of international tourists in Taiwan ranked second in Asia at 29%, second only to Japan at 36%. Taiwan began promoting in 2002-2007 with its Doubling Tourist Arrivals Plan, 2008-2009 promoted as Tour Taiwan Years, and propelling its 2009-2012 Tourism Pilot programs to implement a sustainable tourism policy, its economic growth has been driven by results [25]. The tourism industry is a localized and deeply rooted in technology. There is no relocation of industries to foreign soil. This is favorable to the national economy thus has indicatived status by June 19, 2013 from Taiwan's Executive Yuan announcing the policy results [10] show that the number of international tourists to Taiwan totaled 6,087,000 passengers, growth rate of 9.34% in 2011; a total of 5,567,000 passengers in 2010, a growth rate of 26.67%; 2009 had 4,395,000 annual passengers with growth rate of 14.30%. The growth rate in recent years rank first place among other major countries in Asia-Pacific position. Department of the tourism industry including natural resources, cultural assets, transportation, lodging, food and beverages, leisure activities, cultural arts venues, joined hands in promoting with objectives to its composite industries. This results in job creation and increase of foreign exchange earnings as a substantive benefits. When promoting the development of tourism industry, the tourism services in the international tourist hotel plays an important role because of its unyielding characteristics of the industry. The capital investment in this industry is extremely intensive and fixed costs are relatively high, whether profit or non-profit organization of business, are based on short-term investment, cost minimization, profit-maximizing output for the highest operational goals. As mentioned above, the tourism industry propels into an era of competition, measuring the operating efficiency of international tourist hotels is a noteworthy topic. Purposes of this study are as follows:

1) International tourist hotels in Taiwan assess overall operating efficiency.
2) To establish and international tourist hotel industry benchmark overall analytical framework.
3) Distinguished the relative efficiency of the performance of each level of international tourist hotels.

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4) Comparing the different levels of performance of the hotels and to distinguish the difference between the new comers and potential competitors in the industry.

II. Literature

Data envelopment analysis of the relevant literature can be simply divided into theoretical and empirical application of basic research. The theoretical foundation of research literature can be divided into basic theory and model development, model improvement, comparative studies, as well as other aspects. Because Charne, etc. [6], Gau Chen, etc. [13], Cook and Seiford [9] and other books or periodicals are on data envelopment analysis literature with detailed description and classification, so that this article can only be viewed relatively relating to or at best a representative of the literature reviewed.

A. The definition of international tourist hotels in Taiwan

According to Taiwan's "Development of Tourism" and "Tourist Hotel Construction and Equipment Standards", "Tourist Hotel Industry Management Rule" requires tourist hotels by buildings, equipment standards, operation, management and services in different ways [25]. It is divided into international tourist hotels and general sightseeing hotels. Tourist hotels mainly cater for the reception of international and domestic leisure travelers to provice accommodation and services. An evaluation takes place once every three years in Taiwan by issuing a grading identifcation in order to distinguish the various tourist hotel service levels and service quality standards.

B. Assessment of international tourist hotel industry production efficiency related literature

Assessment of production efficiency of the method can be broadly divided into four categories: Regression Analysis, Richmond [19]; Index Number, Fisher [13], Tornqvist[24]; Stochastic Frontier Approach (SFA), Aigner et al. [1], and Meeusen and Van Den Broeck [17]; Data Development Analysis (DEA), Charnes et al. [5].

Recalling hotel industry operating efficiency of the relevant literature to DEA as the main research methods majority, such as Wang Feiqing and Jui-Kou Shang [27] to analyze the BCC model year 2000 of Taiwan 48 international tourist hotels, Chiang [7] to analyze the BCC model year 2000 of Taipei 25 international tourist hotels, Barros [4] to the BCC model year 2001 of Portugal 42 franchise guesthouses, Wang et al [29]. Four-stage DEA analysis in 2004 of Taipei 54 international tourist hotels, Wang and He [29] in two stages DEA Analysis in 2002 of Taiwan 56 international tourist hotels, Shang et al. [21] three-stage DEA analysis in 2005 of Taiwan 57 international tourist museum. It's mainly Data Envelopment Approach (DEA) is a nonparametric (non-parametric analysis approach) analysis method which does not pre-set any function assignment type, one can conduct efficiency estimate. While the international tourist hotel industry with multi-input, multi-output characteristics, it can be viewed as objective assessment of the international tourist hotel industry's operating efficiency.

However, from the above literature findings of the assessment results show conflict if both units have the same level of decision-making efficiency values. The DEA measured together all the decision-making unit competitions, dividing into relatively efficient and relatively inefficient as two clusters. The actual management perspective does not have real meaning.

In view of this, the establishment of an international tourist hotel industry benchmark sets the tone for overall analytical framework to distinguish the efficiency values according to different performance levels. This research will be more meaningful In analyzing the relative inefficiency of international tourist hotels (ie DMU), and distinguishing relatively similar new comers and potential competitors, and gradually adjust their business strategies to improve its efficiency.

III. Research Methods

A. Data Envelopment Analysis (DEA)

Data envelopment analysis system by Charnes, Cooper and Rhodes in 1978 [5] is observed. According to Farrell in 1957 [12], the efficiency of the model developed, in order to link Technical Efficiency (TE) and the production efficiency of the leading edge (production frontier), an efficiency measure the method of assuming vendor or industry as the constant returns to scare (CRS). It is called the CCR model, which is a measure of the total technical efficiency (overall technical efficiency, OTE), the researchers according to necessity, use of (Inputs oriented) or (Output-oriented) to evaluate, under the assumption that the CRS to input-oriented or output-oriented assessment of the efficiency of the value is the same. However in reality, there are many industrial environment that is not a constant returns to scale status. Therefore Banker, Charnes and Cooper [3] developed a change in the scale of compensation (variable returns to scale, VRS), called the BCC model, This model of total technical efficiency (overall technical efficiency, OTE) is decomposed into pure technical efficiency (PTE) and scale efficiency (SE), which OTE = PTE × SE. Additionally, *Färe* et al. Joined in 1992 [11] (Non-Increasing Return to Scale, NIRS) assumptions, changing limit condition from $\sum_{j=1}^{n}\lambda_j = 1$ to

$\sum_{j=1}^{n}\lambda_j \le 1$ to renew NIRS solving linear programming problems. Solving each decision-making unit NIRS the technical efficiency, TE_{NIRS} and then with under variable returns to scale efficiency value TE_{VRS} for comparison, one can determine the kind of decision-making units in the returns to scale.

DEA is a non-parametric analysis approach, with no variability measure units (Units Invariance Theorem) characteristics, but highly influential to extreme values. According to Golany and Roll [15], by the assessment of a number of units should be put in the number of items and the number of items and output times two, otherwise the unit will generate a lot of decision-making performance values as 1, resulting in poor discernment.

B. Context Dependent DEA (Context-dependent DEA)

Due to the shortcomings recognition ability of traditional DEA, it promises scholars to continue to develop improved models. Such as: Andersen and Petersen [2] super-efficiency model (AP Model), Thanassoulis [22] threshold model (Threshold Model), Tone [23] based on the difference between the variable efficiency model (super SBM Model), Lovell and Rouse [16] modified super-efficiency model (modified super-efficiency model) and so on. In the tourism services sector, the main target for the consumer, the consumer choice theory (consumer choice theory). When consumers choose products, products in the market will be affected by the positioning such as when a product is compared to similar products within a group of relatively poor quality, it may render its attractiveness or vice versa. Thus extending viewpoints, all DMU efficiency values according to distinguish between different levels of performance, the same level of performance can be regarded as the same as the DMU. Therefore, this paper Seiford and Zhu [20] proposed Context-dependent DEA model to conduct assessments. Under Context-dependent DEA, all decision-making units used will cull to distinguish different performance levels. Each layer has an efficiency for its edge, and each one leading edge efficiency is considered a class of its own assessment background (evaluation context), which can be used to measure the relative attractiveness of decision-making unit value and relative progress value. The meaning is that the use of DEA model to calculate the efficient frontier for each class, then an efficient DMU to distinguish between different class respectively. Relative attractiveness of larger value indicates more competitive advantage. Conversely, relatively progressive with higher the value, then the relative efficiency is worse.

Hotel industry is a profit-seeking enterprise measuring with multiple output characteristics. The market demand fluctuations, and the number of rooms and catering floor area will obviously has no fixed input elements of nature. This study used input-oriented in order to assess international tourist hotels in the relative efficiency.

C. Select the Input and Output Variables

Table 1 References can be found that the researchers will study the object and purpose and selected variables are also slightly different. In this study, the selected input and output options, will consider relevant literature, and consider the characteristics of the industry sources to obtain resistance and unity, completeness, and with the purpose to a connected degree be selected.

Select the input variables: the international tourist hotels focus in accommodation and food services as the main operating items. The reason the hotel industry is a labor-intensive industry, the need to invest tremendous manpower engaged in the service, cleaning, finishing work, and the number of employees is bound to affect labor costs. The labor cost is also a certain percentage of total operating costs. The number of rooms and catering floor area for hotel operators are indispensable in fixed assets investment. The number of employees, number of rooms, catering floor area included in the study breaks down into the financial statements. The fees paid should also be taken into account for the requirements to maintian the hotel business. In order to avoid double counting, deductions are made to the net payroll-related expenses, depreciation, rent, taxes and amortization to actually obtain food and beverage costs, laundry costs, utilities fuel, insurance, advertising, repair and maintenance costs, and other operating costs.

The output variables selected areas, according to the Taiwan Tourism Bureau published the "Taiwan International Tourist Hotels Operational Analysis Report" [25] that room revenue consists of 40.50% total revenue, food and beverage revenue to total 47.19%. Deductions from room and catering revenue after other income as 12.31%, This includes: laundry revenue, shop rental income, subsidiary operating income, fee income, nightclubs income, and other miscellaneous income, will be inclusive of output variables of room revenue, food and beverage revenue, and other income.

Order of the above, the input and output variables in this study are based on the production function principle. The use of cost inputs into outputs income, whose variables are selected as the most common use of the literature. This only deduct the cost of employee salaries in order to avoid duplication. This study adopted four input variables (number of employees, number of rooms, food and beverage sector total floor area, operating

expenses) and three output variables (room revenue, food and beverage revenue, other income).

D. Pearson Correlation Coefficients (Pearson Correlation Coefficient)

After determining the input and output variables, Golany and Roll [15] pointed out that the empirical analysis in DEA, between its input and output variables, it must comply with the increase in investment, the amount of output can not be reduced to the same isotropic (isotonicity) relations, and DMU number of input and output should be at least twice the sum of the number of items. However according to Coelli et al. [8] study, if the investment increase (decrease) will lead to reduced output (increase), then the DEA efficiency assessment results will likely be biased. Therefore before the efficiency of the first stage in the assessment, this study will first use Pearson correlation coefficients to measure the linear relationship between two variables and compliance between inputs and outputs isotropic (isotonicity).

IV. Empirical analysis

A. Descriptive Statistics

This study focuses on 67 international tourist hotels of 2011 in Taiwan for business performance evaluation (Table 4.1), including 22 located in the Taipei area; 9 in the Kaohsiung area; 5 in Taichung area; 5 in Hualien ; 12 located in sightseeing areas; 7 at Taoyuan, Hsinchu & Miaoli region; and 7 located in other districts. Average room revenue of NT$249.13 million, The Grand Hyatt Taipei rated the most whereas Hotel Royal Hsinchu ranked the least. Catering revenue averaged NT$291.96 million, The Grand Formosa Regent Taipei with the highest whereas the lowest for the Emperor Hotel. Average of other income NT$77.91 million, Grand Formosa Regent Taipei made the most while Hualien Astar made the least. Average number of employees of 310, Sheraton Taipei claimed the highest while Landis Yangmingshan has the least. Average number of rooms of 293 and Grand Hyatt Taipei has the most while Landis Yangmingshan has the least. Average catering floor area came to 4062.09 square meters, again with Grand Hyatt Taipei having the largest and Landis Yangmingshan having the smallest. Average operating expenses of NT$276.85 million, Grand Hyatt Taipei with the most while Emperor Hotel with the least. Also according to Table 4.2, the input and output variables have a positive correlation, such as the more input the more output, in line with the requirements of isotropic variable data suitable for use on behalf of DEA model, in line with conditions of constant returns to scale.

Table 4.1 List of 67 International Tourist Hotels in Taiwan

AREA	DMU	HOTEL NAMES
Taipei	1	Grand Formosa Regent
	2	Sheraton
	3	Grand Hyatt
	4	Shangri-La
	5	Ambassador
	6	Grand Hotel
	7	Howard
	8	Westin
	9	Sherwood
	10	Brother
	11	Caesar Park
	12	Sanwant
	13	Hotel Royal
	14	Landis
	15	Imperial
	16	Gloria
	17	Mirama Garden
	18	Santos
	19	Golden China
	20	United
	21	Hotel Riverview
	22	Emperor
Kaohsiung	23	Grand Hi-Lai
	24	85 Sky Tower
	25	Ambassador
	26	Han-Hsien
	27	Howard
	28	The Lees
	29	Hotel Kingdom
	30	Holiday Garden
Taichung	31	Splendor
	32	Evergreen
	33	Hotel National
	34	Plaza International
	35	Howard
Hualien	36	Farglory
	37	Parkview
	38	Chateau de Chine
	39	Marshal
	40	Astar
Sightseeing	41	Hotel Royal Chiao Hsi
Sightseeing	42	Fleur de Chine
	43	Kenting Ceasar Park
	44	Kenting Howard
	45	The Lalu
	46	Hotel Royal Chihpen
	47	Grand Hotel Kaohsiung
	48	Silks Place Taroko
	49	Wen Wan Resort
	50	Landis Yangmingshan
	51	Hibiscus Resort
Taoyuan, Hsinchu &	52	Ambassador Hsinchu

Miaoli	53	Sheraton Hsinchu
	54	Novotel Taipei Airport
	55	Royal Hsinchu
	56	Skyline
	57	South Garden
	58	Taoyuan Hotel
Other Area	59	Kaohsiung Crowne Plaza
	60	Jiaosi Evergreen Resort
	61	Tainan Shangri-La
	62	Tayih Landis
	63	Silks Place
	64	Tainan Evergreen Plaza
	65	Nice Prince
	66	Formosan Naruwan
	67	Hotel Tainan

Table 4.2 Input-Output Variables Correlation Coefficient

	Room Revenue	Food & Beverages Revenue	Other Revenue	Number of Employees	Number of Rooms	Food Services Area	Operating Costs
Room Revenue	1						
Food & Beverages Revenue	0.829**	1					
Other Revenue	0.768**	0.870**	1				
Number of Employees	0.875**	0.933**	0.836**	1			
Number of Rooms	0.846**	0.712**	0.622**	0.796**	1		
Food Services Area	0.618**	0.425**	0.397**	0.435**	0.612**	1	
Operating Costs	0.912**	0.908**	0.802**	0.912**	0.815**	0.602**	1

B. Analysis of the Relative Attractiveness and Relative Progress

By model definition, the relative attractiveness of each class is greater than 1, and higher values indicate the relative attractiveness with the more competitive advantage. Otherwise relatively progressive values greater than 1, and higher values indicate the relative progress of the poorer relative efficiency, which should be adjusted input-output allocation of resources in order to increase efficiency. By geographical distribution (Table 4.3 and 4.4), Located in Level 1, Taipei has 10 (DMU 1,2,3,4,5,6,8,11,17,25); Sightseeing has 5 (DMU 41,42,43,45,50); Taoyuan, Hsinchu & Miaoli has 1 (DMU 55); and other regions also has 1 (DMU 66). In level 2, it shows 4 in Taipei, (DMU 10,12,13,21); Kaohsiung shows 1 (DMU 23); Taichung shows 1 (DMU 32); Hualien shows 1 (DMU 40); Sightseeing shows 1 (DMU 44); Taoyuan, Hsinchu & Miaoli shows 1 (DMU 52); and other regions shows 2 (DMU 60,64). At level 3, Taipei has 4 (DMU 7,9,14,22); Kaohsiung has 3 (DMU 25,28,30); Taichung has 2 (DMU 31,33); Hualien has 1 (DMU 36); Sightseeing has 1 (DMU 46); Taoyuan, Hsinchu & Miaoli has 5 (DMU 53,54,56,57,58); and other regions has 3 (DMU 59,63,67). At level 4, there are 3 in Taipei (DMU 15,16,18); 4 in Kaohsiung (DMU 24,26,27,29); 2 in Taichung (DMU 34,35); 2 in Sightseeing (DMU 47,49); and 3 in other regions (DMU 61,62,65). In the last level 5, Taipei has 1 (DMU 19); Hualien has 2 (DMU 37, 38) and Sightseeing has 2 (DMU 48,51).

The study is divided into five layers, wherein the relative attractiveness of Level 1 perform better than other layers. In Level 1, ranking top 3 are Taipei Ambassador, Taipei Westin and Hotel Royal Chiao Hsi in the sightseeing area respectively. The Taipei Ambassador has twice the relative efficiency value than the Westin displaying its advantage of having a dynamic competitive industry in (Dynamic Competition). An example in Level 2, the Grand Hi-Lai Hotel has a high attractiveness value (1) but also a high progressive force value (9), indicating a change of input resources (ie: number of employees, food costs, utilities fuel, insurance, advertising costs, repair maintenance charges, laundry costs, other operating costs and other business expenses) needs control in reduction. The other option is to enhance room revenue, food and beverage revenue and other operating income.

Also known by the relatively progressive values, hotels advances obtained higher the value, the greater the representative of the performance improvement. If at the same level of input and output are committed, then the investment is needed to outshine the other. Vice versa, when advances are low due to an inbalance of input and output, adjustment is required of resource allocation and operational strategy in order to catch up with the level of performance of other benchmarking hotel. In the current level of performance in a leading hotel, operators can also focus from behind performance hierarchy of potential competitors in the market. The Marshal hotel has the worst relative efficiency value in relative improvement in Level 6. It can benefit by studying from the Hualien Chateau de Chine or Silks Place Taroko as learning goals in adjusting business strategy and resource allocation methodically.

Table 4.3 Layers (efficient frontier) of Regional Distribution of International Tourist Hotels

	Taipei	Kaohsiung	Taichung	Hualien	Sightseeing	Taoyuan, Hsinchu & Miaoli	Other	Total
Level 1	10	0	0	0	5	1	1	17
Level 2	4	1	1	1	1	1	2	11
Level 3	4	3	2	1	1	5	3	19
Level 4	3	4	2	0	2	0	3	14
Level 5	1	0	0	2	2	0	0	5
Level 6	0	0	0	1	0	0	0	1

Table 4.4 Layers (efficient frontier) of Distribution of International Tourist Hotels

	DMU
Level 1	1、2、3、4、5、6、8、11、17、25、41、42、43、45、50、55、56
Level 2	10、12、13、21、23、32、40、44、52、60、64
Level 3	7、9、14、22、25、28、30、31、33、36、46、53、54、56、57、58、59、63、67
Level 4	15、16、18、24、26、27、29、34、35、47、49、61、62、65
Level 5	19、37、38、48、51
Level 6	39

C. Resource Allocation

Relatively attractive value and the average value of the relative progress (Table 4.5) is to evaluate the increase and decrease of input variables and output variables. The relative attractiveness of order in Level 1 has a ratio of 1to the resources of a value of 0.5299 by using Level 2 act as assessed background. The decision-making units in Level 1 can be reduced by 53% of its input costs, which can be achieved with the same efficiency as Level 2. In order for Level 2 to achieve Level 1 efficiency, an increase of 88% shall be invested.

Table 4.5 Progressive Force value and Average Value of 2011 Taiwan International Tourist Hotels Average Attractiveness

	Level 1 Attractiveness Value	Level 1 Progressive Value
Level 1	0.5299	---
Level 2	0.7062	0.8842
Level 3	0.5574	0.9242
Level 4	0.4960	0.9242
Level 5	0.1810	0.9416
Level 6	---	0.8985

D. Competitive Advantage

To understand the decision-making unit of the merits of the position itself, one can refer to the relative attractiveness of the value and the relatively progressive values to distinguish its competitive advantage in the industry position. This view can determine the appropriateness of existing business strategy and resource allocation. To clearly define the competitive advantages and disadvantages, this study will be divided into four quadrants to show the average attractiveness layers and average values prevail progress.

Quadrant I The relative attractiveness of low value in contrast to the high value of relatively progress. It indicates the existent of competition in the same playing field. In order to maintain in the same class of competition, one needs to make substantial improvements in resource allocation strategy to achieve the best efficiency frontier.

Quadrant II Although the relative attractiveness of progressive values and the relative values are high, it is no closer to the existent competitors. Therefore one must work harder to improve performance to create opportunity to reach competitive edge.

Quadrant III When relative values and the relative attractiveness of progressive values are not high, it indicates the potential presence of competitors. In order to catch up to the next level of decision-making units, managers need to review the appropriateness of existing policy.

Quadrant IV If the relative attractiveness value is high but the value of relative progress is low, it shows solid footing in its competitive position. Performance is relatively strong and can retain its existing management strategies.

In order to achieve a better relative performance in decision-making, a high value of relative attractiveness and a low progressive values are necessary. Therefore the best ideal state is in quadrant IV whereas the least ideal will be in quadrant I. Quandrant II and III both have its own advantages and disadvantages.

Figure 4.1 to 4.4 show the comparisons of each level of the relative attractiveness to the relative progress. In Level 2 of the DMU23 (Grand Hi-Lai Hotel) has the highest values of relative attractiveness, with the relative progressive values at 9. This is located in the Kaohsiung area and show a high competitive advantage. Another example in Level 3 of the DMU9 (Sherwood) has the highest values of relative attractiveness with its progressive values at 5, and ranking at third of DMU7 (Taipei Howard) has relative attractiveness values ranked at 3 and progressive values at 4. This illustrate that the two hotels are very competitive within the same Taipei area.

There are a total of 13 hotels in the layers of decision making in quadrant IV. There are 3 in Level 2; DMU10 (Brother), DMU12 (Sanwant), and DMU60 (Jiaosi Evergreen Resort). Level 3 has three; DMU7 (Taipei Howard), DMU9 (Sherwood), and DMU46 (Grand Royal Chihpen). Level 4 has six; DMU18 (Santos), DMU24 (85 Sky Tower), DMU27 (Howard), DMU47 (Grand Hotel Kaohsiung), DMU35 (Taichung Howard), and DMU62 (Tayih Landis). DMU19 (Golden China) is the only one in Level 5. These decisions units at all levels (ie, the efficient frontier) performed relatively better and has a competitive advantage.

There are a total of 10 hotels in quadrant I. There are two in Level 2; DMU32 (Taichung Evergreen), and DMU40 (Hualien Astar). Level 3 has three; DMU36 (Farglory), DMU53 (Sheraton Hsinchu), and DMU54 (Novotel Taipei Airport). Level 4 has three; DMU15 (Imperial), DMU16 (Gloria), and DMU49 (Wen Wan Resort). Level 5 has two; DMU38 (Chateau de Chine) and DMU51 (Hibiscus Resort). The relative performance of the layers are relatively poor making it vulverable for rivalry in the existing markets. Efforts should be more to improve the performance and to adjust business strategy in order to gain competitive advantage in the market.

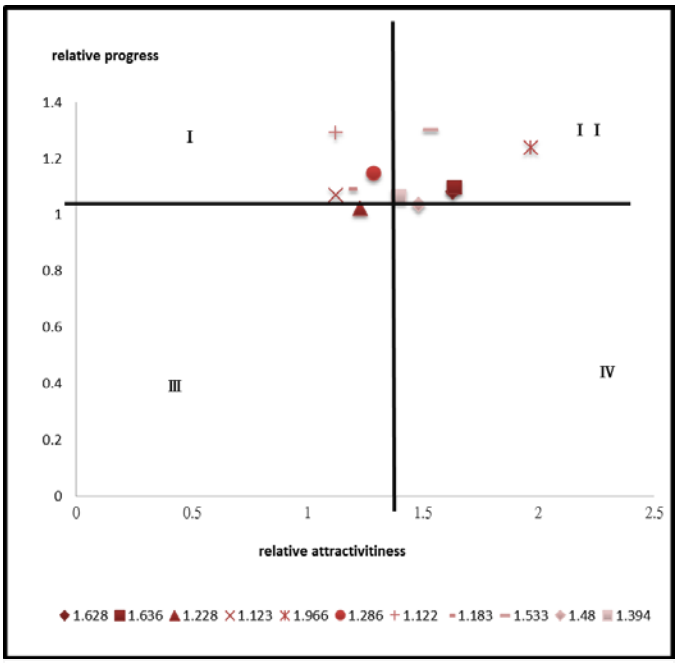

Figure 4.1 Level 2 Relative Attractive Values and Relative Progressive Values of International Tourist Hotels

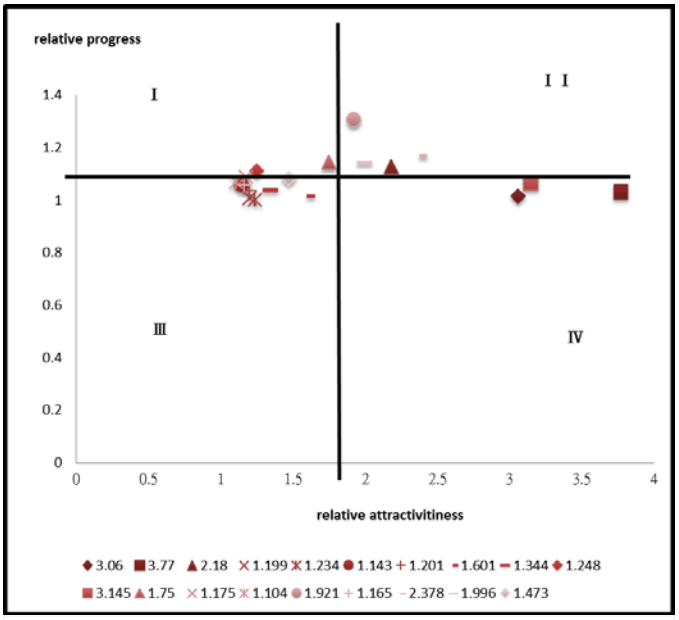

Figure 4.2 Level 3 Relative Attractive Values and Relative Progressive Values of International Tourist Hotels

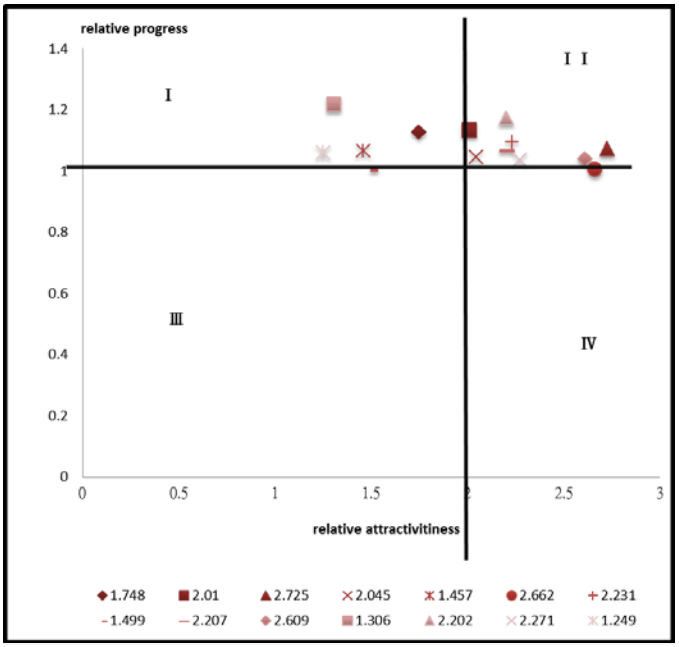

Figure 4.3 Level 4 Relative Attractive Values and Relative Progressive Values of International Tourist Hotels

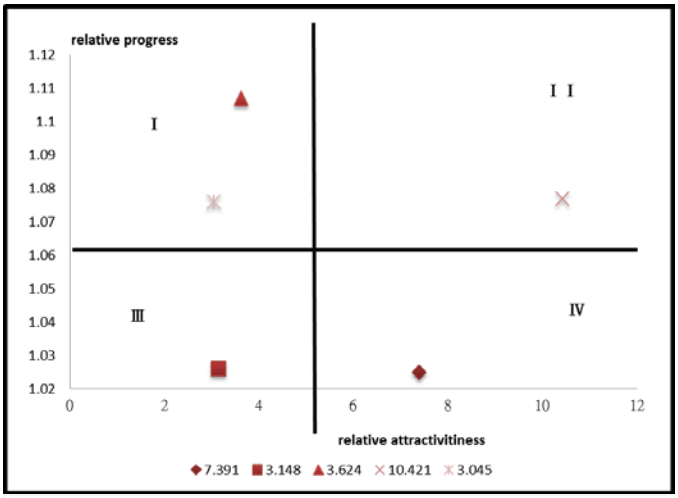

Figure 4.4 Level 5 Relative Attractive Values and Relative Progressive Values of International Tourist Hotels

V. Conclusion and Recommendations

A. Conclusion

International tourist hotels in the tourist industry play a very important role. The positive and negative of its service quality and operational performance merits reflect on Taiwan's overall image and tourism industry as an important impact. This research adopts situational dependent DEA 's CCR input - oriented model to radial efficiency measure mode to distinguish five benchmark performance levels to help hoteliers understand their own industrial status and competitive environment as a resource to improve and provide strategy adjustment reference. The ideal state is with a high attractive force with low progress ratio. According to the 67 hotels studied in terms of overall efficiency, Level 1 accounted for 25.3%; Level 2 accounted for 16.4%; Level 3 accounted for 28.4%; Level 4 accounted for 20.9%; Level 5 accounted for 7.5%; and Level 6 with 1.5%. Of the 11 hotels in Level 2, it uses the learning benchmark of Level 1 of aggressive cost cutting to enhance operational efficiency. In regional terms, among the 22 hotels in Taipei, there are 10 in Level 1, 4 in Level 2, 4 in Level 3, 3 in Level 4, and only one at Level 5. This shows a larger consumer market with overall relative performance over Kaohsiung, Taichung, Hualien, Taoyuan, Hsinchu & Miaoli and other area hotel. Among the hotels with best performance in Level 1, Taipei area hotels accounted for 58.8% and 29.4% for sighteeing ones. This shows superiority in Taipei area of interest when compared to other metropolitan areas with higher operating performance. Sighteeing hotels come in at second. International tourist hotels in Taipei with the average efficiency value is better than in other regions. However, the Taipei international tourist hotels exceed in number far greater than other areas. Under Level 2 in quadrant IV, the most competitive advantages are two (Brother and Sanwant), Level 3 also has two (Taipei Howard and Sherwood). Therefore Taipei shows the most competitive of international tourist hotels because of its location. The suggestion is that it must pay close attion to its operating efficiency. In Kaohsiung area located in the same quadrant IV of Level 3, (85 Sky Tower and Howard) are also relatively competitive.

In summary, Taipei being the capital of Taiwan, is the hub of business travel. When compared to other metropolitan areas accounted for the regional advantages, and although the hotel has a scenic and natural geographic advantages of resources, seasonal differences is of a main factor. Different target customer groups in regional tourism development and government policy implications also play a part and thus the sightseeing hotels performance varies greatly.

B. Recommendations

This study adopted Context-dependent DEA model to measure the relative efficiency, and at the end of expert opinion into the international tourist hotel industry, setting each input or output variables relative weights can be studied after the results of a prior information specialists (prior information). This is included in the assessment mode. Also in the environmental factors (ie: management, proportion of each nationality tourists, regional location, etc.) should also be considered in order to more closely reflect market changes in the market's relative performance of each hotel. Hotels in the face of competition in the market, its business strategy are often made under convoluted conditions in decision making. This can be supplemented by Fuzzy DEA sort assessment to provide more information for decision making.

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