

Wu-Chung Wu¹

PERFORMANCE EVALUATION OF IMPLEMENTATION CRM SYSTEMS INTO CATERING INDUSTRY: THE APPLICATION OF DATA ENVELOPMENT ANALYSIS

For effective retaining of customers and promoting organizational profits, a lot of industries have introduced customer relationship management (CRM) systems. However, the performance evaluation after the implementation of CRM systems has been ignored. To evaluate the effectiveness of the CRM systems 20 domestic catering businesses which have introduced the CRM systems have been analyzed by the data envelopment. Financial and non-financial dimensions have also been applied for performance evaluation. Recommendations to improve the customer relationship management are offered.

Keywords: data envelopment analysis, performance evaluation, customer relationship management (CRM).

Бу-Чун Ву

ОЦІНЮВАННЯ ЕФЕКТИВНОСТІ ВПРОВАДЖЕННЯ СИСТЕМ УПРАВЛІННЯ РОБОТОЮ З КЛІЄНТАМИ В ІНДУСТРІЇ ГРОМАДСЬКОГО ХАРЧУВАННЯ ЗА МЕТОДОМ АНАЛІЗУ СЕРЕДОВИЩА

У статті показано, що для ефективного утримання клієнтів і підтримки рівня прибутку багато підприємств впроваджують системи управління роботою з клієнтами (CRM), але найчастіше аналіз їх ефективності після впровадження не проводиться. Для оцінювання ефективності CRM-систем на підприємствах проведено аналіз 20 підприємств громадського харчування за методом аналізу середовища. В оцінюванні ефективності враховано фінансові та нефінансові показники. Запропоновано рекомендації щодо покращення роботи з клієнтами.

Ключові слова: аналіз середовища функціонування, оцінка ефективності, система управління роботою з клієнтами.

Табл. 5. Літ. 22.

Бу-Чун Ву

ОЦЕНКА ЭФФЕКТИВНОСТИ ВНЕДРЕНИЯ СИСТЕМ УПРАВЛЕНИЯ РАБОТОЙ С КЛИЕНТАМИ В ИНДУСТРИИ ОБЩЕСТВЕННОГО ПИТАНИЯ ПО МЕТОДУ АНАЛИЗА СРЕДЫ

В статье показано, что для эффективного удержания клиентов и поддержания уровня прибыли многие предприятия внедряют системы управления работой с клиентами (CRM), но зачастую анализ их эффективности после внедрения не проводится. Для оценки эффективности CRM-систем на предприятиях произведен анализ 20 предприятий общественного питания по методу анализа среды. В оценке эффективности учтены финансовые и нефинансовые показатели. Предложены рекомендации по улучшению работы с клиентами.

Ключевые слова: анализ среды функционирования, оценка эффективности, система управления работой с клиентами.

Research Background and Purpose

In the industrial globalization and the fiercely competitive environment, enterprises have strived for self-competitiveness to achieve the objective of sustainable management. With the rapid economic growth and the largely increasing national income,

¹ PhD, Assistant Professor, National Kaohsiung University of Hospitality and Tourism, Taiwan.

housewives have entered the employment market. The chances to eat out increased, resulting in the change of diet habits and the boom of catering industry in Taiwan. According to the operation analyses of tourist hotels in Taiwan (Directorate-General of Budget, Accounting and Statistics, Executive Yuan), the catering income of international hotels is higher than the accommodation income, with an annual increase.

Hotels need to constantly innovate in diverse products or services for the differentiation that they have to acquired customers and create profits, in addition to remaining prime customers. In regard to customer retention, Zikmund, Mcleod, and Gilbert (2003) proposed that 80% of product sales were from 20% of customer purchase; when 20% of customers were lost, the enterprise would lose 80% of product sales. Peppers, Rogers and Dorf (1999) indicated that most enterprises would averagely lose 25% of customers annually. While developing relations with new customers a business spends five times more than retaining the existing ones. In this case, effective retention of customers could enhance organizational profits. Nevertheless, mastering in customer information and satisfying the demands to attract more customers and further enhance the organizational profits are considered as the critical issue for organizations. For solving the above organizational demands, customer relationship management (CRM) system has been regarded as a solution for most organizations (Tai, 2009).

Literature Review and Theoretical Framework

John Ott (1999) indicated that Customer Relationship Management (CRM) deepened and developed the customer relationship by analyzing the customers and the relevant data and providing customer-tailored products and services. CRM system should be a type of Continuous Relationship Marketing that continuous concern and investment in an enterprise for the accumulation of customer data or the continuous enhancement and improvement of an organization and the management was necessary. Khirallah (1999) regarded it as a commercial strategy for sales and services that enterprises would move around the customers. When there were interactions and information, new customers would appear. Besides, understanding and affecting customer behaviors with meaningful communications are aimed to increase new customers, prevent the existing customers from loss, enhance customer loyalty, and promote customer profits (Swift, 2001).

Performance evaluation is regarded as a systematic and effective evaluation process, aiming at establishing the common sense of an objective between an organization and individuals and enhancing the possibility of achieving the objective. Such importance present the meanings of: 1. presenting the efficiency evaluation of the past resource application and 2. the proactive influence to guide the formulation of future objectives and the direction of resource allocation through constantly improving the past mistakes (Yang & Huang, 2010). DEA has been widely applied to evaluate the operating efficiency in various profit-making and non-profit-making organizations domestically and internationally. In the past few years the application of DEA has been enriched in the research on the performance evaluation of operation, in which a lot of them are related to service industry. Accordingly, performance evaluation allows organizational resources being effectively controlled and the achievement of responsibilities and tasks for the managerial levels being confirmed. Furthermore, it allows self-inspecting the performance to find out the problems for improvement and promoting the performance (Deng, 2011). Present research on performance

focuses on financial dimensions. For instance, Lee & Fang (2010) applied the accounting returns in financial reports, such as return on investment, return on total assets, and return on equity, to measuring the performance of organizations. Su (2009) utilized 5 financial indicators, like revenues, total assets, and earnings per share, for the study on customer satisfaction in service and manufacturing industries. Such financial indicators are regarded as financial rate analysis. On the other hand, regarding the research on performance evaluation with non-financial indicators, Chang (2010) focused on the evaluation of thirteen indicators, such as patent rights, customer satisfaction, and number of customers. In conclusion, the consideration of both financial and non-financial dimensions in the performance evaluation of an organization would present better integrity. Deng (2010) evaluated banking industry with 13 indicators, like number of people in the bank, support of high-level executives, literacy of employees, and the development and correspondence of information technology.

DEA also reveals some restrictions and shortcomings, so most researchers include different methods to overcome the problems in DEA. Pearson product-moment correlation and spearman rank order correlation are mostly utilized for analyses. According to the types of data, such two methods are independently selected for suitable correlation analyses so as to understand the explanation of variables to the efficiency. For example, James and Peggy (1990) and Roll, Golany & Seroussy (1989) utilized Pearson Product-Moment Correlation for acquiring the relations among the variables in interval scale, while Hsing (2009) applied Spearman Rank Order Correlation to acquiring the relevant data among variables in ordinal scale. Different industries would present distinct characters that the evaluation methods would be different. For instance, Huang (2009) used Balanced Score Card for establishing the performance evaluation system for public organizations. The above research findings showed that establishing the performance indicators for performance evaluation according to the characteristics of the evaluated subjects would be more meaningful. Lin (2009) applied DEA to evaluate the operating performance of domestic semiconductor industry, and the relevant factors, based on the characteristics of the industry, were regarded as the performance indicators for evaluation.

Most domestic businesses with CRM system tend to outsource its functions. In the performance evaluation in catering industry, the operation performance is determined by the operating revenue and costs. The former is related to the number of customers, while the latter is referred to the establishment of investing time and number of people. In this case, the factors in performance evaluation in catering industry are considered pure that not too many inputs and outputs need to be taken into account. In comparison with other evaluation methods, DEA, without limiting the original weight, presents simplicity, objectiveness, and wider applications.

Research Method and Research Design

I. Research design

This study utilizes a CCR model to understand whether catering businesses have achieved the minimum inputs and the maximum outputs for the evaluations. In order to improve the resource allocation, slack variable analysis is applied to realize the improvement of inputs and outputs and the allocation. Moreover, the BCC model allows the businesses to realize the effectiveness of using input/output resources.

Applying returns to scale analysis could assist the businesses in adjusting the input/output proportion for enhancing the efficiency.

II. Application of Data Envelopment Analysis

(1) Selection of input/output

Modified Delphi method, proposed by Murry & Hammons (1995), is applied to select the input/output for this study. The original Delphi method was modified based on specific considerations in some research. In other words, the open questionnaire was deleted, and the structural questionnaire was directly developed after a large amount of literature review or planning of researchers for the first questionnaire survey. It was called a modified Delphi method. Directly applying the structural questionnaire for the first investigation could save a lot of time and have the expert group who participated in the research pay attention to the research body so as to increase the retrieval rate.

Both the input and output data are interval scale in this study for which a Pearson product-moment correlation is used for determining the isotonicity of inputs and outputs. When the isotonicity is violated, the input/output appears negative correlations that improper input/output should be deleted.

(2) CCR Model

By extending the ideas of Farrell (1957), CCR Model was first developed by Charnes, Cooper and Rhodes (1978) with the connection of technical efficiency and production frontier estimation. It is regarded as an envelopment concept that the inputs and outputs of all decision making units (DMU) are projected to a geometric space to find out the highest and the lowest input border.

(3) Slack Variable Analysis

When the evaluated subject is inefficient, slack variable analysis could be preceded for management decision makers understanding the direction and range of resource improvement and realizing inputs not being thoroughly used and outputs for improvement. Decision makers could make adjustment according to such information till the relative efficiency=1, achieving the efficiency.

(4) BCC Model

BCC Model, developed by Banker, Charnes, and Cooper in 1984, replaces the fixed returns to scale in CCR model with variable return to scale (VRS) to evaluate the pure technical efficiency of DMUs for understanding the effective use of input/output resources.

III. Input and output

Table 1.

	Item	Definition /measurement
Input	1. Period for implementation CRM system	Total investing time of a business from the planning of CRM system to the completion of implementation
	2. Expenses for implementing CRM system	Total investing amount of money of a business from the planning of CRM system to the completion of implementation
	3. Number of people for investing in CRM system	Total investing number of people of a business for the CRM system implementation
	4. Total number of customer service representatives	Total number of customer service representatives in a business
Output	1. Operating revenue	Total amount of operating revenue of a business
	2. Number of customers	Total number of customers consuming in the business
	3. Operating market share	The scale of a business in the entire catering market

Source: Developed by the author.

Result analysis and discussion

With Pearson correlation to determine the isotonicity of inputs and outputs, both the input and output performance indicators revealed positive correlations after 1% of a significance test, not violating the isotonicity. The Pearson correlation test results are shown in Table 2.

Table 2. Pearson Correlation test results

Input/output	Operating revenue	Number of customers	Operating market share
Period for implementing CRM system	0.423**	0.231	0.166
Expenses for implementing CRM system	0.268	0.182	0.175
Number of people for investing in CRM system	0.459**	0.382*	0.433**
Total number of customer service representatives	0.512**	0.495**	0.532**

Source: Developed by the author.

According to the isotonicity test results, the annual reports of hotels in 2011 were regarded as the input/output data sources. With DEAPXP to proceed CCR analysis, the efficiency of 20 hotels in 2011 was analyzed, Table 3. From the table, Grand Hyatt, Howard, Regent, The Grand, Ambassador, Imperial, Grand Hi-Lai, and The Splendor presented relatively high efficiency on the performance of CRM system in 2011, while Gloria Prince appeared the lowest efficiency, showing the worse performance. According to the efficiency analysis proposed by Norman & Stocker (1991), hotels with high efficiency could be the reference for other hotels. Howard was referred 12 times that it could be the performance benchmark for other hotels and was worth learning.

Table 3. Analysis results of CCR Model

Hotel	Relative efficiency	Number of times being referred
Grand Hyatt	1	2
Far Eastern Plaza	0.924	0
Howard	1	12
Regent	1	5
The Grand	1	7
The Westin	0.735	0
Sheraton	0.882	0
Ambassador	1	6
Caesar Park	0.917	0
The Landis	0.834	0
Royal	0.922	0
Imperial	1	4
Gloria Prince	0.662	0
Grand Hi-Lai	1	3
The Splendor	1	2
Han Hsien International	0.973	0
Kingdom	0.968	0
Evergreen	0.929	0
Farglory	0.845	0
Chinatrust	0.992	0

Source: Developed by the author.

For understanding the efficient use of resources, Slack Variable Analysis was utilized for finding out the inefficient hotels (Table 4).

Table 4. Slack Variable Analysis results

DMU	Input				Output		
	Period for Implementing CRM system	Expenses for Implementing CRM system	Number of people for investing in CRM system	Total number of customer service representatives	Operating revenue	Number of customers	Operating market share
Grand Hyatt	0	0	0	0	0	0	0
Far Eastern Plaza	-8.16	-22.37	0	0	+20.72	0	0
Howard	0	0	0	0	0	0	0
Regent	0	0	0	0	0	0	0
The Grand	0	0	0	0	0	0	0
The Westin	-2.38	0	-3.58	0	+12.62	+100	+0.52
Sheraton	-1.62	-4.57	0	-12.75	0	+120	+0.37
Ambassador	0	0	0	0	0	0	0
Caesar Park	-14.67	-8.42	-6.33	0	+33.42	0	+0.26
The Landis	0	0	-16.81	-9.37	+15.76	+80	0
Royal	-3.17	-4.16	-1.69	-2.93	0	+50	0.73
Imperial	0	0	0	0	0	0	0
Gloria Prince	-21.36	-17.85	-11.13	-7.95	+56.27	+200	+0.94
Grand Hi-Lai	0	0	0	0	0	0	0
The Splendor	0	0	0	0	0	0	0
Han Hsien International Kingdom	-4.37	0	-2.16	0	0	0	+0.39
Kingdom	-2.82	-5.38	0	-3.77	0	0	+0.41
Evergreen	-3.42	0	-1.68	-6.88	+25.83	+20	0
Farglory	0	-2.69	-7.12	0	+36.74	+30	0
Chinatrust	-4.65	0	0	-2.97	+28.51	0	+0.63

Source: Developed by the author.

As CCR Model could not find out the factors of bad management in inefficient hotels, the resource allocation revealed problems. Or, the improper production scale of input/output proportion resulted in the inputs not receiving the relative outputs that this study tended to understand the resource allocation of inefficient hotels by calculating the pure technical efficiency in BCC. Furthermore, the overall efficiency being the product of the pure technical efficiency and the allocation efficiency was used for calculating the allocation efficiency for understanding the appropriateness of the input/output proportion (Table 5).

Table 5. Analysis results of BCC Model

Hotel	CCR relative efficiency	BCC pure technical efficiency	Scale efficiency	Returns to scale
Far Eastern Plaza	0.924	0.933	0.871	IRS
The Westin	0.735	0.866	0.785	IRS
Sheraton	0.882	0.873	0.856	IRS
Caesar Park	0.917	0.904	0.825	IRS
The Landis	0.834	0.858	0.846	IRS
Royal	0.922	0.881	0.762	IRS
Gloria Prince	0.662	0.712	0.683	IRS
Han Hsien International Kingdom	0.973	1	0.882	IRS
Kingdom	0.968	1	0.753	IRS
Evergreen	0.929	1	0.833	IRS
Farglory	0.845	0.964	0.861	IRS
Chinatrust	0.992	1	0.917	IRS

Source: Developed by the author.

Taking the example of Far Eastern Plaza, both the pure technical efficiency and the scale efficiency were not 1, showing that the decision quality of the managers and the proportion of production scale were not proper, and the efficiency was not obvious. Moreover, the scale efficiency was less than the pure technical one, the improper proportion of production scale revealed larger effects on the efficiency. According to the returns to scale, the output proportion was larger than the input proportion, and the input scale should be increased so as to equal the input/output proportion for enhancing the overall efficiency.

Conclusion and Suggestion

Applying DEA to evaluation of the CRM system performance of catering businesses could not only assess the efficiency, but also could provide relevant resource allocation and the orientations of management improvement. In comparison with other performance evaluation tools, such as single indicator or balanced score card, which merely generate scales and scores but cannot inform the manager with the next step, DEA could indicate the problems, according to the analysis results, and offer proper suggestions. Catering businesses therefore could acquire rich management information for understanding and improvement orientation.

When applying DEA to proceeding performance evaluation, financial and non-financial dimensions are also taken into account for the businesses for checking the differences with other competitors. After analyzing the research results, catering businesses with CRM system present favorable performance on decision-making and resource management. Nonetheless, the scale efficiency not being obvious might be too small, i.e. the resource inputs are less than the outputs. The factors are considered as the damage to operating environment that would lead to recession. Consequently, catering businesses could increase or merge branches and develop new products to promote the operating revenue, or even enlarge the scale to complete the objective of efficiency improvement.

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