

Evaluating the Balanced Scorecard with Data Envelopment Analysis to Measure Management Efficiency of Hotels in Taiwan and Vietnam

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Abstract

The purpose of this study is to develop a useful framework to evaluate the interrelationships among four output perspectives of the balanced scorecard using DEA to measure performance efficiency, including efficient frontiers, benchmarking partners, and inefficient slacks. A 32-item survey questionnaire was developed to conduct a survey using 44 hotels in Taiwan and 44 in Vietnam as the sample of this study.

Through a series of questionnaire surveys, the results of this study indicated that the comprehensive model is valuable and that there are significant relationships among the four perspectives of the balanced scorecard, i.e. financial, customer, internal business process and learning and growth perspectives'. Furthermore, the results of applying DEA into the balanced scorecards to measure performance efficiency of hotels in Taiwan and Vietnam showed the efficiency frontiers and benchmarking partners which can tell the ideal input volume and the slack of every hotel. The information could be very helpful for hotel managers to identify competitive positions and improvement goals.

Keywords: Hotel, BSC, DEA, Benchmarking, Effectiveness, Performance

1. INTRODUCTION

With the boom of the tourism industry, hotels in both Taiwan and Vietnam have mushroomed nationwide, and the number of international hotels has continuously increased in the past decades. However, because of the rapid expansion of hotels, supply has exceeded market demand, and many hotels have subsequently been closed or changed their function. Facing a highly competitive environment, the formulation of business strategy, strengthening corporate operations and upgrading the quality of service have become essential for survival. In formulating strategies to develop hotels' competitive advantages, one major problem is the measurement of management performance and efficiency of the hotel, compared to the average of the entire industry, prior to an assessment of advantages and disadvantages.

Traditionally, most organizations look at their corporate performance by reviewing the financial aspects. However, financial measures alone are not a balanced view of the critical success factors of any organizations, mainly because financial measurement tends to measure

the past. According to Kaplan and Norton (1996), the balanced score card (BSC) is based on the concept that managers must manage and evaluate their business from at least four major perspectives: (1) How do customers view the firm? (2) What business process must we improve and exceed at? (3) Can the firm continue to learn and innovate? (4) How does the firm appear to its shareholders? The BSC translates an organization's mission and strategy into a comprehensive set of performance measures and provides the framework for strategic measurement and management.

However, there are several major limitations of the BSC approach discussed in the literature. First, it is a top down approach only (Kanji and Moura 2001; Malina and Selto 2001). Therefore, the interaction between the top management team and working level employees is limited. Lohman et al. (2004) find in the corporate setting they studied that BSC did not provide an opportunity to develop, communicate and implement strategy. Although BSC has been adopted widely by different industries, there is no formal implementation methodology. This lack of formal implemented methodology and subjective measures often leads to focusing on short-term financial measures. According to Fletcher and Smith (2004), BSC lacks a single focus for accountability. What BSC does not do, but what a manager needs, is provided one comprehensive index to summarize the interaction between these leading and lagging measures of performance. While BSC may tell us what measures to look at, it does not tell us how to look at them or their relative importance.

In addition, in order to evaluate the competitive position of the firm, managers need to apply data envelope analysis (DEA) to identify the efficient frontier, benchmarking partners and inefficient slack for the firms. It is important for the firm to understand their relative position in terms of productivity and efficiency. DEA is viewed as a methodology that provides a valid starting point for specifying balanced performance. Previous studies applying both BSC and DEA to evaluate the competitive positions of the hotel are not available. Thus further empirical validations are required.

The main purpose of this study is to provide new insight into the research areas of DEA and BSC. The results of this study should provide competitive information, which is essential to designing the long term strategy and objectives of hotels in both Taiwan and Vietnam.

Detailed research objectives of this study are listed as follows:

- (1) To confirm the measurement variables of the input variables and output variables based on the four perspectives of the balanced scorecard to measure the operational performance of a hotel.
- (2) To develop and test several research hypotheses and a research framework for further empirical validation.
- (3) To adopt Data Envelopment Analysis (DEA) to measure the management efficiency of hotels in Taiwan and Vietnam.

2. LITERATURE REVIEW

2.1 The Balanced Scorecard (BSC) Approach

The balanced scorecard approach offered by previous studies addresses the issues of divergent stakeholder goals and gauging managers' effectiveness. Many authors argue that existing performance measures are basically too reliant on financial-accounting measures. It is thus necessary to develop a monitoring system that communicates both financial and nonfinancial measures using two combinations of lagging and leading indicators to address a firm's long-term and short term objectives (Yap, Siu, Baker & Brown, 2005; Edward & Thomas, 2005; Papalexandris, Ioannou, & Prastacos, 2005; Braam & Nijssen, 2004). Kaplan and Norton (1992) propose four balanced perspectives: financial, customer, internal business proc-

esses, and learning and growth perspective. They contend that the balanced scorecard retains not only an emphasis on achieving financial objectives but also includes the performance drivers of these financial objectives. It is argued that the scorecard enables companies to track financial results while simultaneously monitoring progress in building the capabilities and acquiring the intangible assets for future growth (Koplan & Nortion, 2005; Gumbus, 2005).

Denton and White (2000) contend that the basic premise of a firm is to attract and retain top associates, which enables the execution of best practices in the internal-business process. The competitiveness of the internal-business process will then increase customer satisfaction, which will eventually result in better financial success. The balanced scorecard approach should be implemented at all levels of the organization and needs to focus on the key indicators for each of the four perspectives. Senior executives should decide to focus on the single most-important variable or multiple variables for each of the four perspectives.

It seems that firms in different industries and different competitive positions tend to focus on different variables for each perspective of BSC. Fletcher and Smith (2004) suggest that, based on BSC, managers must evaluate their business from the four perspectives. They further argue that BSC is an excellent management framework to help managers track many factors that influence performance. The ability of BSC to provide this view depends upon "the construction of a set of performance measures that track how successfully a firm is carrying out its strategies, objectives, and overall mission".

2.2 Interrelationships among Four Perspectives of BSC

The BSC approach emphasizes that, in order to achieve objectives in the financial perspective, all objectives and measures in other perspectives should be linked (Gosselin, 2005; Laitnen, 2005; Kim & David, 2004). For most organizations, the financial themes of increasing revenues, improving productivity, enhancing assets utilization could provide the necessary linkages. To achieve a synergetic effect, firms should emphasize the cause and effect relationship among the BSC measures. Olve, Roy and Wetter (2000) argued that improved value in human resource and development capital should be the leading indicators of improvement in customer capital and profitability. These authors develop a cause and effect relationship among the BSC measures. Their cause and effect model indicates that the measures of human resource development would influence the internal business process of the firm.

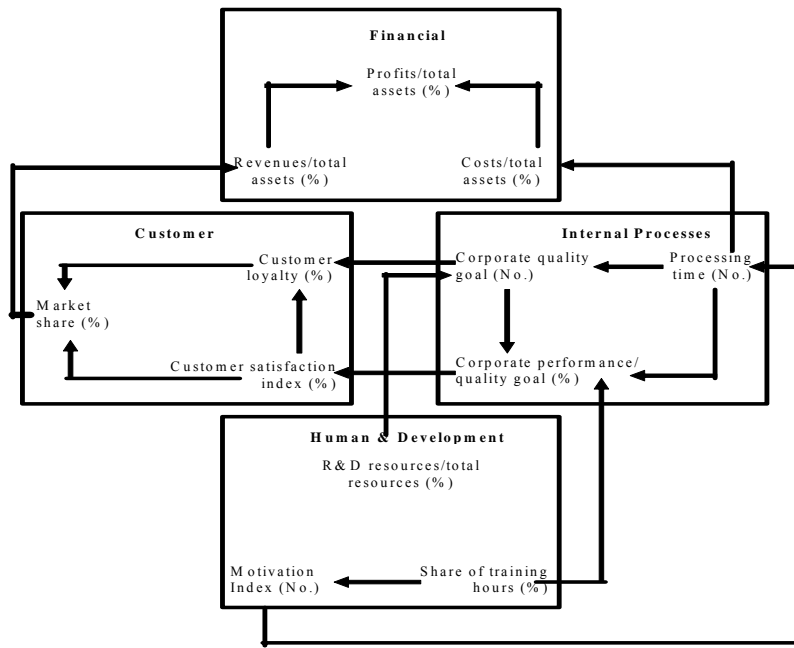


Figure 1. Cause and effect relationship between strategic measures

Source: Olve, N.G., Roy, J. & Wetter, M. (2000). *Performance Drivers: A Practical Guide to Using the Balanced Scorecard*. Baffins Lane, Chichester: John Wiley & Sons, Ltd., p.210.

The internal business process will influence customer perspective and eventually financial perspective. In addition, these authors also suggest that the measurement indicators of each perspective are also interrelated. These interrelationships are shown in Figure 1.

Based on the above literature review, it seems that the interrelationships among the four perspectives of BSC have drawn significant attention. However, scholars seem not to reach a consistent agreement on the interrelationships among the four perspective of the BSC. This study would like to go further by integrating the opinions of previous studies to evaluate more specifically the interrelationships among the four perspectives of BSC. These interrelationships are as follows: (1) the learning and growth perspective of the balanced scorecard impacts on the internal business process perspective of the balanced scorecard; (2) the internal business process perspective of the balanced scorecard has the influence on the customer perspective of the balanced scorecard; (3) the learning and growth, internal business process, and customer perspective of the balanced scorecard will significantly impact on the financial perspective of the balanced scorecard.

2.3 The application of DEA into the BSC approach

The increasing use of BSC is changing the way in which top managers run their companies. According to Rickards (2003), BSC helps top managers realize their visions by assisting in developing appropriate strategies, setting new goals, establishing standards or benchmarks, measuring progress, and reporting results pertaining to both monetary and non-monetary variables.

However, due to the complexity of the management system of BSC and the interrelated nature of the BSC indicators, this approach clearly confronts managers with an extraordinarily complex optimization problem. DEA can be a helpful tool in dealing with this complexity. DEA, as developed by Charnes *et al* (1978) and further by Banker *et al* (1984), is designed to set benchmarking partners and is widely used in various kinds of industry; for example, there

are some studies that have tried to measure the productivity and efficiency of container ports using DEA (Tongzon, 2001; Martinez-Budria *et al* , 1999; Roll and Hayuth, 1993). Thus, application of DEA to evaluate the BSC result may be a good solution to the implementation of the BSC. As there are many indicators, which are required to measure the four perspectives of the BSC, firms need to identify benchmarks and standard costs embodying the “best practice” of the industry. Consequently, this benchmark and standard cost are both planning objectives and currently attainable goals for performance evaluation (Horngren *et al.*, 1997, p. 235).

To identify the best practice is not a very easy task. In many cases, the BSC lacks a capstone like return on equity, return on assets, cash flow, etc. Furthermore, BSC advocates specify neither a mathematical model nor objective weighting scheme. Hence, it is difficult to make comparisons within and across firms on the basis of BSCs. In addition, the inefficient use of resources may go unrecognized (Hsu, 2005; Banker, Chang, Janakiraman, & Konstans, 2005; Ho & Zhu, 2004; Park & De, 2004).

Richard (2003) argues that DEA is suitable for measuring the best practice of the BSC indicators. The efficiency frontier as measured by DEA can be used to specifically investigate the efficiency of decision-making units (DMUs). The slack could be used as the evaluation of a firm’s efficiency on those BSC indicators. It is suggested that DEA can identify how to objectively determine BSC indicators (Rickards 2003).

According to Rickards (2003), in order to adopt DEA to evaluate the BSC indicators the following requirements must be taken into consideration. First, all the inputs and outputs for the study must be present in and measurable for each DMU (i.e. there can be no missing data). Second, the relationship between the number of output and input variables to the number of DMUs studied should not exceed a certain upper limit in that practice is generally a ratio of 1:2. Third, the potential input savings or output increases identified in a DEA are not always attainable. Particularly in an operational setting, one simply may not be able to eliminate a DMU’s inefficiencies when they involve absolutely small amounts of an indivisible input or output unit. Fourth, the source of the revealed savings or increased production potential is not always evident from the analysis.

2.4 Background of Measurement of Hotel Efficiency

As the operational environment becomes more and more competitive, the management of hotel efficiency is the main priority. Morey and Dittman (1995) probe the efficiency of 54 hotels with the use of DEA. They consider nine inputs: (1) salaries, (2) energy costs, (3) fixed market expenditure, (4) room division expenditure, (5) non-salary expenses with property, (6) non-salary expenses with administrative work, (7) non-salary expenses with variable advertising, (8) payroll and related expenses for administrative work, and (9) salaries and related expenses with variable advertising. They handled four outputs: (1) market share, (2) rate of growth, (3) total revenue, and (4) level of service provided.

By using the DEA approach, Anderson *et al.* (2000) also evaluate the efficiency of 48 hotels by using cross-sectional data on prices, inputs, and outputs. They use five inputs: (1) number of rooms, (2) full-time equivalent workers, (3) total-gaming-related expenditure, (4) total expenditure on food and beverages, and (5) various other expenditures. They only consider two outputs, total revenue and other revenue.

Barros and Alves (2004) also analyze the efficiency a Portuguese publicly-owned hotel chain, Enatur, by applying DEA to estimate total factor productivity through technical efficiency and technological change. They designate input variables as labor (number of full-time equivalent workers and salary received by these workers) and physical capital (external costs, operating costs, and book value of the property). The output is measured by sales, number of guests, and number of nights spent in the hotel.

According to the Taiwan Tourism Bureau, the indicators used for input-output factors are as follows. Output factors are room revenue (refers to revenues from lease of rooms), food and beverages revenue (refers to income derived from sale of food, snacks, alcohol, beverages in dining room, coffee room, banquet and night clubs), and other revenues (refers to revenues other than the two items mentioned above). It includes operating revenues from lease of storage spaces, laundry, swimming pool, ball courts, barbershop, beauty salons and bookstores. Input factors are number of full-time employees (refers to hired employees), guest rooms (refers to number of guest rooms in the hotel), total area of meal department (measured by total floor area), and operating expenses including salary, cost of meals, utility, fuel, insurance and other relevant operating costs.

In summary, although several studies have adopted DEA to identify the efficiency of hotel management, none of them has integrated the concept of BSC and developed a measurement framework using DEA to investigate the competitiveness of hotel management.

3. Research design and methodology

3.1 The Research Framework

Based on the above literature review, this research developed a research framework as shown in Figure 2. It is suggested that, to make the firm more efficient, managers should measure their performance from both financial and non-financial perspectives (Fletcher & Smith, 2004).

Since BSC is the most useful technique which managers could adopt to evaluate their management performance from four output perspectives, this study adopts, the BSC approach to measure the output performance of hotel management. Therefore, six major measurement constructs are analyzed in this research. Input variables are improving service quality, building up brand image, upgrading the equipment, training employees, offering innovative services, and building up proactive human resources. The four output constructs are financial perspective, customer perspective, internal business process perspective, learning and growth perspective. The characteristics of respondents are the final measurement construct.

3.2 Questionnaire Design and Sampling Plan

All the data, except for the characteristics of respondents, was collected through the Likert-scale questions of the survey described above.

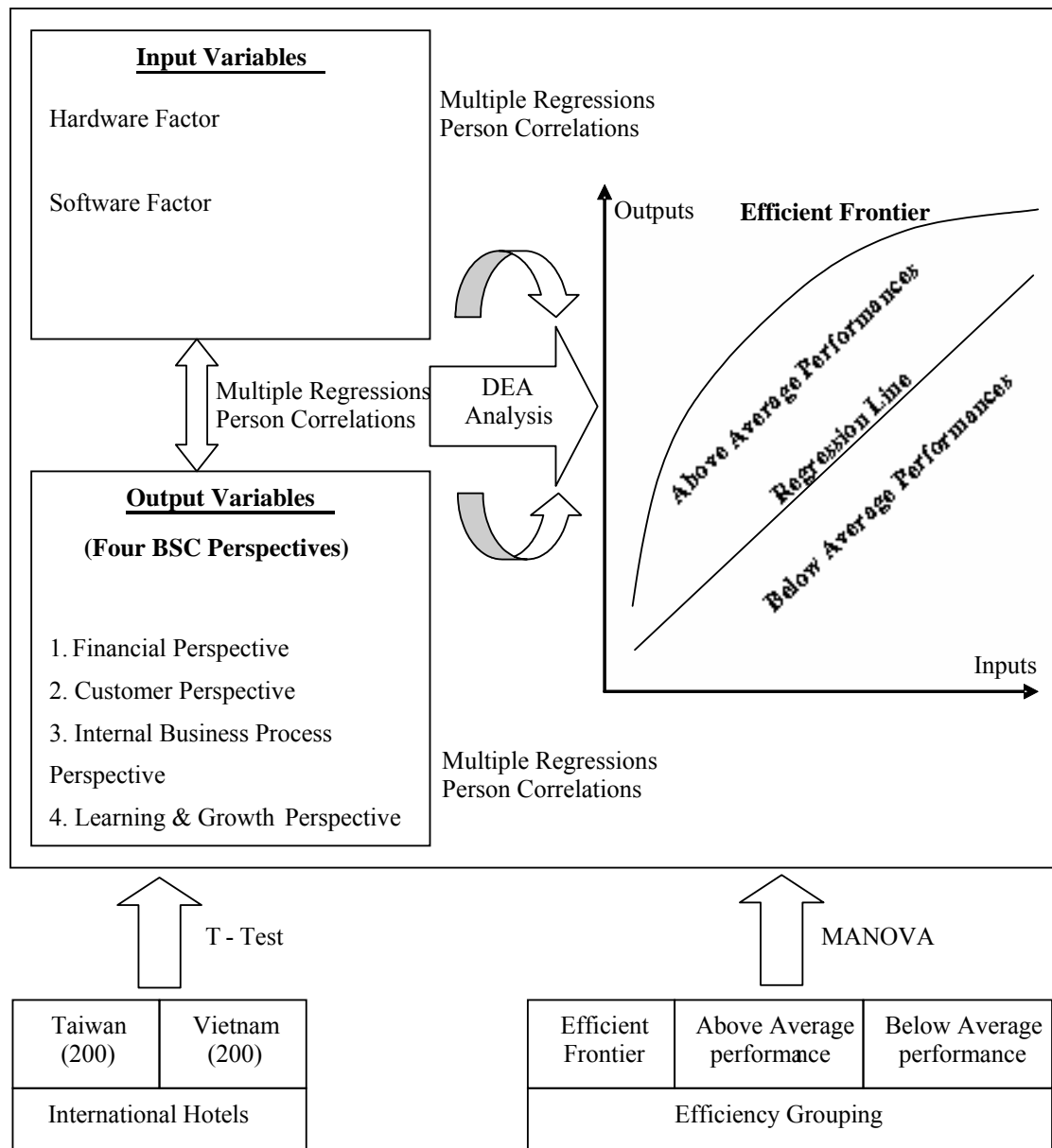


Figure 2. Research framework

An expert interview was conducted to investigate the representatives of the questionnaire items that fit into the actual performance measurement of the hotels. A series of questionnaire surveys were conducted to identify managers’ perceptions of the levels of investment in input indicators and of the levels of achievement on financial, customer, internal business process and learning and growth perspectives for this study. A pilot study was conducted with a reliability test to ensure the questionnaire is reliable and valid. The final version of questionnaire items was refined through a process of purification. The respondents were asked to express their perceptions of investment in input and of achievement of four output perspectives of the BSC measurement, the financial, customer, internal business process and learning and growth perspectives.

The data were gathered through mail questionnaire survey over a three-month period beginning in March of 2005, and ending at the end of May 2005 for data in Vietnam and Taiwan, including one pilot test and two final surveys. For the final surveys, a total of 44 survey

questionnaires were collected in Vietnam and 44 in Taiwan. There were no missing data among the 88 questionnaires; all of the questionnaires were usable.

4. RESEARCH ANALYSES AND DISCUSSIONS

4.1 Factor analysis and reliability test

To verify the dimensionality and reliability of constructs of this study, purification processes, including factor analysis, item to total, correlation analysis, and coefficient alpha analysis were conducted in this study. Using factor loadings of 0.6, item to total correlation coefficients of 0.5, and coefficient alpha of 0.6 as cut-off points to extract factors from research variables, this study finds one factor to identify the construct of financial perspective output, one factor to identify the construct of customer perspective output, one factor to identify the construct of internal business process perspective output, and one factor to identify the construct of learning and growth perspective output. Thus, for the following data analysis, the factor scores will be used to represent variable scores on the four perspectives of output factors.

4.2 Interrelationships among four Output Perspective Measurements

For the relationships among four output perspective measurements, the results of canonical correlation show that the levels of indicators for learning and growth perspective tend to significantly impact on the financial perspective (Can $R^2 = .473$, Eigenvalue = .896, $F = 2.536$, $P = 0.000$, $RI = 57.645\%$), the levels of indicators for learning and growth perspective tend to significantly influence the levels of internal business process perspective (Can $R^2 = .561$, Eigenvalue = 1.277, $F = 3.032$, $P = 0.000$, $RI = 67.225\%$), the levels of indicators for internal business process perspective tend to significantly influence the levels of financial perspective (Can $R^2 = .463$, Eigenvalue = .863, $F = 3.308$, $P = 0.000$, $RI = 61.674\%$), the levels of indicators for internal business process perspective tend to significantly influence the levels of customer perspective (Can $R^2 = .592$, Eigenvalue = 1.452, $F = 5.246$, $P = 0.000$, $RI = 69.481\%$), and the levels of indicators for customer perspective tend to significantly influence the levels of financial perspective (Can $R^2 = .515$, Eigenvalue = 1.062, $F = 3.581$, $P = 0.000$, $RI = 64.51\%$).

The detailed information of canonical correlation is shown in Figure3, as well in the Table 1.

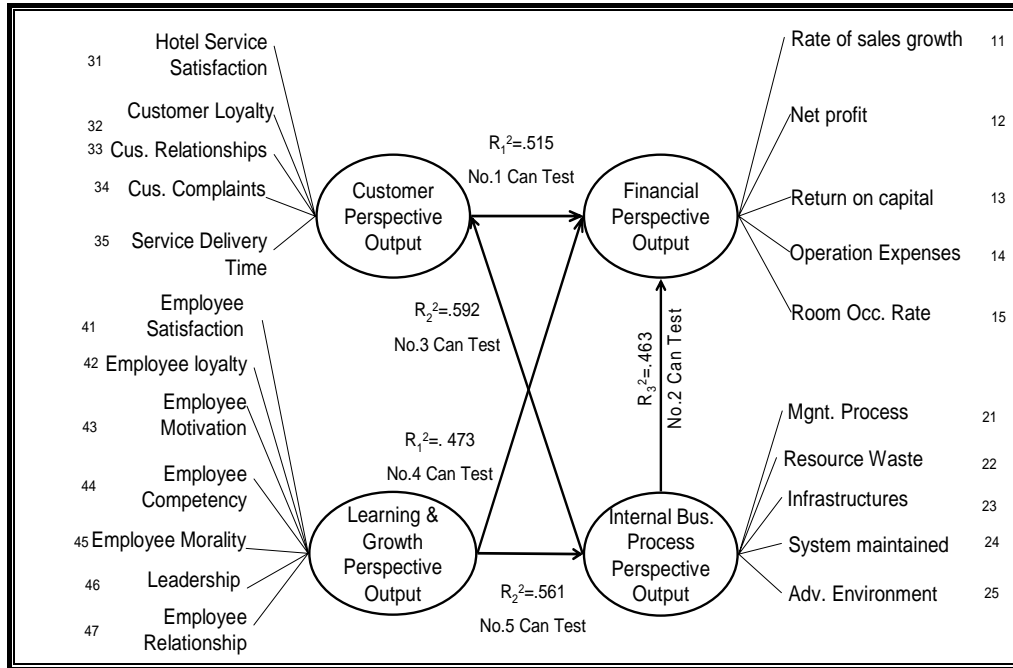


Figure 3. Interrelationship among financial, internal business process, customer, and learning and growth perspective measurement

Table 1 Canonical Loadings of Four Perspective Output Measurements

Financial Perspective ↕ Customer Perspective	Financial Perspective ↕ Internal Bus. Pro. Perspective	Customer Perspective ↕ Internal Bus. Pro. Perspective	Financial Perspective ↕ Learning & Growth Perspective	Internal Bus. Pro. Perspective ↕ Learning & Growth Perspective
No.1 Can. Test	No.2 Can. Test	No.3 Can. Test	No.4 Can. Test	No.5 Can. Test
$\lambda_{11} = .873^*$	$\lambda_{11} = .853^*$	$\lambda_{31} = .801^*$	$\lambda_{11} = .719^*$	$\lambda_{21} = .919^*$
$\lambda_{12} = .672^*$	$\lambda_{12} = .650^*$	$\lambda_{32} = .887^*$	$\lambda_{12} = .623^*$	$\lambda_{22} = .758^*$
$\lambda_{13} = .838^*$	$\lambda_{13} = .796^*$	$\lambda_{33} = .867^*$	$\lambda_{13} = .781^*$	$\lambda_{23} = .794^*$
$\lambda_{14} = .813^*$	$\lambda_{14} = .858^*$	$\lambda_{34} = .719^*$	$\lambda_{14} = .939^*$	$\lambda_{24} = .786^*$
$\lambda_{15} = .805^*$	$\lambda_{15} = .752^*$	$\lambda_{35} = .882^*$	$\lambda_{15} = .697^*$	$\lambda_{25} = .832^*$
$\lambda_{31} = .858^*$	$\lambda_{21} = .865^*$	$\lambda_{21} = .913^*$	$\lambda_{41} = .762^*$	$\lambda_{41} = .951^*$
$\lambda_{32} = .808^*$	$\lambda_{22} = .666^*$	$\lambda_{22} = .760^*$	$\lambda_{42} = .805^*$	$\lambda_{42} = .878^*$
$\lambda_{33} = .917^*$	$\lambda_{23} = .800^*$	$\lambda_{23} = .827^*$	$\lambda_{43} = .776^*$	$\lambda_{43} = .861^*$
$\lambda_{34} = .706^*$	$\lambda_{24} = .880^*$	$\lambda_{24} = .848^*$	$\lambda_{44} = .916^*$	$\lambda_{44} = .847^*$
$\lambda_{35} = .890^*$	$\lambda_{25} = .868^*$	$\lambda_{25} = .769^*$	$\lambda_{45} = .843^*$	$\lambda_{45} = .782^*$
			$\lambda_{46} = .773^*$	$\lambda_{46} = .860^*$
			$\lambda_{47} = .819^*$	$\lambda_{47} = .812^*$

These results are in line with those of previous studies, including Kaplan & Norton (1996), Fletcher & Smith (2004), Olve, Roy & Wetter (2000), and Denton & White (1996). Based on the above results, it is suggested that learning and growth perspective has been regarded as the most important factors to impact on internal business process perspective; internal business process perspective has been regarded as the most important factors to impact on customer perspective; and learning and growth, internal business process and customer perspective have been regarded as the most important factors to impact on financial perspective. Hotels

intending to promote financial perspective should put more efforts on building up learning and growth, the internal business process and customer perspectives.

4.3 Structural Equation Model (SEM)

The purpose of this study is to find out the relationships among four output perspectives. For such an objective, a structure equation model is employed to test the interrelationships of all the variables in the entire model. The proposed structural equation model is shown in Figure 4.

Before evaluating the structural or measurement models, the overall fit of the model should be evaluated. In this study, five indices were used to test the fit of the model. The first one was the chi-square test, essential for the nested model comparison. The chi-square value of 452.673 with 204 degrees of freedom is statistically significant at the 0.000 significance level. Thus, the research must conclude that significant differences exist between the design model (as shown in Figure 4) and the actual model. However, we must also note that the chi-square test becomes more sensitive as the number of indicators rise. With this in mind, other measures were also examined.

The rest of the fit indices adopted in this study were the root mean square residual (RMR), the goodness of fit index (GFI), and the adjusted goodness of fit index (AGFI). The smaller the RMR is, the better the fit of the model. A value of 0.05 is suggested as a close fit (Arbuckle & Wothke, 1999). GFI and AGFI will not be influenced by the sample size explicitly and they were adopted to test how much better the model fits than no model at all. A very good fit of research model would require GFI and AGFI to be higher than 0.9 (Arbuckle & Wothke, 1999). The quality of the alternative models should rely on the fit indices. However, it does not necessarily mean that one model is superior or the correct causal model. Another important criterion for the quality of the model is the plausibility criterion (Joreskog & Sorbom, 1994). It means that the path coefficients in the model adhere to the general theoretical conception and to the hypotheses. Therefore, a model that fits the data well, but with many unsupported hypothesized paths, cannot be defined as correct. Hence, the fit indices and the theoretical predictions should be taken into consideration.

According to the criterion above, the best model (see Figure 4) is tested in this study. Figure 4 estimates the fit indices of the model. It shows a somewhat big, significant GFI is 0.896, AGFI is 0.824 with quite high chi-square number (452.673), the GFI and AGFI indices indicate moderate fit of this model. As the overall goodness of fit is promising, it is encouraged to further identify the magnitudes and significance of the path structural coefficients of the model. As shown in Figure 4, it indicates that internal business process perspective has a significant impact on customer perspective ($\beta = .817$) and learning and growth perspective has a significant impact on internal business process perspective ($\beta = .790$). Also, the customer perspective and internal business process perspective have a significant impact on financial perspective ($\beta = .539$, $\beta = .418$). Furthermore, there is a significant relationship between learning and growth perspective and financial perspective ($\beta = .424$).

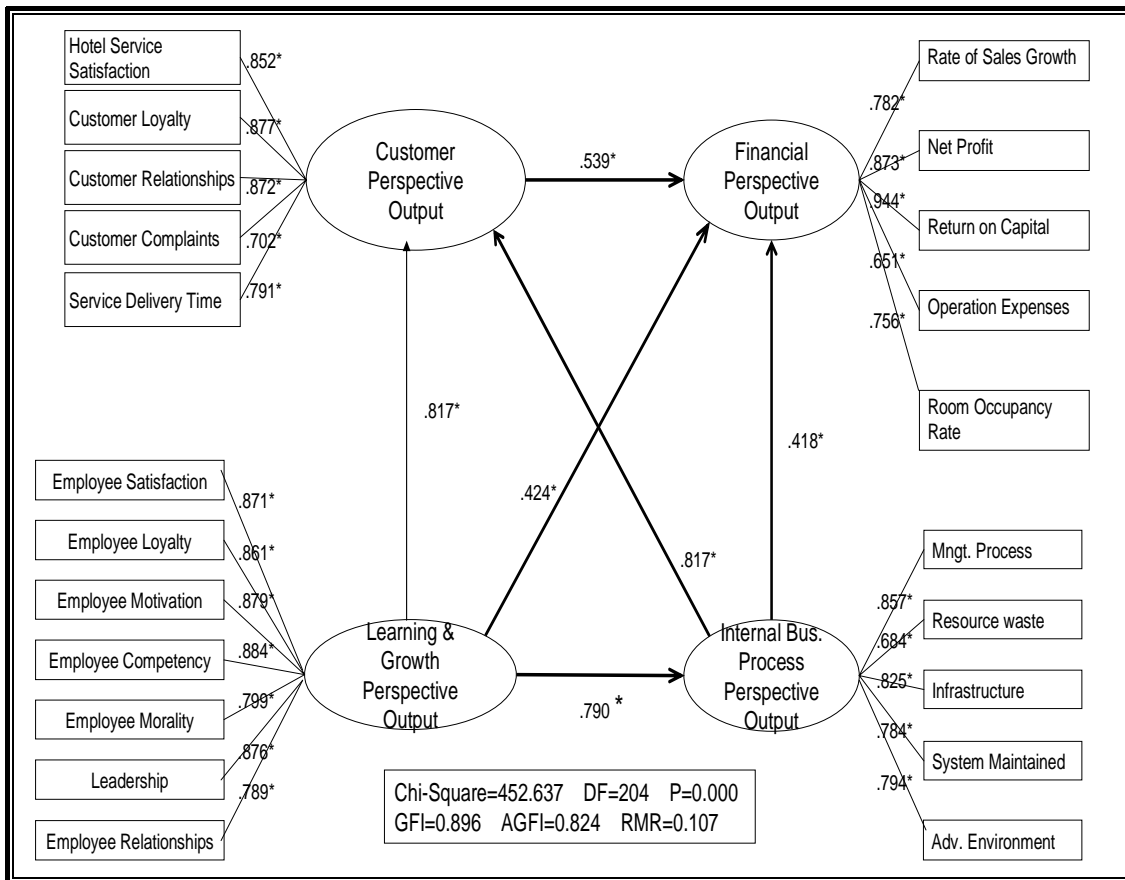


Figure 4. Structural Equation Model of This Study

These results seem to indicate that the interrelationships among the four output perspective are specifically significant. These results are in conformity with the study results of Kaplan & Norton (1996), Fletcher & Smith (2004), Olve, Roy & Wetter (2000), and Denton & White (1996) that indicate the interrelationships among the four perspectives of the Balanced Scorecard. The Balanced Scorecard literature indicates that to promote the financial perspective, hotel managers should focus on learning and growth, customer, and internal business process perspective. The detailed implications of these results shown in Figure 4 are that hotel managers should invest more in hotel service satisfaction, customer relationships, management process qualification, support infrastructure, employee satisfaction, employee morality, employee motivation, and leadership in order to improve financial performance.

4.4 Comparisons of Research Factors between Taiwanese and Vietnamese Hotels

This study uses a t-test to identify the differences of research factors between Taiwanese and Vietnamese hotels. This study adopts a t-test for both standardized and unstandardized data. Unstandardized data was collected through questionnaire items on the basis of a 7-point Likert scale.

Table 2 Comparison of Research Variables between Taiwanese and Vietnamese Data

Research Variables	Data Mean		t - value	p - value
	Taiwan	Vietnam		
Hotel Input Measurement				
Improving our service quality.	5.432	5.114	1.301	.197
Building up our brand image	5.273	4.500	2.804	.006
Upgrading our equipment	5.500	4.932	2.608	.011
Our employees are well trained	5.068	4.636	1.629	.107
We always offer innovative services	5.091	4.568	2.006	.048
Building up pro-active human resources	5.227	5.023	.784	.435
Four BSC Perspective Output Measurements				
Financial Perspective Output	5.159	4.691	2.000	.049
Customer Perspective Output	5.577	5.132	2.366	.020
Internal Business Process Perspective Output	5.327	5.000	1.697	.093
Learning & Growth Perspective Output	5.367	5.253	.559	.577

Table 3 Comparison of Research Variable between Standardized Taiwanese and Vietnamese Data

Research Variables	Data Mean		t - value	p - value
	Taiwan	Vietnam		
Hotel Input Measurement				
Improving our service quality.	7.648	7.170	1.301	.197
Building up our brand image	7.409	6.250	2.804	.006
Upgrading our equipment	7.750	6.898	2.608	.011
Our employees are well trained	7.102	6.455	1.629	.107
We always offer innovative services	7.136	6.352	2.006	.048
Building up pro-active human resources	7.341	7.034	.784	.435
Four BSC Perspective Output Measurements				
Financial Perspective Output	7.239	6.536	2.000	.049
Customer Perspective Output	7.866	7.198	2.366	.020
Internal Business Process Perspective Output	7.491	7.000	1.697	.093
Learning & Growth Perspective Output	7.550	7.380	.560	.577

The standardized formula is used to convert the unstandardized data into a spectrum, the lowest value “1”, and the highest value “10”. The t-test results as shown in Table 2 and Table 3 indicate that hotels in Taiwan tend to achieve higher levels of output perspective variables than hotels in Vietnam. These results are especially significant in such variables as the financial (t-value = 2.000, p-value = .049) and customer (t-value = 2.366, p-value = .020) perspectives. Therefore, hypothesis 6 of this study is partially supported.

These results have several managerial implications. As shown in Table 2 and Table 3, the differences in the research constructs between the two countries is the significance business location. The hotel managers doing business in Taiwan tend to evaluate higher levels of their performance. Thus, hotel managers should very carefully make their decision before doing business in Vietnam. Finally, in order to get competitive advantage, managers should design a profitable investment strategy in such a way to create higher levels of performance efficiency.

4.5 Data Envelopment Analysis of 88 hotels in Taiwan and Vietnam

This study uses DEA to find out the efficiency scores and benchmark partners of Taiwanese and Vietnamese hotels. Through the results of the analysis, this study uses six hotel input variables: improving service quality, building up brand image, upgrading the equipment, training employees, offering innovative services, and building up pro-active human resources. The output variables are financial, customer, internal business process, and learning and growth perspectives. For consistency, the standardized formula is used to convert the data into a spectrum, the lowest value “1”, and the highest value “10”. Transformation formula for data is as follows:

$$\text{Score} = 9 * \frac{(\text{hotel value} - \text{sample min})}{(\text{sample max} - \text{sample min})} + 1$$

In the previous studies, the CRS assumption is appropriate when all DMUs are operating at an optimal scale. However, there are lots of reasons to cause a DMU not to operate at an optimal scale, such as imperfect competition, constraints of finance, or environment. Banker, Charnes, and Cooper (1984) suggested using the extension of the CRS DEA model for considering the variable returns to scale (VRS) situations, and the use of the CRS specification when not all DMUs are operating at the optimal scale. According to the previous study, the CRS model is a better method since the study uses the average of the respondent’s score of hotels, and measures the technical efficiency and scale efficiency in a relatively efficient way. As a result, the original definition of the CRS assumes that proportional input increased (reduced), will follow an equal increase (reduction). This study says that when an input variable receives higher scores, then the output variable will receive higher scores as well.

The results of DEA analysis of the hotels’ efficiency and benchmarking partners are shown in Table 4. It is shown that the hotels such as DMU No. 01, 02, 07, 09, 11, 16, 20, 21, 22, 23, 27, 28, 29, 30, 32, 39, 40, 41, 44, 46, 47, 48, 50, 51, 56, 57, 60, 61, 64, 65, 66, 73, 75, 77, 78, 79, 82, 84 are located at the efficiency frontier, due to their outstanding performances. On the other hand, DMU No. 72, 14, 35, 71, 12, 19, 70, 59, 43, 83, 37 are considered to be least efficient hotels among hotels in the sample as their VRSTE scores are below 0.85. Among these hotels at the efficiency frontier, No. 1, 7, 9, 11, 21, 23, 29, 30, 41, 46, 47, 50, 56, 57, 64, 65, 82, and 84 are the most distinguished hotels because they have been treated as benchmark partners for more than 15 others.

Table 4 also shows the efficiency scales of each hotel. Hotels with “irs” means that if the input variable increased one unit, then the output variable will be increased more than one unit, whereas “drs” means if the advertising inputs are increased by one unit, then the outputs will increase by less than one unit. The results show that most of the hotel are in the category of “drs”, which means that there is more scope to improve the inputs of the hotel including improving service quality, building up brand image, upgrading the equipment, training employees, and building up a proactive human resource.

The above results have several managerial implications. First, using DEA as the analytical tool among 88 hotels in Taiwan and Vietnam, 38 hotels are located in the efficiency frontier, 24 achieved the efficiency score between 0.906 and 0.999, 18 hotels achieved the efficiency score between 0.851 and 0.897, 7 hotels achieved the efficiency score between 0.763 and 0.848. These efficiency scores implied that there are 50 hotels with room to improve, compared to those hotels located at the efficiency frontier. Second, for those hotels that need to improve the results provide the benchmark partners. For these hotels, it is suggested that more improvement is required in the input variables, and the amount of improvements required could be found by referring to benchmark partners. Third, based on the drs and irs method, managers need to consider how to convert the hotel management efficiency from drs

to IRS for their management. It is important for managers to see that the increases of one unit of input variable will result in an increase of more than one unit of output variable. It is suggested that the IRS hotels will have more potential to become competitive. Fourth, for the DMU No. 71, 12, 19, 70, 59, 43, 83, 37 whose efficiency scores are lower than 0.85, it is recommended that strategic changes on each of the input variables are required to become more competitive.

Fifth, the function of DEA methodology can simultaneously deal with multiple inputs and multiple outputs, from this perspective DEA is superior to the traditional approach which can only deal with multiple inputs and a single output. With a homogeneous decision making unit, DEA enables direct measurement of efficiency, without transaction or conversion through any prior function. Based on DEA compliance, this study can identify the efficiency scores in 88 hotels in a sequential order. It is suggested that hotels targeting a similar segmentation should be compared and regarded as members of peer groups. Benchmarking learning should be started from the peer group. The result of DEA analysis for hotel management in this study has served as a target of MBO (management of objective). Managers can use the results of DEA as steps to improve and become more competitive.

Table 4
The Efficiency Scores and Benchmarking Partners of 88 Hotels

No	Hotels	Crste	Vrste	Scale		Benchmark partners	
1. Excellent Efficiency Frontier Hotels							
DMU01	Nanka Experss Hotel	1.000	1.000	1.000	-	1	5
DMU07	Marshal Hotel	1.000	1.000	1.000	-	7	8
DMU09	Harn Yuan Hotel	1.000	1.000	1.000	-	9	7
DMU11	Howard Plaza Hotel	1.000	1.000	1.000		11	12
DMU21	Kenting Maldives	1.000	1.000	1.000	-	21	10
DMU23	Fu Wang Hotel	1.000	1.000	1.000	-	23	36
DMU29	Asia Pacific Hotel	1.000	1.000	1.000	-	29	28
DMU30	Chinatrust (Hsintien)	1.000	1.000	1.000	-	30	12
DMU41	The Great-Land Hotel	1.000	1.000	1.000	-	41	5
DMU46	Tan Loc	1.000	1.000	1.000	-	46	12
DMU47	Sao Nam	1.000	1.000	1.000	-	47	0
DMU50	Phong Lan	1.000	1.000	1.000	-	50	1
DMU56	Phuoc Thanh	1.000	1.000	1.000	-	56	1
DMU57	Quoc Son	1.000	1.000	1.000	-	57	7
DMU64	Thanh Long	1.000	1.000	1.000	-	64	2
DMU65	Tram Huong	1.000	1.000	1.000	-	65	1
DMU82	Dong Kinh	1.000	1.000	1.000	-	82	1
2. Efficient Frontier Hotels							
DMU39	Caesar Park Taipei	.997	1.000	.997	drs	39	0
DMU16	Wang Fu Hotel	.992	1.000	.992	drs	16	3
DMU66	Phuong Long	.984	1.000	.984	drs	66	0
DMU61	Long Phat	.977	1.000	.977	drs	61	0
DMU60	Hong Duc	.964	1.000	.964	drs	60	1
DMU32	Gala Hotel Taipei	.955	1.000	.955	drs	32	1
DMU84	Huong Sen	.951	1.000	.951	drs	84	12
DMU44	Unknown name Hotel	.950	1.000	.950	drs	44	7
DMU20	K.G. Inn- Kenting	.941	1.000	.941	drs	73	0
DMU73	CAESAR	.941	1.000	.941	drs	73	6
DMU48	Quynh Quang	.934	1.000	.934	drs	48	22
DMU40	Agora Garden Hotel	.910	1.000	.910	drs	40	0
DMU78	Phuong Dong	.894	1.000	.894	drs	78	8
DMU79	Ky Dong	.866	1.000	.866	drs	79	0
DMU22	Swan Lake Resort	.865	1.000	.865	drs	22	16
DMU75	Hai Van Nam	.848	1.000	.848	drs	75	0
DMU02	Yin Shan Hotel	.845	1.000	.845	drs	2	11
DMU27	Tainan Hotel	.841	1.000	.841	drs	27	5
DMU51	Dong Khoi	.824	1.000	.824	drs	51	2
DMU28	Tayih Landis Hotel	.809	1.000	.809	drs	28	3
DMU77	Hoang De	.809	1.000	.809	drs	77	0
3. High Efficiency Hotels							
DMU04	Formosa Hotel	.856	.999	.857	drs	2 48 29 78 73	0
DMU26	Cambridge Hotel	.837	.994	.842	drs	73 29 28	0
DMU38	Sowa Hotel	.799	.993	.805	drs	9 29 44 27	0
DMU54	Bao Ngoc	.926	.991	.935	drs	16 23 11 21	0
DMU74	EPCO	.802	.972	.825	drs	48 22 51 46 78 30	0
DMU80	Huong Xuan	.759	.972	.780	drs	78 28 44 27 2 48 22	0

Table 4 (Continued)

No	Hotels	Crste	Vrste	Scale		Benchmark partners									
DMU06	Chinatrust Hualien	.734	.969	.757	drs	48	29								0
DMU49	Tran Thi Canh 2	.667	.959	.696	drs	22	2	48	46						0
DMU76	Vien Dong	.834	.957	.872	drs	22	73	29	48	28					0
DMU31	Flowers Hotel	.927	.951	.974	drs	23	84	16	21	29	57				0
DMU36	Kilin Hotel Taipei	.945	.945	1.000	-	23	29	9							0
DMU15	Aloha Hotel	.943	.943	1.000	-	11	7	23							0
DMU42	Tao Yuan Holiday	.767	.936	.819	drs	23	78	48	22	46					0
DMU52	Kim Do	.798	.929	.859	drs	73	51	30	46	78	22				0
DMU05	Royal Hsinchu Hotel	.809	.923	.876	drs	11	73	22	84	2	48	30			0
DMU33	Gloria Prince Taipei	.805	.917	.878	drs	29	23	1	41	84	22				0
DMU67	Hoang Lan	.887	.915	.970	drs	57	7	29	9	84	23	21			0
DMU17	West Lake Resotopia	.842	.913	.922	drs	84	29								0
DMU34	Gothic Garden Motel	.766	.913	.839	drs	48	29	23							0
DMU08	Parkview Hotel	.751	.912	.824	drs	23	30	84	22						0
DMU86	Lam Vien	.906	.911	.994	drs	23	57	16	21	11					0
DMU45	Phong Lan 2	.856	.908	.943	drs	78	57	46	48	11	64				0
DMU25	Plaza International	.904	.906	.998	drs	44	41	23	30						0
DMU03	Spring Hotel	.767	.906	.847	drs	22	46	29	23	2	30				0
4. Middle Efficiency Hotels															
DMU53	Xuan loc	.894	.897	.996	irs	56	9	82	29	23	64				0
DMU85	Thien Thanh	.832	.887	.938	drs	32	23	41	29						0
DMU18	Cheng Pao Hotel	.711	.883	.805	drs	29	48	9	27	23					0
DMU10	Bin Hai Part Hotel	.815	.882	.924	drs	7	1	29	23	48	11	78			0
DMU69	Thien Ha	.814	.881	.924	drs	84	21	48	29						0
DMU62	Trieu Sam	.794	.879	.903	drs	23	60	48	9						0
DMU68	An Lac	.877	.877	1.000	-	7	11	23	57						0
DMU81	Tay Nguyen	.763	.876	.871	drs	2	44	27	23	30					0
DMU87	Ngoc Lan	.705	.874	.807	drs	30	2	23	48						0
DMU63	Hoa Mai	.868	.873	.995	drs	7	23	57	65						0
DMU55	Vinh Phat	.800	.873	.917	drs	84	46	44	29	23	50				0
DMU13	Kingdom Hotel	.808	.872	.926	drs	22	23	29	41	21					0
DMU58	Tan Binh Minh	.810	.870	.931	drs	29	30	23							0
DMU24	Grand Formosa Hotel	.791	.867	.913	drs	11	2	84	29	21	22	23			0
DMU88	Thai Thanh	.860	.860	1.000	-	11	7	23							0
DMU72	Mach Lam	.824	.859	.959	drs	21	23	29	1	11	48	84	30		0
DMU14	Round Garden Hotel	.724	.854	.848	drs	46	23	48	22	1	44				0
DMU35	Howard Plaza Taipei	.670	.851	.788	drs	22	2	46	44	48	1	29	23		0
5. Low Efficiency Hotels															
DMU71	Hoang Thao Nam	.823	.848	.971	drs	29	11	21	7						0
DMU12	Image Hotel	.641	.818	.784	drs	30	23	2	22	46	78	48			0
DMU19	Sun Wang Hotel	.746	.816	.914	drs	48	84	23	29	21					0
DMU70	Anh Quoc	.813	.813	1.000	-	23	29	41							0
DMU59	Phuong Linh	.808	.808	1.000	-	11	23	57	7						0
DMU43	Tai Shinu Int. House	.722	.796	.908	drs	29	2	22	23	48	46				0
DMU83	Hai Phong	.791	.791	1.000	-	30	23	46							0
DMU37	Landis China Hotel	.680	.763	.891	drs	9	27	23	48	29	84				0

5. CONCLUSION AND SUGGESTIONS

5.1 Conclusions

The first major objectives of this study are to identify the interrelationships among four output perspectives of the balanced scorecard and to investigate the efficient frontiers of DMUs for hotel management in Taiwan and Vietnam. Based on the results of this study, several conclusions can be drawn. The first conclusion is that there are significant relationships between internal business process perspective and customer perspective. It is indicated that the factors of management process, resource waste, support infrastructure, well maintained system, and advantageous environment for management process innovations tend to have significant impacts on hotel service satisfaction, customer loyalty, customer relationships, rate of customer complaints, and customer delivery time.

The second conclusion that can be drawn in this research is that there are significant relationships between learning and growth perspective and internal business process perspective. It is indicated that employee satisfaction, employee loyalty, employee motivation, employee competency, employee morality, leadership, and employee relationships have significant impacts on the levels of the factors of management process, resource waste, support infrastructure, well maintained system, and advantageous environment for management process innovations.

The third conclusion that can be drawn in this research is that there are significant relationships between the customer perspective and financial perspective. It is indicated that hotel service satisfaction, customer loyalty, customer relationships, rate of customer complaints, and customer delivery time have significant impacts on the levels of the rate of annual sales growth, net profit, return on capital, operation expenses, and room occupancy rate.

The fourth conclusion that can be drawn in this research is that there are significant relationships between the internal business process perspective and financial perspective. It is indicated that the factors of management process, resource waste, support infrastructure, well maintained system, and advantageous environment for management process innovations have significant impacts on the levels of the rate of annual sales growth, net profit, return on capital, operation expenses, and room occupancy rate.

The fifth conclusion that can be drawn in this research is that there are significant relationships between the learning and growth perspective and financial perspective. It is indicated that the levels of employee satisfaction, employee loyalty, employee motivation, employee competency, employee morality, leadership, and employee relationships have significant impacts on the levels of the rate of annual sales growth, net profit, return on capital, operation expenses, and room occupancy rate.

The sixth conclusion that can be drawn in this research is that there are significant differences in hotel management performance for our sample hotels in Taiwan and Vietnam. According to the DEA analysis, the study assembled the hotels into four groups: group 1, group 2, group 3, group 4, the figure below shows the positions of each group.

The above grouping has some meaningful implications. First, DEA was adopted as an analytical tool to categorize the hotels into efficient and inefficient groups. Based on this grouping, managers are able to identify the benchmarking partners and develop appropriate strategies. Second, based on the results of this study, hotels can understand their needs to improve their performance.

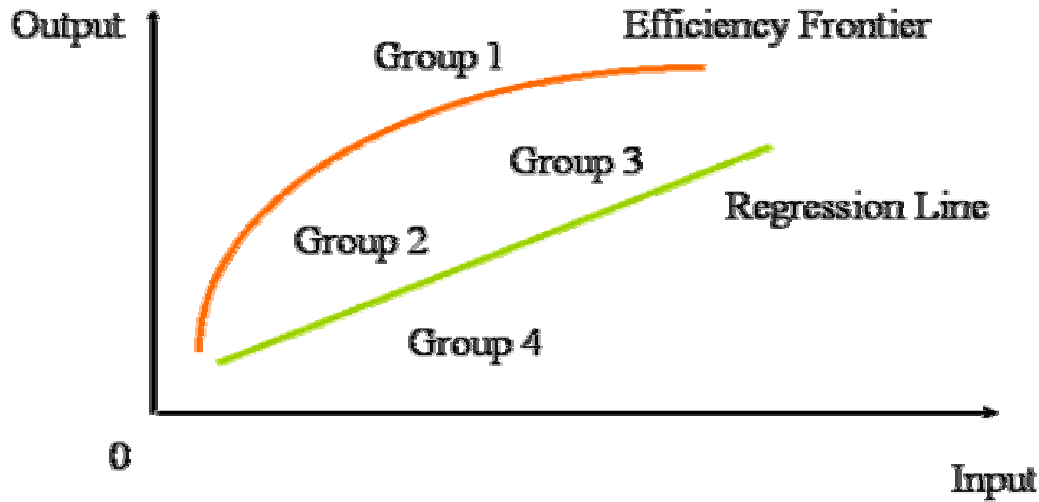


Figure 5. The Research Results from DEA Analysis

In summary, the conceptual model as developed in this study serves as a useful framework for academicians and practitioners to evaluate the interrelationships among four output perspectives of the balanced scorecard. The hypotheses developed and tested in this study confirm the interrelationships among the four output perspectives of BSC.

In addition, this study contributes to the existing literature in adopting DEA to the efficiency and inefficiency of hotels. It is extremely important to maintain competitive advantages as hotels' management activities are always facing a changing market and serious competition. To lead in the market place, hotels managers should put their efforts in watching management efficiency among competitors. It is only hotels that can continuously monitor their competitive position that can lead their market with little threat from the operating environment. DEA has provided the best record of the status among competition and the amount of lead or slack that a hotel has. Although DEA is still not a popular technique for the evaluation of hotel management efficiency, it is expected that the results of the study can serve as one of the most important references for managers to improve their performance.

Furthermore, the results of this study could also serve as reference data for management to exercise strategies to improve performance. Particularly, it is eventual for hotel managers to identify the amount of slack, the amount of investment that hotel needs to improve and the amount of efforts that a hotel should aim for become efficient and competitive. Previous studies have found that among MBO, TQM, and benchmarking management, the latter provides the highest level of encouragement and the least level of resistance for employees to go ahead. It is contended that as long as the benchmarks are clearly identified and operating records are available, employees tend to follow the benchmarks without complaint. Thus, the facts or the real data are the most important power to enable employees to achieve their goals. As far as management can identify the real operating data of the competitors, it is human nature to compete against the benchmark partners.

5.2 Suggestions

Although this study is fruitful and these results may contribute to the existing literature for further validation, several suggestions could be made for academics and business practitioners. First, this study adopted the cross-sectional research design and examined the sample of hotels at one point in time. As a result, directional relationships among research constructs are not clear and must be inferred based on the models or theories as developed from previous

studies. Due to the constraints of time and data availability, longitudinal research is not viable in this study.

Second, this study adopted a survey methodology using hotel manager respondents as our samples. It is extremely difficult to get the characteristics of the hotel population, because the hotel population is not precisely identified, the extension of research results of this study should be restricted to the scope of the samples.

Third, though most of hypotheses have been validated through the empirical test in this study, empirical validations for the integrated framework are not well established. The comprehensive model using the LISREL test seems to indicate that there is still plenty of room to revise and modify the research model and further validation may be required. Nevertheless, the results of this study do provide significant contributions to scholars and practitioners to evaluate the management performance of the hotels.

Finally, for the sake of comprehensiveness, this study integrates many research constructs into our study. It seems that, to obtain deeper results, further study could use part of the research framework and have a more detailed evaluation of part of our research hypotheses.

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利用資料包絡法評估以平衡計分卡為基礎之經營績效：以台灣與越南觀光旅館為例

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摘要

本研究的目的是在於發展一套有用的架構，採用資料包絡分析法(DEA)來評估平衡計分卡(BSC)中四種產出構面彼此相互關聯性，以便提供經營績效衡量方法，包括效率前緣、標竿夥伴以及效率不彰等因素。本文採 32 項問卷調查，用來引導本研究中所調查的台灣與越南各 44 家之樣本旅館。

本研究藉由一系列的抽樣調查，結果顯示整體模型架構是有價值的，而且該模型與平衡計分卡的四個構面(財務、顧客、內部流程及成長與學習)有顯著的關係。此外，應用平衡計分卡的觀念結合 DEA 的方式來衡量台灣與越南的旅館經營效率，可以找出效率前緣、標竿夥伴，藉此提供旅館最適合的資源投入及了解每個旅館的經營弱勢。且本研究提供旅館管理者在實務上有意義的資訊，可用來確認公司的競爭地位及改善的目標。

關鍵詞：旅館、平衡計分卡、資料包絡法、標竿學習、效率、績效