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Efficiency, effectiveness and productivity of marketing in services

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Abstract

How can a service firm right-size marketing expenses and yet strive to maximize revenue? This paper represents the first attempt to model these efficiency and effectiveness issues using a 49-unit Asia–Pacific hotel chain as illustration. We employ a triangular DEA model with total expenses (controlling for number of rooms) as the raw input, marketing expenses as intermediate output/input and revenues from room rentals and F&B as final outputs. We infer that efficiency tails off when more than 12% of the budget is expended on marketing activities. In terms of effectiveness, we find that all the units rated as relatively inefficient can accrue increasing returns to scale in revenues from marketing activities. By contrast, in the productivity stage linking the raw inputs to the revenues, we observe mostly decreasing returns to scale. Our results highlight the crucial role of marketing in service organizations.

Keywords: Marketing; Productivity; Efficiency; Effectiveness; Data envelopment analysis; Services

1. Introduction

In a difficult economic climate, service organizations often face a thorny dilemma; budgets continue to shrink, yet they are expected to produce positive results. Essentially, they have two options; either to reduce costs or to increase productivity and efficiency. However, this is often easier said than done. The first option has led many service establishments such as hotels to retrench workers

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as well as reduce operating expenses. Since capital expenses such as rental, utilities and equipment are relatively rigid, among the first expense to be reduced is usually marketing spending (Weber, 2002). Paradoxically, companies need to continually engage in marketing activities in order to attract and retain customers.

The second option, increasing productivity, can be difficult to achieve (e.g., van Biema and Greenwald, 1997). Due to the characteristics of services (i.e., intangibility, heterogeneity, simultaneity and perishability), the measurement of service productivity is often a challenging task (McLaughlin and Coffey, 1990). The intangible and heterogeneous nature of services makes them difficult to quantify. Furthermore, the perishability and simultaneity of services make it hard to determine a firm's capability to produce in the absence of immediate demand (Klassen et al., 1998).

In this paper, we address these two related issues. We develop a three-stage (triangular) model which incorporates how the service firm can first efficiently minimize the level of marketing expenses, then effectively use marketing to maximize the level of output, and lastly relate final output to raw input. We test this model on data obtained from a chain of hotels operating in the Asia–Pacific region. The remainder of the paper flows as follows. Section 2 introduces some conceptual and measurement issues of efficiency, effectiveness and productivity, followed by the development of a literature-based model and the relevant hypotheses. We describe the DEA methodology in Section 3, and present the data in Section 4. Section 5 contains the empirical analysis, followed by managerial implications in Section 6. We conclude with limitations and suggestions for future research in Section 7.

2. Research framework

In this section, we first review the concepts of efficiency, effectiveness and productivity in services. Following that, we describe our research framework and develop two hypotheses.

2.1. *Efficiency, effectiveness and productivity of marketing in services*

Like most companies, service firms spend considerable amounts of money on marketing activities, including sales and promotion. Successful marketing enables the firm to acquire and retain customers, which translates into an improved bottom-line (Lovelock, 2001). However, the drive towards effective marketing must be tempered by the amount of expenses incurred in the process. It defeats the purpose when the marketing costs are higher than the revenues generated. Hence, it is crucial to consider the efficiency, effectiveness and productivity of marketing in the service firm. As various definitions of these terms exist, we review the relevant literature below.

Achabal et al. (1984, p. 111) note that "Efficiency deals with the allocation of resources across alternative uses ... [it] is achieved when the marginal productivity per unit of price is equated across all resources that contribute to the firm's output." Another way to look at efficiency is, given a level of output, how does the firm minimize input? On the other hand, "the effectiveness question is concerned with determining which retail strategy, among all possible strategies, maximizes long-run ROI. This search for the most effective use of resources assumes resources are used efficiently" (Achabal et al., 1984, p. 114).

In a similar vein, Sheth and Sisodia (2002) define marketing productivity as including both the dimensions of efficiency (doing things right) and effectiveness (doing the right things). When the firm is able to achieve both high efficiency and high effectiveness, it attains 'productive marketing,' resulting in low marketing costs and satisfied customers. According to Sheth and Sisodia (2002, p. 352), "What is needed is a design for a marketing system that delivers both efficiency ... and effectiveness ...". Consistent with these definitions, Grönroos and Ojasalo (2004) posit that there are two sides to service productivity; internal efficiency (or the cost-effective use of resources) and external effectiveness (or the revenue-generating capability).

2.2. Conceptual model and hypotheses

In order to capture all three elements of efficiency, effectiveness and productivity, we model a three-stage (triangular) service process in a hotel, as shown in Fig. 1. In Stage 1 (EFFICIENCY), the raw input (i.e., total expenses) is allocated to obtain the minimum intermediate output (marketing expenses), taking into account the number of rooms. In Stage 2 (EFFECTIVENESS), the input factor (marketing expenses) is used to produce the maximum final outputs (revenue). For completeness, we also consider an aggregate linkage between the raw inputs and the final outputs (cf. Parkan, 1996), that we label as Stage 3 (PRODUCTIVITY). The virtues of a multiple-stage model are explicated in Seiford and Zhu (1999a), Soteriou and Zenios (1999), Sexton and Lewis (2003), Keh and Chu (2003). The innovation in our paper resides in closing the triangular relationship via Stage 3 as depicted in Fig. 1. Downstream in the paper, we will demonstrate that EFFICIENCY and EFFECTIVENESS impact positively on PRODUCTIVITY.

The advantages of this three-stage process can be seen from both a theoretical angle and a manager's viewpoint. First, EFFICIENCY relates to a hotel's intra-organization operation, deciding what appropriate proportion of the total expenses to allocate to marketing expenses. After the budget allocation is completed, EFFECTIVENESS ensures the marketing expenses are used to generate maximal revenue from room rental and F&B operations. PRODUCTIVITY allows us to compare the ratio of output to input as an added check, and to assess if having a three-stage (triangular) model is indeed more informative.

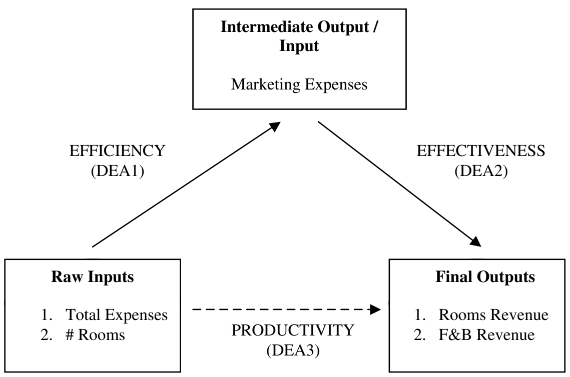

Fig. 1. A three-stage marketing efficiency, effectiveness and productivity model.

The three-stage process specification illustrates that efficiency in services is not simply an engineering process whereby inputs are transformed into outputs stiffly via a certain production function (cf. Brown and Dev, 2000). Rather, there is an intermediate stage 'buffering' the service production process. Second, treating the stages separately makes it easier for managers to identify the function of each factor. Specifically, in the first stage, the process of allocating marketing expenses as a proportion of total expenses is purely a budgeting or accounting issue. It does not have a direct impact on the effectiveness of the hotel's marketing, sales and promotion activities.

Our model facilitates the assessment of efficiency and effectiveness, respectively, and take corrective action as necessary. Given that management tries to minimize or right-size marketing expenses while trying to maximize output, we posit that there is a negative correlation between the two stages. Grönroos and Ojasalo (2004) note that the productivity of service processes can be measured as the ratio between total revenues and total costs. In the EFFECTIVENESS stage, marketing efforts determine what sells, where, when, in what volume, and at what price (Lovelock, 2001). This stage has a closer relationship with the ultimate financial ratio (PRODUCTIVITY) than the budget allocation decision (the EFFICIENCY stage) as marketing effectiveness offers more improvement possibilities than budget allocation efficiency in the company's strategic planning. Hence, we posit that:

H_{1a}: For an individual hotel, allocative efficiency is negatively correlated to marketing effectiveness.

H_{1b}: For an individual hotel, marketing effectiveness is positively correlated to productivity.

H_{1c}: For an individual hotel, allocative efficiency is weakly correlated to productivity.

Structurally, we are studying individual hotels within a hotel group with two brands ('A' and 'B') under the assumption of similar technology and management style in each brand. Thus the capability to manipulate marketing efforts effectively turns out to be a key determinant of success (Lovelock, 2001). Accordingly, we postulate that marketing expenses are more effective at generating revenues than other expenditure items. We investigate this contrast between EFFECTIVENESS and PRODUCTIVITY via their returns to scale, which are obtainable as by-products of DEA (Golany and Yu, 1997; Banker et al., 2004). Such an approach was also adopted by Seiford and Zhu (1999a). We formalize our second hypothesis as follows:

H_2: For an individual hotel, effectiveness and productivity exhibit different returns to scale.

3. Methodology

Ratio analysis, exemplified by revenue per available room (RevPAR), has dominated the evaluation of performance in the hotel industry (Brown and Dev, 1999). However, this univariate ratio provides little insight when considering the effects of economies of scale, the identification of benchmarking policies and the estimation of overall measures of firms (Athanassopoulos and Ballantine, 1995). More input and output factors need to be considered. This can be realized with the following ratio of weighted outputs to weighted inputs:

$$\underline{\text{Stage } j}: \quad E_{ik} = \frac{\sum_{m=1}^{M_j} u_m O_{ijm}}{\sum_{n=1}^{N_j} v_n I_{ijn}}$$

where $j = 1, 2, 3$; E, efficiency indicator; O, I, output and input, respectively; u, weight for output O; v, weight for input I; $i = 1, 2, \ldots, k$, individual firm i; $m = 1, 2, \ldots, M$, output factors in stage j; $n = 1, 2, \ldots, N$, input factors in stage j. The intermediate 'output' in Stage 1 is treated as 'input' in Stage 2.

We use data envelopment analysis (DEA) to determine the efficiency level E. DEA achieves this by converting the above ratios to constrained linear programming problems (Charnes et al., 1978) to obtain weights u and v for the output and input factors and thereafter compute a relative efficiency score for each decision-making unit (DMU). DEA can be carried out in various modes; namely (a) *output-oriented*—where the objective is to maximize the outputs given the inputs, (b) *input-oriented*—where the inputs are to be minimized to achieve a given level of outputs, or (c) *allocative*—where the prices of the inputs are taken into account so that the outputs are achieved at minimum total cost (e.g., Banker and Maindiratta, 1988; Bell and Morey, 1994).

Conceptually, DEA attempts to maximize a service unit's efficiency by comparing a particular unit's efficiency with the performance of a group of similar service units delivering the same type of output. In the process, some units achieve 100% efficiency and are referred to as the "relatively efficient units," while those units with efficiency ratings below 100% are considered inefficient. The degree of inefficiency of a DMU is ascertained against a single or a convex combination of several efficient DMUs. In the current application, the procedures and policies of the best-practice hotels can be examined in-depth and shared so that managers learn from cohorts within the umbrella organization (Morey and Dittman, 1995).

Charnes et al. (1978) stress the assumptions underlying DEA and how they differ from other approaches to estimate performance, conventional regression analysis in particular. DEA does not require an explicit specification of the functional form of the production function or prespecification of the weights. DEA focuses on efficient frontiers rather than on central tendencies, as is done in least-squares regression. This allows DEA to benchmark each observation separately, comparing it only to its most similar peers.

As an aid in evaluating hotel efficiency, DEA has a number of attractive features: (1) a production function is derived for each hotel, rather than being based on an average for all hotels, (2) multiple and possibly conflicting outcome measures can be handled simultaneously, and (3) specific dollar gaps can be specified. The results of this process not only indicate the individual hotel efficiency evaluation based on peer performance comparisons, but also a specific target level of input factors and revenue contribution derived from the best-performing units. In addition, DEA also allows for estimation of scale efficiencies. The theoretical characterization of returns to scale, i.e., decreasing or increasing for inefficient DMUs and constant for efficient DMUs, is well-addressed in the literature (e.g., Banker et al., 1984, 2004; Golany and Yu, 1997; Seiford and Zhu, 1999b; Zhu, 2000).

4. Data description

It is important to use financial measures for measuring services marketing efficiency, effectiveness and productivity. Grönroos and Ojasalo (2004, p. 421) argue that even though it appears difficult to calculate the value of the outputs of the service process,

"financial measures seem to be the only ones that manage to incorporate the quality variations caused by the heterogeneity of services and the effects on perceived quality by customer participation in the service process. In fact, if service productivity is defined as a function both of internal efficiency and cost effective use of production resources and of external efficiency and customer perceived quality, financial measures are probably the only valid measures available."

The hotel industry provides its customers with a package of services. Room rent and food and beverage (F&B) are the main revenue contributors. Their median contributions to revenue for the hotel chain scrutinized in this paper are about 53% and 37%, respectively. These arise from the median room occupancy rate of about 64% and 2.3 daily F&B covers (i.e., individual settings) per room. Although telephone, entertainment, laundry and other services also play pivotal roles, they are not necessarily standard and are usually supplemental services to customers.

In a multi-branch, multi-market hotel chain, the focal organization maintains market statistics and extensive operating information for each hotel. For this study, archival data were obtained from an international hotel chain with units in Australia, China (including Hong Kong), Fiji, Indonesia, Japan, Malaysia, New Zealand, the Philippines, South Korea, Singapore, and Thailand. Size-wise, the smallest hotel, with 84 rooms, had 93 full-time employees while the largest hotel, with 2046 rooms, had 1861 full-time employees. For DEA purposes, such archival data are preferable to other forms since they avoid the problem of reactivity associated with survey or self-report measures (McGrath et al., 1982).

We carry out the analysis as follows. Stage 1 uses Allocative DEA (ADEA) as it aims to right-size the budget allocation to marketing expenses while taking into account the number of rooms. ADEA is preferable when input prices are known because it more realistically restricts the unit's efficiency. It also allows the amount of each controllable input to be set individually (Retzlaff-Roberts and Morey, 1993). We note that an operating unit can be technically efficient, but still be inefficient from the cost perspective. As such, ADEA is useful as it allows for the proper mix of inputs to achieve the vector of outputs at minimum total cost (Bell and Morey, 1994). In Stage 2, we use output-oriented DEA to measure how effectively the input (marketing expenses) is used to generate revenues from room rental and F&B operations. Finally, we will also carry out an output-oriented DEA analysis linking the raw inputs (costs) and final outputs (revenues), and we call this Stage 3 as per the service productivity definition by Grönroos and Ojasalo (2004). The DEA exercises for the three stages are labeled DEA1, DEA2 and DEA3, respectively. In all three stages, we assume varying returns to scale (RTS) in view of the large dispersion in the number of hotel rooms. This contrasts to the usage of constant RTS, as in Brown and Dev (2000).

Our analysis centers on 49 hotels scattered in the afore-mentioned countries. These hotels are marketed along two brands, which we code as 'A' (39 hotels) and 'B' (10 hotels). Quarterly statistics from 1Q1999 to 4Q2000 allow us to carry out the DEA benchmarking on 392 (49×8) decision-making units. Table 1 presents some summary statistics.

Table 1
Descriptive statistics (quarterly data)

	Median	Mean	Standard deviation
Room occupancy (%)	63.7	61.1	17.9
Average daily covers per room	2.3	2.47	1.11
Revenue per room i.e. RevPAR ($)	49.66	62.12	51.19
F&B revenue per room ($)	30.93	50.15	64.19
Room revenue/total expenses	0.928	0.985	0.415
F&B revenue/total expenses	0.667	0.704	0.240
Room revenue/marketing expenses	8.43	9.55	6.35
F&B revenue/marketing expenses	6.00	7.78	3.73
Marketing expenses/total expenses	0.109	0.113	0.036
Marketing expenses per room ($)	5.49	7.15	6.60

5. Analysis

5.1. Efficiency, effectiveness and productivity

Out of the 392 DMUs, we identified 7, 8 and 10 efficient DMUs respectively in the DEA1, DEA2 and DEA3 stages. According to Norman and Stoker (1991), efficiency scores can be split into four main groupings:

(a) *The robustly efficient units*. These will appear on many reference sets and are likely to remain efficient unless there are major shifts in their fortune. We found 5 such units in DEA1, 4 in DEA2 and 6 in DEA3 with between 66 and 313 appearances in the reference sets.
(b) *The marginally efficient units*. These will appear on only one or two reference sets (including their own) and are likely to drop to below 1.0 if there was even a small drop in the value of an output variable or a small increase in the value of an input variable (DEA1: 2 DMUs; DEA2: 4 DMUs; DEA3: 4 DMUs).
(c) *The marginally inefficient units.* These will have an efficiency rating in excess of, say, 0.9 (but less than 1.0) and could soon raise their score towards 1.0 (DEA1: 6 DMUs; DEA2: 4 DMUs; DEA3: 14 DMUs), and;
(d) *The distinctly inefficient units*. With an efficiency score of less than 0.9, these units would have difficulty in making themselves efficient in the short term. Those with scores of less than, say, 0.7 (DEA1: 320 DMUs; DEA2: 352 DMUs; DEA3: 295 DMUs) would remain inefficient until there was a major change in circumstances.

The median efficiency scores in DEA1, DEA2 and DEA3 were about 52, 42 and 56, respectively. These indicate that there is ample room for efficiency convergence towards the best practice norms within the hotel chain.

Fig. 2 displays the pairwise scatter plots of the DEA1, DEA2 and DEA3 efficiency scores. The first scatter plot indicates a Spearman correlation of -0.335 (p-value $= 0$) between DEA1 and DEA2 efficiency scores. This provides statistical support for Hypothesis 1a in this paper, that EFFICIENCY and EFFECTIVENESS are negatively correlated. We also find significant positive correlations between EFFECTIVENESS and PRODUCTIVITY (Hypothesis 1b) and EFFICIENCY and PRODUCTIVITY (Hypothesis 1c), with the former pair displaying a stronger relationship than the latter pair.

The availability of panel data across the eight quarters allows us to carry out a DEA window analysis (Cooper et al., 2000) to check the robustness of each DMU's efficiency. Thus, in DEA1, we found six best performing hotels (3 from Indonesia, 2 from Thailand and 1 from Japan) with a median quarterly efficiency score between 80 and 88. The presence of a Japanese hotel in this select group indicated that allocative efficiency could still

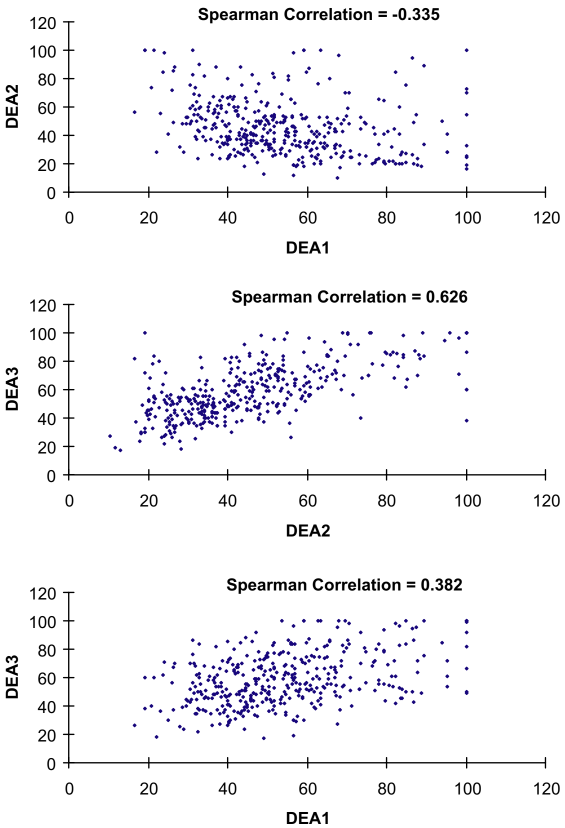

Fig. 2. Scatter plot of DEA efficiency scores from Stages 1–3.

be achieved despite a high-priced and competitive environment. In DEA2, a hotel in Japan earned a 100% efficiency score in 3 out of the 8 quarters and a lowest quarterly score of 80. The worst performing hotel (from Malaysia) had a median quarterly efficiency score of about 19%. Four of the top 5 hotels in DEA2 repeated their feat in DEA3, thereby illustrating the strong correlation between DEA2 and DEA3 (see the second scatter plot in Fig. 2).

Two hotels, one from Indonesia, with 84 rooms, and the other one from Japan, with 444 rooms, distinguished themselves in being the only ones to appear in the top 5 efficient units across DEA1, DEA2 and DEA3. It is worth noting that these outstanding performances were achieved in different regimes of price systems, competition levels and scale of operations. In the eight quarters studied, the Indonesian and Japanese hotels allocated a median 6.8% and 12.8%, respectively, of their total expenses to marketing expenses. Their median combined revenues from room and F&B operations were about 37 and 15 times their marketing expenses, respectively. Fig. 3 indicates that best-practice EFFECTIVENESS and PRODUCTIVITY arises over a wide range of marketing expenses. In particular, we note that EFFECTIVENESS and PRODUCTIVITY tail off when marketing expenses exceed about 12% and 17% of total expenses, respectively.

We also conducted nonparametric statistical tests to infer the individual effects of time, brand and country on the DEA1, DEA2 and DEA3 efficiency scores. To assess the time effect, we conducted eight quarterly-repeated measures comparison on each hotel unit, using a block design

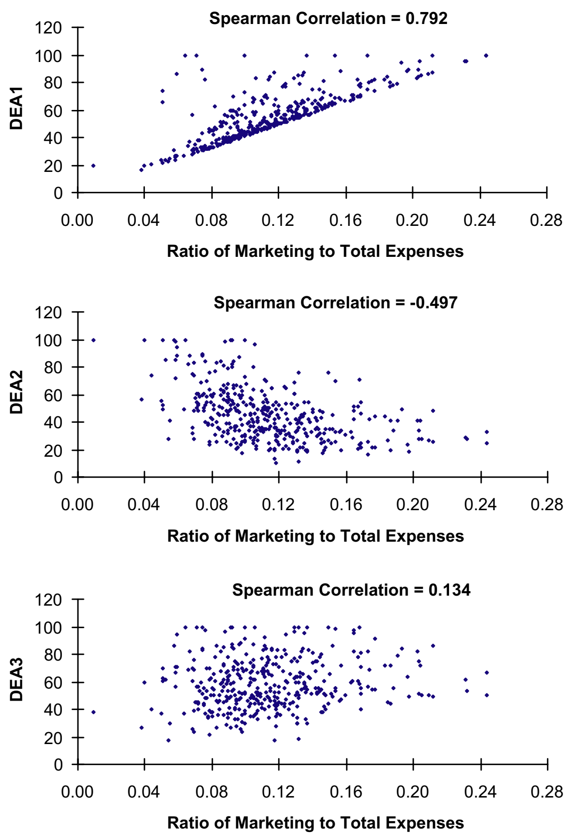

Fig. 3. DEA scores vs. ratio of marketing to total expenses.

based on the Friedman test. Independent samples were assumed for the brand and country effects. For these, we employed the Kruskal–Wallis test. The mean rank scores and test results across time, brands and countries are presented in Table 2.

DEA1 efficiency scores did not differ appreciably across the eight quarters. For DEA2 and DEA3, we note a peak in 4Q1999, which coincides with the Millennium celebration. With regards to branding, brand 'B' scored significantly higher in DEA2 (marketing effectiveness). Japan/South Korea, Thailand and Indonesia generally outperformed other regions across DEA1, DEA2 and DEA3. Interestingly, although the category "Other Asian Countries" ranked last in DEA1, it came in tops in DEA2 and DEA3. This exemplifies the statistically significant negative correlation between DEA1 and DEA2 in Fig. 2.

Although the efficiency scores (truncated at 100%) did not quite conform to a bell-shaped distribution, we decided to carry out a regression model to "explain" DEA3 more holistically than the above nonparametric tests. For explanatory variables, we used DEA1 and DEA2 efficiency scores, dummies for quarters, regions and brands as well as all possible 2-way interactions between them to cater for possible synergy effects. The results appearing in Table 3 are richer than those in the preceding individual nonparametric tests. In particular, we note that DEA1 and DEA2 have the highest influence (albeit, slightly lower in Indonesia and Thailand) on DEA3. DEA1 had an added impact in 4Q1999, most likely due to the Millennium celebration. Brand 'A' fared lower in Japan/South Korea, Indonesia and China. Significantly, we detected no evidence of interaction or synergy between DEA1 and DEA2.

Table 2
Summary of nonparametric tests

	DEA1	DEA2	DEA3
Quarterly effects			
1Q99 mean rank	4.30	3.92	3.86
2Q99 mean rank	4.79	3.14	3.23
3Q99 mean rank	4.18	4.35	4.50
4Q99 mean rank	4.20	6.16	5.80
1Q00 mean rank	4.49	4.31	4.16
2Q00 mean rank	4.56	4.37	4.51
3Q00 mean rank	4.53	4.43	4.48
4Q00 mean rank	4.95	5.33	5.46
Friedman χ^2 statistic (df = 7)	4.23	46.71	38.78
p-value	0.75	0.00	0.00
Brand effects			
Brand 'A' mean rank	201.23	183.32	191.47
Brand 'B' mean rank	178.04	240.10	216.13
Kruskal–Wallis χ^2 statistic (df = 1)	3.01	14.884	3.018
p-value	0.10	0.00	0.082
Country effects			
China mean rank	149.81	177.90	137.97
Japan/S Korea mean rank	202.91	304.21	265.11
Thailand mean rank	209.08	211.45	191.84
Malaysia mean rank	219.17	101.02	110.35
Indonesia mean rank	273.46	144.35	234.64
Oceania mean rank	148.94	237.08	202.51
Other Asian countries mean rank	94.44	325.69	267.23
Kruskal–Wallis χ^2 statistic (df = 6)	91.22	133.64	82.13
p-value	0.00	0.00	0.00

Table 3
Stepwise regression dependent variable: DEA3 efficiency score

Source	Coef.	STD. Error	*t*-Stat.	Sig.
DEA2	0.905	0.033	27.423	0.000
DEA1	0.668	0.034	19.800	0.000
Indonesia	34.360	5.387	6.378	0.000
Other Asia	18.406	6.551	2.810	0.005
DEA1 * Thailand	−0.109	0.023	−4.712	0.000
DEA1 * Indonesia	−0.152	0.060	−2.545	0.011
DEA2 * Malaysia	−.165	0.039	−4.189	0.000
DEA2 * Thailand	−0.304	0.091	3.343	0.001
DEA2 * Indonesia	−0.228	0.053	−4.288	0.000
DEA1 * 4Q1999	0.048	0.022	2.151	0.032
DEA1 * Brand_A	0.059	0.022	2.733	0.007
Brand_A * China	−3.203	1.214	−2.638	0.009
Brand_A * Japan/Korea	−15.335	3.299	−4.648	0.000
Brand_A * Indonesia	−13.298	3.101	−4.288	0.000

$R^2 = 0.837$ (adjusted $R^2 = 0.831$).

5.2. Returns to scale

We assumed variable returns to scale (RTS) in all the DEA analyses. Thus we did not expect outputs to mirror proportionate increases in inputs, as is the case under the restrictive assumption of constant RTS. Theoretically, efficient DMUs, which score 100% efficiency scores, automatically exhibit constant RTS. Relatively inefficient DMUs exhibit either decreasing or increasing RTS.

Our findings, shown in Table 4, indicate that among the inefficient DMUs in DEA1 and in

Table 4
Cross-tabulations of returns to scale (RTS) from Stages 1–3

		DEA2 RTS			
		Decreasing	Constant	Increasing	Total
DEA1 RTS	Decreasing	0	3	251	254
	Constant	0	1	6	7
	Increasing	0	4	127	131
	Total	8	0	384	392
		DEA3 RTS			
		Decreasing	Constant	Increasing	Total
DEA2 RTS	Decreasing	0	0	0	0
	Constant	2	4	2	8
	Increasing	263	6	115	384
	Total	265	10	117	392
		DEA3 RTS (*using total expenses as sole input*)			
		Decreasing	Constant	Increasing	Total
DEA2 RTS	Decreasing	0	0	0	0
	Constant	2	4	2	8
	Increasing	184	4	196	184
	Total	186	8	198	392

DEA3, about two-thirds exhibit decreasing RTS (DRTS) while the remainder exhibits increasing RTS (IRTS). Remarkably, in DEA2, save for the 8 efficient DMUs, all the remaining 384 DMUs exhibit IRTS.

Two-way cross-tabulations of the RTS characterizations are further enlightening. Thus, we observe that 251 DMUs out of 392 display DRTS in DEA1 but IRTS in DEA2. In the second cross-tabulation, about two-thirds of the DMUs exhibit IRTS in DEA2 but DRTS in DEA3, and the remaining DMUs mostly display IRTS in both DEA2 and DEA3. Furthermore, the third tableau indicates that if total expenses were used as the sole input (i.e., ignoring number of rooms), the contrast in scale inefficiencies between EFFECTIVENESS and PRODUCTIVITY would be upheld, thereby validating Hypothesis 2. The result highlights the value of marketing activities in generating increasing returns to scale in room and F&B revenues and thereby addresses the issue of marketing budget effectiveness raised by Weber (2002).

6. Managerial implications

While there is a sizable body of literature on hotel operational efficiency (e.g., Morey and Dittman, 1995; Parkan, 1996), little has been published on the efficiency of individual hotels within multi-brand, multi-market hotel chains. Issues to be addressed in measuring individual hotel efficiency in both marketing budget allocation (DEA1) and marketing effectiveness (DEA2) stages include weighting multiple inputs and outputs, taking into consideration the many factors that are likely to vary from hotel to hotel, developing a single index of hotel efficiency, and establishing the performance capability of each hotel.

Our analysis indicates that close to 90% of the hotels were relatively inefficient in all the three DEA stages. Using the methodology adopted in this study, a distinctive advantage one can achieve is to separate in each stage, the star from the poor performers. It will be therefore useful for the top management of the hotel group to benchmark the star outlets in order to acquire useful insights on hotel operations.

Our regression model indicates that marketing EFFICIENCY and EFFECTIVENESS are key drivers of PRODUCTIVITY in the hotel chain studied. Furthermore, we infer that enhancing marketing EFFECTIVENESS generates increasing returns to scale in revenues. This finding would not have been possible from either the commonly used single ratio of hotel performance measure, RevPAR (Brown and Dev, 1999), or standard one-stage DEA investigations (Parkan, 1996) akin to DEA3, where we find almost 2 out of 3 DMUs exhibit decreasing returns to scale. Our result suggests that a hotel with limited resources should prioritize the enhancement of its marketing effectiveness. This implies that demand management strategies should be given additional attention by the management (Crandall and Markland, 1996; Radas and Shugan, 1998).

From our sample, we find that the more exclusive sub-brand 'B' outperformed sub-brand 'A' on marketing EFFECTIVENESS and, more significantly, in PRODUCTIVITY across a diversity of geographical locations. An important implication is that this finding provides positive support for the latest trend among major hotel chains offering a portfolio of sub-brands to cater to the breadth of customer niches.

A recent study by McKinsey notes that beyond the two traditional segments (i.e., 'service-oriented business customers' and 'price-driven leisure customers') in the hospitality industry, there are new emerging segments, including the 'value-driven business traveler' and 'luxury-driven business traveler' segments (Court et al., 2002). This has led the Starwood chain, for example, to serve the spectrum of price, comfort, amenities, service, luxury, and homeliness via its different sub-brands, including Four Points, Sheraton, Westin, St. Regis and the hip W Hotels. Similarly, the Marriott Corporation has several brands of hotels and resorts, including Marriott Hotels and Resorts, Courtyard by Marriott, Renaissance Hotels and Resorts, Fairfield Inn, Residence Inn, SpringHill Suites TownePlace Suites, and Marriott Vacation Club. Our research suggests that there are indeed financial gains accruing from differentiated and effective marketing campaigns targeting the various market segments.

7. Conclusion

There are two major contributions of this paper. We first show the appeal of dividing hotel service operations into two distinct stages, marketing budget allocation and marketing effectiveness. Secondly, this work represents a rare effort to combine both efficiency and effectiveness (and productivity as a result) into a single model (Klassen and Rohleder, 2001). In particular, we find that marketing activities generate increasing returns to scale in revenues.

Despite the constraints of data availability and observation difficulty, we have submitted a dynamic, quantitative assessment of efficiencies across the units of a hotel group. Combined with qualitative feedback typically garnered from standard surveys, our findings can lead to a more holistic assessment of the quality and delivery of services.

Although the paper has illustrated the usefulness of DEA, some of its practical limitations need to be highlighted. First, DEA relies on the availability of valid and reliable archival data, for instance, audited financial data. DEA assumes no measurement error and, as such, it does not invite the usage of psychometric data reflecting management input and output in this study on hotel services. Second, stable DEA results require a large number of observations, particularly as the number of inputs and outputs are increased. As a result, DEA may not be appropriate for smaller hotel chains.

The triangular service-providing model in this paper can be applied to other service contexts, for example, the airline and info-communications industries. With the advent of globalization leveling competition to the world stage, the unilateral assessment and enhancement of efficiencies of operations and services across national boundaries are becoming critical components of best management practices.

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