

**A STUDY ON SERVICE QUALITY PERFORMANCE IN  
CATERING INDUSTRY – THE APPLICATION OF DEA**

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**ABSTRACT**

Based on the operating survey of catering service in international tourist hotels in Taiwan in 2008-2010, this study combines Data Envelopment Analysis (DEA) and Malmquist Productivity Analysis to measure total efficiency (TE), pure technical efficiency (PTE), and scale efficiency (SE) of 35 international tourist hotels in Taiwan for the further improvements in operational efficiency of catering service in international tourist hotels. The empirical results show that Grand Hyatt Taipei and Plaza Hotel Taipei present the best total efficiency (1.00), Hotel Kingdom, Hotel Holiday Garden, Howard Beach Resort Kenting, and Hotel Royal Chihpen appear the best pure technical efficiency (1.00), and The Westin Taipei, Hotel Kingdom, and Farglory Hotel reveal the best scale efficiency (1.00). In terms of Malmquist Productivity Analysis, The Westin Taipei, Hotel Kingdom, and Farglory Hotel have approached the permanent optimal scale, while the catering service in the rest international tourist hotels tends to away from the permanent optimal scale.

**KEY WORDS**

Catering industry; Data Envelopment Analysis; Service; Quality; Performance.

**1. INTRODUCTION**

The service industry in Taiwan has been flourishing in recent years. According to the statistics of Directorate-General of Budget, Accounting and Statistics, Executive Yuan in 1999, the gross production of service industry was 64.3% of all industries, which had surpassed manufacturing industry and became the key industry in economic development. With the progress of time, the increase of national income, the fine division of labor in the society, female employment rate reaching 49.38%, and the policy of two-day weekend, the people have increased the chance to eat out that catering industry is considered as a potential market for development. With the increasing chance of eating-out, the catering habits have been changed that the catering industry in Taiwan has flourished. Because of the rapid growth of catering industry, the catering service in tourist hotels is affected. Tourist hotels used to focus on accommodations; however, with the development of catering industry, the targeted catering market in tourist hotels has turned to local consumers. From the operational analysis of tourist hotels in Taiwan, the catering revenue in international tourist hotels is higher than housing revenue, and is

increasing annually. By June 1999, the proportion of catering service reached 48.41%, which was higher than the proportion of accommodation (35.84%) and increased 6.3% in comparison with it in 1991. For this reason, catering services has played a critical role in tourist hotels. (1) Catering services are the major product in international tourist hotels. (2) Catering is a key in attracting customers.

Since the catering service in international tourist hotels is competitive and the main products in hotel restaurants are meals, drinks, and services, in which meals and drinks in similar hotel restaurants are not distinct, service quality therefore is considered as a key success factors in hotel restaurant operation that international tourist hotels with satisfactory service quality are likely to create competitive advantages.

## 2. LITERATURE REVIEW

### 2.1 Service quality

Bommer & Jalajas (2004) defined service as additional activities, benefits, or satisfaction with sales. In service industry, service quality is the primary concept which mainly focuses on providing highly satisfactory service quality for customers in order not to be eliminated from the competitive market that it is a key factor in sustainable operation of an enterprise (Wu & Lin, 2002). Chiesa (2006) regarded the evaluation of service depending on service quality. Shen & Chen (2006) regarded service quality as the key of competition in catering industry that an in-time and effective remedy for service error or customer dissatisfaction could prevent customers from serious loss. For this reason, service quality has been considered as an important issue in various industries.

Morey & Dittman (1995) evaluated the operational efficiency of managers in 54 hotels in the USA with DEA-BCC, in which the unique factors of hotels, market-controlled factors, and controllable factors of general managers were the input items, while total operating income, service satisfaction indicator, and facility satisfaction indicator were the output items. It was found that the average efficiency of the managers in all hotels reached 89%, and 64% of hotels were efficiency units.

Anderson, Robert & Scott (2000) measured the efficiency of 48 tourist hotels in different areas in the USA, in which number of employees, number of rooms, gambling costs, catering costs, and other costs were the input items, while total income and other income were the output items. The research outcomes showed that inefficient hotels was about 42%, as staff salary and too many rooms in the input items reduced the efficiency. The hotels therefore were suggested to reduce 58% input resources.

Shen & Chang (2002), with DEA, studied the operational efficiency of the guest room department and the catering department in 29 chained international tourist hotels in Taiwan in 2000 as well as the operational efficiency in 1999-2001. Six chain styles, including direct chains, leased chains, management contracted chains, specially permitted alliance chains, business contacted chains, and member chains were classified. The input items included number of employees, number of rooms, and operating expenses, while the output items contained total income and total number of rooms.

Huang & Chang (2003) analyzed the operational performance of 45 tourist hotels in Taiwan in 1998 and the change of operational efficiency in 1994 – 1998, in which

number of employees, number of rooms, catering department floor effect, and operating costs were the input items, while room revenue, catering revenue, and other income were the output items. The research outcomes showed that the change of efficiency was resulted from the differences between customers and management; besides, managerial efficiency was related to the degree of internationalization.

With Data Envelopment Analysis (DEA), Wang (2003) evaluated the operational efficiency of 60 international tourist hotels in Taiwan in 1992–2001, in which number of employees, number of rooms, catering costs, unit labor costs, unit operating costs, unit catering costs, unit catering costs, short-term variable costs were the input items, while catering revenue and actual number of rental rooms were the output items. The results showed that the obtained number of hotels and the average efficiency in pure technical efficiency were higher than those in total efficiency; besides, large-scale hotels presented better operational efficiency, followed by small-scale ones, and medium-scale hotels the worst.

Wang, Hung & Shang (2004) analyzed total efficiency (TE), pure technical efficiency (PTE), and scale efficiency (SE) of 50 international tourist hotels in Taiwan in 2001 with DEA, in which number of employees in guest room department, number of employees in catering department, number of employees in other departments, number of rooms, and area of catering department were the input items, while room revenue, catering revenue, and other income were the output items.

## 2.2 Data Envelopment Analysis

Farrell (1957) proposed the efficiency models of Input orientation and Output orientation. With existing fixed outputs, the former evaluated the efficiency with minimum inputs. On the other hand, with existing input resources, the latter compared the efficiency of decision-making units with maximum outputs. Generally, the input items in profit enterprises are controlled by DMUs, while the output items are restricted by market factors that Input orientation are commonly utilized. In this case, this study applied DEA with Input orientation to analyze the service quality performance of catering service in international tourist hotels. Further discussions and applications of DEA are referred to Fried et al. (1993) and Cooper et al. (2000).

## 3. RESEARCH METHOD

With Data Envelopment Analysis to evaluate efficiency, each input/output item would reduce the discrimination of Data Envelopment Analysis. When four inputs and five outputs are utilized, twenty input/output ratio values would be deducted. As a result, at least more than two DMUs are required for the discrimination. Golany & Roll (1989) further proposed the rule for Data Envelopment Analysis that the number of the evaluated DMUs should be two times the sum of input and output items (Chang, 1997).

In this study, five input/output variables and 35 DMUs were selected that it corresponded to the above rule for Data Envelopment Analysis. The data of all variables utilized in this study were the public statement of profit and loss, prospectus, and annual reports of the international tourist hotels.

**Definitions of various variables:****3.1 Input variables**

1. Number of rooms: The total number of rooms.  
Staff salary: Including employee salary, bonus, pension, meals, overtime pay, labor premium and the healthcare expenses, and welfare funds. The service fee income distributed to employees should be counted in this item.
2. Catering costs: All expenses for the direct material of meals, snacks, alcohol, and drink, and the transportation fees.

**3.2 Output variables**

1. Room revenue: The room rental income.
2. Catering revenue: The sales of meals, snacks, alcohol, and drink in restaurants, café, ballrooms, and nightclubs.

**4. EMPIRICAL ANALYSES****4.1 Relative efficiency analysis**

Table 1 shows the relative efficiency of various international tourist hotels. In terms of total efficiency, Grand Hyatt Taipei and Plaza Hotel Taipei appeared the best performance (1.00), followed by The Regent (0.99), and The Grand Hotel Kaohsiung the worst (0.48).

In regard to pure technical efficiency, Hotel Kingdom, Hotel Holiday Garden, Howard Beach Resort Kenting, and Hotel Royal Chihpen presented the best performance (1.00), followed by The Regent and The Grand Hotel Kaohsiung (0.99), and Han-Hsien International Hotel the worst (0.58).

Regarding scale efficiency, The Westin Taipei, Hotel Kingdom, and Farglory Hotel revealed the best performance (1.00), followed by Grand Hyatt Taipei and The Regent (0.99), and The Grand Hotel Kaohsiung the worst (0.51).

**Table 1:**  
**Relative efficiency of various international tourist hotels**

Hotel	Total efficiency	Pure technical efficiency	Scale efficiency
Grand Hyatt Taipei	1.00	0.98	0.99
Far Eastern Plaza Hotel	0.93	0.91	0.90
Plaza Hotel Taipei	1.00	0.86	0.98
The Regent	0.99	0.99	0.99
The Grand Hotel	0.96	0.95	0.95
The Westin Taipei	0.95	0.94	1.00
Sheraton Taipei Hotel	0.86	0.87	0.82
Ambassador	0.80	0.76	0.77
Caesar Park Taipei	0.76	0.80	0.82
The Landis Taipei	0.71	0.76	0.83
Hotel Royal Taipei	0.69	0.69	0.94
Imperial Hotel Taipei	0.73	0.75	0.86
Gloria Prince Hotel	0.80	0.83	0.88
Grand Hi-Lai Hotel	0.65	0.70	0.76
The Splendor Hotel	0.63	0.77	0.82
Ambassador Kaohsiung	0.61	0.63	0.94
Han-Hsien International Hotel	0.55	0.58	0.86
Plaza Hotel Kaohsiung	0.52	0.68	0.76
Hotel Kingdom	0.62	1.00	1.00
Hotel Holiday Garden	0.57	1.00	0.80
Evergreen International Hotels	0.60	0.65	0.81
The Splendor Hotel Taichung	0.70	0.72	0.86
Howard Prince Hotel Taichung	0.66	0.91	0.75
Farglory Hotel	0.73	0.79	1.00
Chinatrust Hotel Hualien	0.69	0.66	0.88
Howard Beach Resort Kenting	0.91	1.00	0.92
Hotel Royal Chihpen	0.83	1.00	0.88
Caesar Park Hotel	0.86	0.90	0.93
Silks Place Taroko	0.75	0.92	0.76
The Grand Hotel Kaohsiung	0.48	0.99	0.51
Ambassador Hsinchu	0.61	0.75	0.82
Hotel Royal Hsinchu	0.66	0.86	0.73
Taoyuan hotel	0.51	0.77	0.86
Tayih Landis Hotels	0.53	0.75	0.83
Tainan Hotel	0.78	0.91	0.79
Average	0.73	0.81	0.84

#### 4.2 Malmquist Productivity Analysis

Table 2 shows Malmquist efficiency analyses in 2008-2010. From the table, the total factor productivity of Hotel Holiday Garden and Howard Beach Resort Kenting was larger than 1, but the rest international tourist hotels appeared less than 1, showing the decrease of productivity. In terms of pure technical efficiency change, the efficiency of Grand Hyatt Taipei, Hotel Kingdom, Hotel Holiday Garden, Howard Beach Resort Kenting, and Hotel

Royal Chihpen was improved, while the efficiency of the rest international tourist hotels got worse. In regard to the scale efficiency between two stages, The Westin Taipei, Hotel Kingdom, and Farglory Hotel approached the permanent optimal scale, while the rest international tourist hotels tended to away from the permanent optimal scale. Moreover, Grand Hyatt Taipei, Hotel Kingdom, and Hotel Holiday Garden presented improvement in the production technology between two stages, while the rest hotels did not.

**Table 2:**  
**Malmquist efficiency analyses in 2008-2010**

Hotel	TECHCH	PECH	SECH	TFPCH
Grand Hyatt Taipei	1.06	1.02	0.99	0.99
Far Eastern Plaza Hotel	0.93	0.97	0.95	0.93
Plaza Hotel Taipei	0.98	0.95	0.97	0.91
The Regent	0.96	0.91	0.96	0.93
The Grand Hotel	0.83	0.81	0.98	0.86
The Westin Taipei	0.76	0.73	1.02	0.93
Sheraton Taipei Hotel	0.77	0.72	0.86	0.82
Ambassador	0.80	0.76	0.79	0.83
Caesar Park Taipei	0.86	0.82	0.85	0.88
The Landis Taipei	0.82	0.78	0.87	0.76
Hotel Royal Taipei	0.80	0.71	0.91	0.83
Imperial Hotel Taipei	0.83	0.80	0.89	0.85
Gloria Prince Hotel	0.81	0.86	0.90	0.92
Grand Hi-Lai Hotel	0.85	0.82	0.82	0.73
The Splendor Hotel	0.86	0.80	0.87	0.84
Ambassador Kaohsiung	0.71	0.76	0.91	0.83
Han-Hsien International Hotel	0.75	0.66	0.83	0.69
Plaza Hotel Kaohsiung	0.78	0.73	0.80	0.66
Hotel Kingdom	1.05	1.03	1.06	0.93
Hotel Holiday Garden	1.03	1.04	0.83	1.04
Evergreen International Hotels	0.73	0.71	0.85	0.78
The Splendor Hotel Taichung	0.80	0.78	0.84	0.80
Howard Prince Hotel Taichung	0.96	0.93	0.80	0.86
Farglory Hotel	0.89	0.86	1.03	0.88
Chinatrust Hotel Hualien	0.82	0.78	0.90	0.84
Howard Beach Resort Kenting	0.99	1.02	0.96	1.01
Hotel Royal Chihpen	0.97	1.01	0.88	0.98
Caesar Park Hotel	0.95	0.93	0.98	0.95
Silks Place Taroko	0.94	0.90	0.78	0.84
The Grand Hotel Kaohsiung	0.96	0.94	0.62	0.70
Ambassador Hsinchu	0.86	0.80	0.85	0.72
Hotel Royal Hsinchu	0.81	0.87	0.79	0.83
Taoyuan Hotel	0.86	0.82	0.81	0.77
Tayih Landis Hotels	0.71	0.79	0.83	0.71
Tainan Hotel	0.93	0.95	0.72	0.85
平均值	0.87	0.83	0.88	0.85

## 5. CONCLUSION AND SUGGESTIONS

With the years 2008-2010 as the dimensions, this study investigated the catering service in international hotels in Taiwan, where 35 valid international tourist hotels were studied. Data Envelopment Analysis was applied to evaluating the service quality performance of the catering service in international hotels. The research outcomes showed that the average pure efficiency of the hotels in 2008-2010 was less than 1. To enhance the technical efficiency of a hotel, the improvement in pure technical efficiency should be managed that the allocation of internal resources, the progress of managerial ability, the external industrial environment, and the management and decision-making ability toward the governmental policies should be maintained the relative performance advantage. Several suggestions are proposed for promoting service quality of hotels.

1. Effective trainings for employees: Quality service comes from the mind; the employees should present it as perceived awareness and behaviors. The distance between the employees in the hotel and the customers is close, particularly the first-line employees who could sensitively know the psychological change and the demands of customers. For this reason, trainings could help employees appear more considerate services so as to enhance the customer satisfaction and to promote the service quality.
2. Establishment of positive and effective incentives: The selections of "Smile Ambassador" and "Service Star" allow the hotel offering material and mental reward to employees. Having the employees participate in "Smile Service" could enhance the service quality of the hotel.
3. Regarding customer complaints as the chance for service quality improvement: It is common to receive complaints from customers; such complaints could enhance the development of the hotel. Complaints are not bad things. From the aspect of psychology, customer complaints appear when they do not receive satisfaction from the service quality. In other words, the customer indicates the insufficiency of the hotel. In this case, reasonably accepting customer complaints could further enhance the service quality that it is regarded as a key factor in quality promotion.

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