Efficiency Assessment with Data Envelopment Analysis for Benchmarking Fitness Center Business Performance in Thailand[1]

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Abstract

The fitness center business (FCB) in Thailand has experienced growing market value and economic impacts on the sports industry over the last few years. Despite the fact that sports marketers often extend competitiveness by increasing investments through various marketing strategies, efficiency has never been assessed. Data envelopment analysis (DEA) and Tobit regression model were first examined in FCBs for benchmarking their efficiency, which assists entrepreneurs, marketers, and scholars to fulfill the management gap to investigate influential marketing factors affecting FCB performance. Sixty FCBs in Thailand were qualified in the inclusion criteria to be decision-making units (DMU). The average efficiency score of DMUs is 0.9468, which is consistent with empirical data showing that they survived the COVID-19 pandemic. Personal trainer standards, product development, atmosphere, and interior decoration are significant influential marketing factors that affect FCB performance. Entrepreneurs and marketers should adopt the International Personal Trainer's Standards into their marketing strategies to drive FCB performance.

Keywords: Data Envelopment Analysis; Benchmarking; Fitness Industry; Sport Marketing; Performance Measurement

Introduction

Thailand needs to enhance its fitness center business (FCB). With 816 enterprises and an investment worth of 8,350.66 million baht, it increased from 2016 to 2019, growing from 10% between 2016 and 2017 and then 20.69% between 2018 and 2019. There are also over 4.8 million registered members. More than 80% of the FCB market share is owned by foreign investors, which reflects their efficiency and standards. Implementing marketing strategies has become very popular as domestic businesses study the FCB business model to grow their organizations and increase profits (Chankuna, 2018; Chankuna, 2020; Chankuna & Sriboon, 2022; Department of Business Development, 2019). However, marketing strategies rely on inputs that can produce different outputs, which can help pinpoint FCB efficiency. The effect of marketing strategies on FCB efficiency is not well understood in this area.

Efficiency is the ratio between inputs and outputs. An efficient business should reduce the number of inputs; the number of outputs (profits), however, must remain the same (Farrell, 1957; Sherman & Gold, 1985). However, many FCBs in Thailand have attempted to increase inputs in order to improve their marketing competitiveness, e.g., 24-hour service; small studios for specific exercises such as yoga, Pilates, and Thai boxing; service fee reduction with multiple branches access; and special competitive events such as Spartan and Cross-fit (Chankuna, 2018; Chankuna, 2020). FCB also launched new products and services through online media platforms during the COVID-19 pandemic (Chankuna & Amphai, 2022; Chankuna & Sriboon, 2022; Chankuna et al., 2021). While efficiency assessment gives business owners or marketers crucial knowledge for managing inputs, outputs, and modifying marketing strategies for boosting profits (Walraven et al., 2016), no academic research or empirical evidence, to the best of our knowledge, has highlighted FCB efficiency in Thailand.

Data envelopment analysis (DEA) is frequently used in efficiency assessments. It is an analysis of various inputs and outputs. The benefits of efficiency assessment are fourfold: (1) to benchmark the competitive performances and management practices of a business unit; (2) to identify the adjusted efficiency factors that induce effective management; (3) to strengthen the competitiveness of the business unit both short- and long-term; and (4) to accelerate the scale-up of the business unit (Alnafrah, 2021; Bhat et al., 2019; Tawesaengskulthai et al., 2021; Walraven et al., 2016). However, efficiency assessment for FCB is uncommon in Thailand. Neither marketers nor academics have evaluated efficiency to understand FCB performance. Unfortunately, there is no study benchmarking the performance of each FCB type with DEA i.e., low-cost or general (Chankuna, 2018; Chankuna, 2020, Chankuna & Sriboon, 2022). Further, this research seeks to fulfill the research gap by identifying influential factors of marketing strategies on FCB performance.

Thus, the research's question statements are: (1) What is FCB efficiency in Thailand when employing DEA as a method? (2) What are the differences of FCB performance among various types? and (3) Which influential marketing factors affect FCB performance? The methodology has pioneered new principles for assessing and benchmarking FCB efficiency in Thailand. All FCBs in Thailand were recruited as decision-making units (DMU) to secure acceptation from entrepreneurs, marketers, and scholars involved with FCBs. Results were presented according to three hypotheses. The discussion indicated the implications for entrepreneurs and marketers.

Literature Review

The three objectives of this research were: (1) to assess FCB efficiency in Thailand with the DEA method; (2) to benchmark FCB performance by type; and (3) to investigate the influential marketing factors affecting FCB performance. The researchers reviewed the relevant papers and research to determine the variables. Three hypotheses were developed as follows.

Hypothesis Development 1: Assess FCB efficiency in Thailand with the DEA method

In Thailand, DEA has not yet been applied in FCB research. Although effectiveness of FCB has been studied (Chankuna, 2018; Chankuna, 2020), along with other sports business research related to FCB management (Chankuna & Sriboon, 2022), the definition of conceptual framework or parameters for assessing efficiency using DEA remains to be clarified.

On the other hand, an efficiency assessment in Thai Premier League (TPL) football clubs (Chaiwuttisak, 2018) was found. The researchers used a DEA to assess the sports and financial performance of 15 TPL football clubs with two input variables, i.e., stadium capacity and administrative expenses. The outputs were comprised of seven variables: number of supportive attendances; total score in 2016; total revenues; net assets; number of trophies; qualification for Asian Football Confederation (AFC) for the previous and the next season; and qualification for TPL for the previous and the next season. The efficiency scores were consistent with the empirical data that two football clubs are not efficient, while three football clubs with top rankings have high cross-efficiency scores.

Furthermore, research on efficiency using a DEA technique in the international sports industry determined the variables of various inputs and outputs. Walraven et al. (2016) assessed sports sponsorship performance through DEA, based on one input variable (i.e., estimated yearly right fee per sponsorship) and three output variables (i.e., sponsorship familiarity, attitude toward the sponsorship, and perceived sponsorship fit). Bhat et al. (2019) reviewed 61 studies using a DEA technique in nine team sports (i.e., baseball, basketball, cricket, cycling, soccer, golf, handball, Olympics, and tennis). The authors found that most of the research (29 studies) focused on soccer performance. Those studies identified different input and output variables, e.g., the number of players, player salaries, total assets, and investment in stadium facilities. These have an influence on matching scores, number of tickets sold, and the turnover of spectators. Moreover, ball possession, shots, corners, penalty shoot-outs, goalkeeper's defense, player rotation, steals, and the team's economic value affect the total number of goals scored. It can thus be concluded that input and output characters for assessing efficiency with DEA for sports business have not been universal but still depend on business context.

This research determines the input and output variables using multiple concepts. Organizational effectiveness of FCB (Chankuna, 2018; Chankuna, 2020), the efficiency of TPL football clubs, and the service quality of hotel businesses were integrated. Organizational effectiveness is the framework designed for assessing the output of a profit-oriented organization. Chankuna (2020) confirmed that organizational effectiveness of FCBs in Bangkok's metropolitan regions is composed of organizing, resources, operating, management, service, strategy, development, and sustainability. While business characteristics of TPL football clubs are input-oriented (Chaiwuttisak, 2018), the hotel managerial environment is a service business similar to that of FCB (Untong et al., 2011). Furthermore, many fitness centers are a part of hotel accommodation which be managed as a service unit together (Chankuna & Sriboon, 2022). Thus, six input variables and two output variables were defined to assess FCB efficiency in Thailand as follows.

Input 1: Operation duration (unit: month) is a key factor of productivity. The number of years strengthen experience and knowledge of the business for efficient management (Assaf & Agbola, 2011). Likewise, an effective FCB remains in operation for a long time (Chankuna, 2020).

Input 2: Fixed assets (unit: baht) were the main inputs indicating business investment (Sangkaew & Phucharoen, 2018); similarly, effective FCB was planned and organized with fixed asset investments (Chankuna, 2020).

Input 3: Business size (unit: m2) has a greater correlation with business performance than the smaller sizes. Empirical samples of hotel businesses are found in Australia, Africa, and Portugal (Assaf & Agbola, 2011). In the same way, large FCBs in Thailand have an advantage in providing a variety of products and services, leading to generating higher revenues, as opposed to smaller FCBs (Chankuna, 2020).

Input 4: The number of workforce (unit: people) reflects the activities and facilities in a business. A large workforce has the advantage of offering more services, which is in contrast with the cost of production (Assaf et al., 2010). In FCB, a workforce requires efficient human resource management to achieve maximum productivity (Chankuna, 2020).

Input 5: Salary and commission (unit: baht/month) have congruence with workforces. An entrepreneur must motivate and control their employees to accomplish goals as well as induce job satisfaction (Tran & Vo, 2020). This is an important strategy of career path development as FCB (Chankuna, 2020).

Input 6: Operating expenses (unit: baht/month) includes business expenses per month, except for salary and commission such as rent, water, electricity, marketing, and advertising. Chaiwuttisak (2018) revealed that operating expenses are positively correlated with the efficiency score of TPL football clubs. Operating expenses, no doubt, are thus good predictors for organizing an efficient FCB.

The outputs variables consisted of (1) monthly membership revenue fees per year (unit: baht) and (2) operations revenue per year (unit: baht). Revenues are predominant outputs of a business such as TPL football clubs (Chaiwuttisak, 2018) and sustainability (ends) of effective FCB (Chankuna, 2018; Chankuna, 2020), which represents the quality of service and products. Moreover, operation revenue per year is non-membership revenue of FCB in a year i.e., new entry fee, renewal fee, personal trainer fee, insurance fee, exercise equipment retail etc. Therefore, this study assessed FCB efficiency in Thailand using a DEA by considering six inputs and two outputs. The authors hypothesize that FCB efficiency scores are consistent with the empirical data (H1).

Hypothesis Development 2: Benchmark FCB performance by type

FCBs in Thailand can be categorized into several types based on shareholders, space, and consumer behaviors. Major shareholders of FCBs are foreign (from England and Australia), which hold a market share of at 80% or 64 branches in total. The biggest domestic shareholder has seven branches. FCB entrepreneurs typically define their spaces as small, medium, or large based on service capacity. A small or studio FCB has a space of 100 to 400 m2 for individual exercise without amenities. Medium sized FCB has a maximum of 1,000 m2 with group exercise rooms, members lounge, changing rooms, lockers, sauna, etc. A large sized FCB has more than 1,000 m2 for luxury amenities such as a boxing ring, spa, or swimming

pool. Investment costs are correlated with the space beginning at 300k to 10M baht (Chankuna, 2018; Chankuna, 2020; Chankuna & Sriboon, 2022).

The consumer behavior aspect is concerned with the efficiency of FCB in providing products and services to meet consumer needs. Based on the literature reviews, two types of FCBs in Thailand were proposed, i.e., low-cost and general (Boodpand et al., 2020; Chankuna, 2020; Chankuna & Sriboon, 2022; Thanabordeekij, 2018; Yumadeen & Kaewkhiew 2019). Low-cost is designed to meet the minimum requirements for consumer exercise and focuses on fundamental weight training and cardiorespiratory exercise without amenities. Some FCBs use natural ventilation instead of air-conditioning systems. The low-cost FCB is the most popular for start-up entrepreneurs and beginning consumers in Thailand. The number of low-cost FCBs is a half of the general. A general FCB is a standard fitness center with exercise zone and amenities. Some FCBs aim to provide specific exercise such as yoga, Pilates, Thai boxing, or group exercises. Some FCBs operate for premium consumers who have the potential to pay for luxury amenities while low-cost FCBs seem limited by space and general is flexible for managing space. Thus, the consumer behavior aspect helps entrepreneurs to efficiently operate FCB.

According to hotel industry studies, different hotel types performed differently on the basis of their different operating innovations. Untong et al. (2011) found that international chains or foreign investment hotels had the highest efficiency scores. The mean operation efficiencies in the motel group have the lowest efficiency scores. In addition, businesses operating similar to FCB were often assessed for efficiency without comparing the differences between various types of businesses such as TPL football clubs (Chaiwuttisak, 2018), hotels (Sangkaew & Phucharoen, 2018), or airports (Yimruthai & Somsuk, 2017). Only two studies compared efficiency, i.e., sports sponsorship (Walraven et al., 2016) and bank groups (Boonjom & Theeranuphattana, 2016). Until now, no study has benchmarked the FCB performance by type. Our hypothesis for this conceptual framework is that general has higher efficiency scores than low-cost (H2).

Hypothesis Development 3: Investigate influential marketing factors affecting FCB performance

Previous research on business performance has provided valuable economic determinants but a lack of conclusions regarding influential marketing factors (Boonjom & Theeranuphattana, 2016; Chaiwuttisak, 2018; Sangkaew & Phucharoen, 2018; Yimruthai & Somsuk, 2017). Only sports sponsorship research has revealed the drivers and efficiency relations. Walraven et al. (2016) examined the influence of drivers of sponsorship efficiency from three drivers: sponsorship clutter (total number of sponsors involved with the property at the same sponsoring level); sponsorship duration (measured by the number of contract years up to the moment of data collection); and sports popularity (measured by a sports popularity index on a scale from 0 to 100), with controlled variables by sponsored property type (team, event/league, and federation) and sponsor industry (other, financial service, beer brand, sports brand, and B2B services). The results show that sponsorship efficiency is significantly negatively related to sponsorship clutter. Sponsorship duration has a significant positive impact on sponsorship efficiency. Sports popularity positively affects sponsorship efficiency. Further, sponsored property type does not have a significant effect on sponsorship efficiency. Beer brands and financial service providers have a higher degree of sponsorship efficiency than sponsors operating in other industries. However, marketing factors on sports sponsorship efficiency remain unknown.

To investigate the effect of marketing factors on FCB performance, the 7Ps mixed marketing strategy was employed (Lovelock & Wirtz, 2007; Rust et al., 2004) and controlled by the proposed FCB types. Chankuna (2018; 2020) pointed out the influential factors of the 7Ps mixed marketing strategy from organizational effectiveness studies for investigating FCB performance as follows.

1) The personnel strategy referred to the human management practice of FCB entrepreneurs for achieving consumer satisfaction. The personal trainer standard has the highest factor loading over recruitment, compensation, warning, or reward system.

2) The place strategy is a planned process that allows target consumers to access the products and services of FCB. A convenient location is a competitive advantage. Location has the highest factor loading over accessibility, traffic, or transportation.

3) The productivity strategy is the sum of the value of products or services in FCB. Monthly fee has a higher factor loading over other fees.

4) The promotion strategy represents the marketing communication process to inform target consumers about the news and value of products and services of FCB. Marketing promotion activity has a higher factor loading than advertising, personal communication, or discount promotion.

5) The product/service strategy focuses on methods or approaches related to products and services in FCB. Product development has a higher factor loading over safety, user-friendliness, or services.

6) The physical evidence strategy creates an atmosphere and interior for consumer perception of the products and services value in FCB. Atmosphere and interior decoration have a higher factor loading over equipment, furniture, or color theme.

7) The process strategy is a service-oriented process aimed to convince consumers to purchase products and services from FCB. The process platform has a higher factor loading than procedure, standard of operation, or contingency plan.

As the 7Ps mixed marketing strategy has a positive impact on organizational effectiveness, the authors hypothesize that all seven proposed mixed marketing strategies have a positive effect on FCB performance (H3).

In summary of hypothesis development, three hypotheses were generated. H1 - FCB efficiency scores are consistent with the empirical data. H2 - general has higher efficiency scores than low-cost. H3 - all seven proposed mixed marketing strategies have a positive effect on FCB performance.

Efficiency Assessment and Tobit Regression Analysis

To test the above three research hypothesizes, DEA and Tobit regression analysis were employed. DEA was used for H1 and H2, followed by Tobit Regression analysis for H3 as described below.

H1: FCB efficiency scores (from six inputs and two outputs) are consistent with empirical data.
H2: General has higher efficiency scores than low-cost.

DEA is a nonparametric mathematical method, based on linear programming. DEA is a technique used to assess the relative efficiency between business unit inputs and average inputs across all business units and business unit output and average output across all business units (Coelli et al., 2005).

DEA is commonly used to assess the efficiency of business units or decision-making units (DMU) for homogeneity characteristics with multiple inputs and outputs. This may be considered either through a DMU's ability to reduce the number of inputs but produce constant outputs (input-oriented), or the DMU's ability to increase outputs under constant inputs (output-oriented) (Coelli et al., 2005). Several businesses were assessed for their efficiency through DEA, such as hotels (Sangkaew & Phucharoen, 2018), banks (Boonjom & Theeranuphattana, 2016), and airports (Yimruthai & Somsuk, 2017). For FCB, it could be argued that all units were identical businesses. They operated under similar goals with various inputs and outputs (Chankuna & Sriboon, 2022). The DMU in this study is the FCB. Therefore, the researchers applied DEA to assess FCB efficiency.

CCR and BCC are the most commonly used models. The CCR model presented by Charnes, Cooper, and Rhodes (1978) aims to find the maximum value of the overall technical efficiency constant return to scale (TECRS) under a constant return to scale (CRS). The BCC model, presented by Baker, Charnes, and Cooper (1984), considers input-oriented efficiency, which aims to determine the value of efficiency scores under the variable returns to scale (VRS). The BCC model is used to calculate the value of pure technical efficiency variable returns to scale (TEVRS). Here, the efficiency score indicates the true comparative efficiency and is greater than or equal to the efficiency of the CCR model.

In this study, DEA techniques are used to assess efficiency assessment. Input orientation is used because FCB investment, which is related to operation duration, fixed assets, business size, the number of workforces, salary and commission, and operating expenses, is the predominant effective factor in FCB. Entrepreneurs must carefully plan before fitness type is designed and funds are raised. Furthermore, a BCC VRS model was chosen because it has the efficiency to control for scale economies in FCB revenues and monthly membership revenue fees per year and operations revenue per year, as the authors do not expect that an increase (decrease) in FCB investment results in a proportionate increase (decrease) in output scores. However, the BCC (and CCR) model was analyzed based on decreasing (or increasing) proportions of inputs (or outputs) without directly considering input slack and output slack. Tone (2001) proposed a slack-based measure (SBM) model to manage input slack and output slack. Therefore, DEA in this study is a comparative assessment of efficiency across multiple inputs and outputs using the DMU of FCB through BCC and SBM models under VRC assumptions, as in Conceptual Frameworks 1 and 2.

The efficiency score of the DMU is calculated from the total outputs per input. The most effective DMU is equal to 1; the efficiency of the other DMUs is between 0 and 1, as compared with the most effective DMU. A low score means that the DMU considered is relatively inefficient and resides far off the frontier. The results of efficiency scores from DEA techniques reveal two alternative guidelines for enhancing DMU. First, it adjusts efficiency through inputs from congruently reducing inputs that meet efficiency criteria without adjusting outputs. Second, it adjusts efficiency through outputs from congruently increasing outputs to meet efficiency criteria without adjusting inputs. Moreover, DEA efficiency scores can be used as a dependent variable in a regression analysis to identify different factors that influence (in)efficiency.

H3: All seven proposed mixed marketing strategies have a positive effect on FCB performance.

Tobit regression analysis is used to analyze the linear influence of independent variables on the upper and/or lower limits of dependent variables. The dependent variables are the comparative efficiency obtained from DEA, in which the upper and/or lower bounds are censored (with an upper bound of 1 and lower bound of 0). Independent variables are the marketing strategy factors. Linear regression analysis, however, caused unstable variance between dependent and independent variables; thus, the regression equation showed a poor linear relationship (Rousseeuw & Leroy, 1987). Tobit regression was analyzed after DEA, similar to the method of Walraven et al. (2016), as in Conceptual Framework 3. The Tobit regression model of this research is expressed in Eq. (1).

$$\text{Eq. (1)} \quad y_i^* = \beta_0 + \beta_1 x_{1i} + \beta_2 x_{2i} + \beta_3 x_{3i} + \beta_4 x_{4i} + \beta_5 x_{5i} + \beta_6 x_{6i} + \beta_7 x_{7i} + \varepsilon_i$$

$$y_i \begin{cases} 0 \; if \; y_i^* \leq 0 \\ y_i^* if \; 0 < \; y_i^* < 1 \\ 1 \; if \; y_i^* \geq 1 \end{cases}$$

where

y_i	represents the efficiency of FCB
i and y_i^*	represent latent variables of efficiency FCB
x_{1i}	is the personal trainer standard
x_{2i}	is the location
x_{3i}	is the monthly fee
x_{4i}	is the marketing promotion activity
x_{5i}	is the product development
x_{6i}	is the atmosphere and interior decoration
x_{7i}	is the process platform
ε_i	is a normally distributed disturbance term, assumed to be independent between fitness centers

Research Methodology

This research methodology uses a quantitative approach with a cross-sectional study. The researchers divided the methodology into four parts: decision-making units; research tools and ethics; data collection; and data analysis.

Decision Making Unit (DMU)

The DMU refers to the 60 FCBs in Thailand still running in 2020. The business was registered as a legal entity, and its financial statements were presented in a database of the Department of Business Development under DBD DataWarehouse (Department of Business Development, 2019; DBD DataWarehouse, 2021). In this study, the researchers enrolled the FCB with three inclusion criteria.

First, the DMU must be a registered business that indicates fitness center operations. Using the keyword "fitness," 769 DMU were found. Subsequently, the screening process was

based on the type of business, which indicates the fitness center business from the database of the Department of Business Development under the DBD, namely, "operation of a fitness facility," "provision of facilities for sporting events," "renting and operating a movable property owned by one's own or leased from others for residential purposes," "leasing of intellectual property and similar products except for copyrighted works," "renting and leasing of recreational and sporting goods," and "other management consulting activities not elsewhere classified." DMUs were included in a total of 538.

The second inclusion criterion, DMU, must have a status of "still running" with data accessible for analysis; 238 DMUs were included.

The third criterion is that the DMU must generate profit that demonstrates its efficiency. As a result, only 60 DMUs remained.

Importantly, DMUs were sufficient for DEA because the number of DMU (samples) was higher than that of the minimum conditions. Bowlin (1998) suggested that the DMU should be equal to three times the sum of inputs and outputs (or 3 x number of inputs + number of outputs). In this study, with six inputs and two outputs, the DMU should be minimum at 3 x (6 + 2) = 24.

Research Tools and Ethics

Two instruments are used in the research. The first is a content validity test of input and output variables for assessing FCB efficiency. It was assessed by three experts and had an index of item objective congruence (IOC) at 0.94. The second is a field note using a spreadsheet. In addition, ethical consideration was approved by the Human Research Ethics Committee of Thailand National Sports University (TNSU 062/2564) on June 18, 2021.

Data collection

The researchers collected six input and two output variables by searching the data from the database of the Department of Business Development, namely, the DBD Data Warehouse (Department of Business Development, 2019; DBD DataWarehouse, 2021). Subsequently, DMU were enrolled according to the inclusion criteria, as described previously. The researchers collected the data in July 2021, when the FCB had to report annual statements to the Department of Business Development.

Further, documentary research was used, as in Scott's (2006) guidelines, to classify FCB using secondary data from the research database and websites/or Facebook fan pages of 60 DMU. Data triangulation was executed to ensure validity, reliability, and error prevention. In this regard, three data periods were surveyed: Period 1 (between August 1–7, 2021); Period 2 (between August 21–28, 2021); and Period 3 (between September 1–7, 2021).

Data analysis

The researchers analyzed the data following three objectives and a conceptual framework, as detailed below.

Objective 1: Assess the FCB efficiency in Thailand with the DEA method, data variation, and correlation among all variables. For issues of multicollinearity between inputs or the correlation coefficient exceeding 0.80, the researchers reduced the variance by transforming the data with a natural logarithm (Unthong, 2009). Then, the efficiency was analyzed using BCC and SBM models under the VRS and input-oriented assumption.

Objective 2: Benchmark the FCB performance by types; efficiency scores of DMU were used to test the difference between low-cost and general; t-test dependence was applied with statistical significance at .05 and .01.

Objective 3: Investigate the influential marketing factors affecting FCB's performance; efficiency scores (DEA 1) were used to investigate the influence of marketing strategy on FCB performance.

Tobit regression was analyzed with bootstrapping because it estimated the parameters using a replacement sampling. In addition, the dummy variables for the 7Ps mixed marketing strategy factors must be defined. Relevant research (Chankuna, 2018; Chankuna; 2020) was adopted to determine the following variables.

Dummy variables for personal trainer standard, location, monthly fee, marketing promotion activity, product development, atmosphere and interior decoration, and process platform are stated as "international qualification," "stand alone," "greater than 2,000 baht," "more than one activity per month," "more than one product development per year," "economy," and "offline-oriented." The reference categories are "domestic qualification," "convenient mall," "less than 2,000 baht," "one activity per month," "one product development per year," "luxury," and "offline and online," respectively.

Furthermore, alternative DEA models were estimated to assess the robustness of the DEA results regarding the efficient set of FCB performance; DEA 1 = input-oriented by SBM under VRS assumption with natural logarithm; DEA 2 = input-oriented by SBM under VRS assumption.

Research Findings

The results of data analysis from three objectives and three hypotheses are presented in three parts: FCB efficiency scores; benchmarking FCB performance; and influential marketing factors that affect FCB performance. Details are as follows.

FCB efficiency scores

Input variables indicate that 60 DMUs have operated on an average 20.07 months on fixed assets at 55.84 million baht with an average business size of 664.13 m2. They employed an average 16.68 people that costs 1.32 million baht per month in salaries and commissions. Average operating expenses are 2.92 million baht per month. Output FCB generated monthly membership revenue fees per year and operation revenue per year on average at 27.88 and 18.59 million baht, respectively. Descriptions of input and output variables are shown in Table 1.

Table 2 shows DEA efficiency scores and ranking of FCB performance: 38 DMU are categorized as low-cost (63.33%); 22 DMU are general (36.67%). The average efficiency score of DEA 1 is 0.9468, with a range from 0.8051 to 1.000; DEA 2 is 0.8109, with a range from 0.3484 to 1.000. DEA 1 reveals that low-cost had higher efficiency scores than general. The efficient low-cost DMU are 23 or 60.52%; inefficient are 15 or 39.48%. Efficient general DMUs are 7 or 31.81%; inefficient are 15 or 68.19%.

DEA 2 reveals that the efficient and inefficient DMU for low-cost and general are closer to DEA 1 results. DMU 9 of low-cost changes from efficient to inefficient. Hence, the efficient and inefficient low-cost DMUs were changed to 22 or 57.89% and 16 or 42.11%, respectively. For general, DMU 33 and 53 change from inefficient to efficient. Then, efficient general DMU

is increased from 7 to 9 or 40.90%; inefficient decreases from 15 to 13 or 59.10%. However, low-cost still has higher efficiency scores than general.

Table 1: Description of Input and Output Variables (n = 60)

Input and output	Mean	Standard deviation	Maximum	Minimum
Input				
1. Operation duration (month)	20.07	10.96	96.00	12.00
2. Fixed assets (million baht)	55.84	321.23	2,500	1.50
3. Business size (m^2)	664.13	366.31	1,843.00	123.00
4. The number of workforces (people)	16.68	38.48	300.00	3.00
5. Salary and commission (million baht/month)	1.32	3.05	23.85	0.23
6. Operating expenses (million baht/month)	2.92	19.91	154.45	0.0009
Output				
1. Monthly membership revenue fees per year (million baht)	27.88	0.91	1,466	0.011
2. Operations revenue per year (million baht)	18.59	0.61	977.48	0.007

Table 2: DEA Efficiency Scores and Rankings of FCB Performance

No	DMU (Fitness center in pseudonym)	Type (Low-cost or general)	DEA 1 (Input-oriented by SBM under VRS assumption with natural logarithm)		DEA 2 (Input-oriented by SBM under VRS assumption)	
			Score	Ranking	Score	Ranking
1	1	Low-cost	1.000	1	1.000	1
2	2	Low-cost	1.000	1	1.000	1
3	3	Low-cost	1.000	1	1.000	1
4	4	Low-cost	1.000	1	1.000	1
5	5	Low-cost	1.000	1	1.000	1
6	6	Low-cost	1.000	1	1.000	1
7	7	Low-cost	1.000	1	1.000	1
8	8	Low-cost	1.000	1	1.000	1
9	9	Low-cost	1.000	1	0.8697	33
10	10	Low-cost	1.000	1	1.000	1
11	11	Low-cost	1.000	1	1.000	1
12	12	General	1.000	1	1.000	1
13	13	Low-cost	1.000	1	1.000	1
14	14	Low-cost	1.000	1	1.000	1
15	15	Low-cost	1.000	1	1.000	1
16	16	General	1.000	1	1.000	1
17	17	Low-cost	1.000	1	1.000	1
18	18	Low-cost	1.000	1	1.000	1
19	19	General	1.000	1	1.000	1
20	20	General	1.000	1	1.000	1

Table 2: DEA Efficiency Scores and Rankings of FCB Performance (Cont.)

No	DMU (Fitness center in pseudonym)	Type (Low-cost or general)	DEA 1 (Input-oriented by SBM under VRS assumption with natural logarithm)		DEA 2 (Input-oriented by SBM under VRS assumption)	
			Score	Ranking	Score	Ranking
21	21	Low-cost	1.000	1	1.000	1
22	22	General	1.000	1	1.000	1
23	23	Low-cost	1.000	1	1.000	1
24	24	Low-cost	1.000	1	1.000	1
25	25	Low-cost	1.000	1	1.000	1
26	26	Low-cost	1.000	1	1.000	1
27	27	General	1.000	1	1.000	1
28	28	Low-cost	1.000	1	1.000	1
29	29	Low-cost	1.000	1	1.000	1
30	30	General	1.000	1	1.000	1
31	31	General	0.9726	31	0.7482	36
32	32	Low-cost	0.9695	32	0.7981	35
33	33	Low-cost	0.9503	33	1.000	1
34	34	Low-cost	0.9455	34	0.9099	32
35	35	Low-cost	0.9338	35	0.7295	37
36	36	Low-cost	0.9298	36	0.7022	40
37	37	General	0.9295	37	0.6614	42
38	38	Low-cost	0.9246	38	0.8444	34
39	39	Low-cost	0.9162	39	0.6503	44
40	40	Low-cost	0.9150	40	0.6610	43
41	41	Low-cost	0.9051	41	0.6937	41
42	42	General	0.9049	42	0.6313	45
43	43	Low-cost	0.9006	43	0.7061	39
44	44	Low-cost	0.8879	44	0.5308	49
45	45	General	0.8855	45	0.4890	54
46	46	Low-cost	0.8832	46	0.5199	52
47	47	Low-cost	0.8821	47	0.4777	55
48	48	Low-cost	0.8805	48	0.5665	47
49	49	General	0.8787	49	0.5273	50
50	50	General	0.8770	50	0.4617	57
51	51	General	0.8754	51	0.5510	48
52	52	Low-cost	0.8745	52	0.4751	56
53	53	General	0.8691	53	1.000	1
54	54	General	0.8677	54	0.5216	51
55	55	General	0.8640	55	0.7098	38
56	56	General	0.8566	56	0.4488	58
57	57	General	0.8537	57	0.4944	53
58	58	General	0.8482	58	0.5779	46
59	59	General	0.8235	59	0.3484	60
60	60	General	0.8051	60	0.3491	59

Benchmarking FCB performance

Low-cost significantly had higher efficiency scores than general for DEA 1. For DEA 2, low-cost still had higher efficiency than general (0.9594 and 0.9278). Furthermore, the efficiency scores of the 7Ps mixed marketing strategy were benchmarked. Monthly fees of less than 2,000 baht and marketing promotion activity (one activity per month) have more efficiency than monthly fees greater than 2,000 baht and marketing promotion activity for more than one activity per month for DEA 1. Benchmarking for DEA 2 has a similar trend, but statistical significance is not found (Table 3).

Influential marketing factors affecting FCB performance

As expressed in Eq. (1), efficiency scores obtained with the DEA model are explained. The effects of covariates are shown in Table 4. The correlation coefficient does not exceed 0.80. No multicollinearity is found between inputs and outputs. Thus, the model estimation is free from multicollinearity problems.

Table 3: Benchmarking FCB Performance (n = 60)

DMU	Number	Percentage	DEA 1		DEA 2	
			mean	*p*	mean	*p*
FCB type						
1. Low-cost (Factor 1)	38	63.33	.9594		.8527	
2. General (Factor 2)	22	36.67	.9278	.048*	.7477	.072
7Ps mixed marketing strategy						
1. Personal trainer standard (Factor 3)	55	91.7	.9469		.8099	
- domestic qualification						
- international qualification	5	8.3	.9451	.949	.8194	.928
2. Location (Factor 4)						
- convenient mall	25	41.7	.9579		.8584	
- standalone	35	58.3	.9382	.233	.7767	.161
3. Monthly fee (Factor 5)	36	60.0	.9594		.8527	
- less than 2,000 baht						
- greater than 2,000 baht	24	40.0	.9279	.048*	.7477	.072
4. Marketing promotion activity (Factor 6)						
- one activity per month	36	60.0	.9594		.8527	
- more than one activity per month	24	40.0	.9278	.048*	.7477	.072
5. Product development (Factor 7)						
- one product development per year	53	88.3	.9479		.8137	
- more than one product development per year	7	11.7	.9385	.703	.7882	.778
6. Atmosphere and interior decoration (Factor 8)						
- luxury	19	31.7	.9663		.8890	
- economy	41	68.3	.9377	.089	.7745	.062
7. Process platform (Factor 9)						
- offline and online	53	88.3	.9462		.8101	
- offline-oriented	7	11.7	.9511	.841	.8153	.954

Note: * *p* < .05

Table 4 shows three control variables with significant effect on FCB performance. International qualification of personal trainer standards, product development of more than one product per year, and economy of atmosphere and interior decoration have more significant effects on FCB performance than other marketing strategies in the same group. Interestingly, general has a higher degree of FCB performance relation than low-cost (Wald chi-square = 290.87; prob > chi-square = 0.0000; pseudo R2 = 0.2602).

Table 4: Tobit Regression Results: FCB Efficiency Scores

Dependent variable: DEA 1	Tobit without endogeneity control		
Independent variable	**Beta**	**Standard error**	***p***
FCB type			
1. Low-cost (Factor 1)	.625	.34	.736
2. General (Factor 2)	.886	.28	.782
7Ps marketing strategy			
1. Personal trainer standard			
(Factor 3) (ref. domestic qualification)			
- international qualification	.100	3.46	.001*
2. Location (Factor 4) (ref. convenient mall)			
- stand alone	.169	1.32	.311
3. Monthly fee (Factor 5) (ref. less than 2,000 baht)			
- greater than 2,000 baht	.640	.01	.994
4. Marketing promotion activity			
(Factor 6) (ref. one activity per month)			
- more than one activity per month	.153	1.60	.109
5. Product development			
(Factor 7) (ref. one product development per year)			
- more than one product development per year	.635	3.01	.003*
6. Atmosphere and interior decoration			
(Factor 8) (ref. luxury)			
- economy	.145	2.00	.045*
7. Process platform (Factor 9) (ref. offline and online)			
- offline-oriented	.482	.42	.678

Note: * *p* < .05

Discussion

This study discusses the latest empirical evidence regarding FCB efficiency in Thailand. Simultaneously, research gaps in regard to influential marketing factors affecting FCB performance are resolved. DEA and Tobit regression analysis are the first techniques applied here to accomplish three research objectives: (1) to assess FCB efficiency in Thailand with the DEA method; (2) to benchmark the FCB performance by type; and (3) to investigate the influential marketing factors affecting FCB performance. The proposed inputs and outputs extend the understanding of FCB efficiency. In essence, input-oriented consideration through BCC and SBM models under VRS assumption are suitable for the FCB's characteristics in Thailand.

Sixty qualified FCBs are chosen as DMUs, categorized as low-cost (38 DMUs) and general (22 DMUs) of business types. For DEA results, the number of efficient low-cost DMU are 23 or 60.52%; general are 7 or 31.81%. Low-cost FCB has higher efficiency scores than

general. After Tobit regression analysis, personal trainer standards, product development, and atmosphere and interior decoration are significantly influenced marketing factors affecting FCB performance. These results are discussed in conjunction with the conclusion of the research hypothesis (H1 to H3).

For H1, the authors proposed inputs and outputs to distinguish efficient and inefficient FCB. The number of efficient low-cost DMUs are 23 or 60.52%; general are 7 or 31.81% for DEA 1. It could be indicated that, for FCB, operation duration, fixed assets, business size, workforce number, salary and commission, and operating expenses are managerial inputs for generating monthly membership revenue fees per year and operations revenue per year as the outputs. Efficient FCBs showed that they had monthly membership revenue fees per year, higher than inefficient FCBs, e.g., in low-cost, DMU 1 generated 56.025 million baht, but DMU 46 earned 0.397 million baht (DBD DataWarehouse, 2021). Moreover, DEA measure is sensitive to outliers when it is influenced by the presence of outliers in the data set (Unthong, 2009; Tone, 2001). This caused efficiency score deviation in DMU 9 of low-cost, DMU 33 and 53 of general, from 1.000 to 0.8697, 0.9503 to 1.000, and 0.8691 to 1.000 respectively.

Importantly, high monthly membership revenue fees are directly related to membership loyalty and satisfaction. Satisfied members always paid for membership retention (DellaVigna & Malmendier, 2006; Won & Kyoungho, 2018). Notably, during the COVID-19 pandemic, the FCBs adjusted their inputs to maintain membership retention to follow COVID-19 prevention measures, e.g., staff lay-offs, commission reductions, or COVID-19 related-equipment investments, i.e., temperature scanners, alcohol gels, face shields, or signs and instruction in regard to prevention measures (Chankuna & Sriboon, 2022; Chankuna et al., 2021). The efficiency scores could be an indicator for evaluation of FCB survival.

Moreover, the average efficiency score of this study (0.9468) is higher than those of the TPL football league (0.7851) (Chaiwuttisak, 2018) and Dutch sponsorship (0.3000) (Walraven et al., 2016). This would imply that, although in a crisis, FCB has a greater chance of success than football and sponsorship businesses. Technology of FCB probably provides a competitive advantage compared with other businesses. Hence, the FCB efficiency scores from six inputs and two outputs are consistent with those in the empirical data (H1).

For H2, it is surprising that general has lower efficiency scores than low-cost. The authors expected that general, which includes technology and innovation, would show the highest efficiency scores. Contrarily, general suffered from high cost of inputs without proportional high revenues of outputs, later in low net-profit margin (NPM). Zutter and Smart (2019) stated that the NPM shows how much profit is generated from every \$1 (or currency unit) in sales, after accounting for all business expenses involved in earning those revenues. Higher NPM represents higher business management performance of profit generation. Sample NPM of low-cost (DMU 46) in this study is 25.42%, whereas general (DMU 31) is 5.19%. In practical terms, low-cost mostly generates high NPM because it often generates monthly membership revenue fees per year and operations revenue per year from personal trainer expertise and consumer satisfaction in a personal trainer's personality (Chankuna, 2020; Sukwong et al., 2021). This would not require the high cost of inputs but confirms that low-investment FCB has a competitive advantage in this market. Our sample suggests that further investigation into the relationship between NPM and efficiency is needed.

The Tobit analysis results accept the research hypothesis that a mixed marketing strategy has a positive effect on FCB performance (H3). Personal trainer standards, product development, and atmosphere and interior decoration are significantly affected by FCB

performance, which is to similar to that noted in previous research in terms of personnel strategy (Chankuna, 2018; Chankuna, 2020; Chankuna & Sriboon, 2022; Thanabordeekij, 2018; Yumadeen & Kaewkhiew, 2019), place strategy (Lerdchairat & Keawpromman, 2020), and productivity strategy (Lerdchairat & Keawpromman, 2020; Phanthanwatkoson, 2016; Won & Kyoungho, 2018). The authors recommend that entrepreneurs and marketers prioritize marketing strategies based on the impact on FCB performance. Product development (Beta = .635; p = .003*), atmosphere and interior decoration (Beta = .145; p = .045*), and personal trainer standards (Beta = .100; p = .001*) should be considered during marketing strategy implementations.

For H3, adoption of a personal trainer into a marketing strategy is possible. Despite the fact that product development and interior decoration are the first two highest impacts on FCB performance, they also require a high cost of investment and operation (Chankuna, 2020). Entrepreneurs should focus on fundraising, privilege allocating, and sponsorship negotiating. Personal trainer standards seem to be an advantage via low-cost investment, as they relate to human capital development, which begins in-house training (Sukwong et al., 2021). Sample integration between personal trainers and marketing strategy is set at different prices between domestic and international personal trainer certification, promoting personal trainers as celebrities, encouraging personal trainers to be international-certified, cross training between personal trainers and sale consultants, educating personal trainers on marketing strategies, and enforcing personal revenue generation for personal trainers.

Further, the results do not indicate significant differences in place, productivity, promotion, and process. An explanation for the results might be that location, monthly fees, marketing, and process platforms are homogeneous prototypes in FCB. Location has less of an impact on consumer service decisions because of how it fits into consumer behaviors (Lerdchairat & Keawpromman, 2020). Similarly, monthly fees have a low impact on consumer decision-making behaviors in signing FCB membership than overall facility (atmosphere and interior decoration) (Yumadeen & Kaewkhiew, 2019) and available time of enrollment (Won & Kyoungho, 2018). Further empirical arguments are in regard to the necessary marketing promotion and process platform to provide a new experience to satisfy consumers for making a significant efficiency possibility according to digital transformation and recovery from the COVID-19 pandemic (Chankuna, 2020; Chankuna et al., 2021; Chankuna & Amphai, 2022; Miragaia & Constatino, 2019). Entrepreneurs, marketers, and managers should be aware to apply marketing strategies based on FCB environment and resources.

Theoretical Contributions

The efficiency scores in our research show that low-cost FCBs have higher efficiency than general FCBs. This implies that investment in low-cost FCBs has reached the highest efficiency if it has been performing as well as its benchmark to general FCBs. However, inspection of efficient FCBs leads to the conclusion that efficiency can be achieved at any FCB type. Among the efficient FCBs are investments that achieve high monthly membership revenue fees per year and operations revenue per year that attain more acceptable outputs with relatively low inputs (e.g., fixed assets, business size, and operation expenses). This is an illustration of the ability of DEA to benchmark FCBs against similar FCBs only, thereby providing entrepreneurs and investors of inefficient FCBs with clues (in particular, characteristics of their efficient peers) to determine how efficiency can be achieved.

Moreover, FCB performance benchmarking by the 7Ps mixed marketing strategy could indicate an effective strategy in FCBs for entrepreneurs, manager, and marketers. Monthly fees and marketing promotions are two significant strategies that distinguish effective and ineffective FCB performance. The study suggests that low-price monthly fees are more efficient than high-price fees, while one marketing promotion activity has more efficiency than the one activity. Entrepreneurs should first understand consumer behavior and then determine appropriate monthly fees as well as establish a business plan that includes a balance of the possible expenses and expected incomes. As a low-price monthly fee implies a possible trend of membership engagement, managers and marketers have to convince target consumers to become members in order to reach the target of a business plan. Marketers are responsible for launching attractive marketing promotions each month that meet members' desires.

The findings of this study also significantly contribute to the 7Ps mixed marketing strategy of product development and interior decoration in the study of FCB performance in Thailand, especially the proposed practical issues of personal trainer adoption in terms of cost investment and operation. Tobit regression results serve as a knowledge-based system adoption for future studies in the field of FCB management either in Thailand or ASEAN.

The findings suggest that the 7Ps mixed marketing strategy on FCB efficiency might be urged by three significant drivers that clarify entrepreneurs, managers, and marketers' confusion and display strategies related to FCB efficiency management. Entrepreneurs or decision-makers in FCB should reconsider investing in product development, atmosphere and interior decoration, and personal trainer standards. The empirical validation of efficiency scores and Tobit regression results also indicates that each type of FCB needs to consider a proper strategy for increasing performance based on their budgets. High-budget FCBs should first adopt all three drivers (i.e., product development, atmosphere and interior decoration, and personal trainer standards), while low-budget FCBs should select possible drivers for implementation, i.e., personal trainer standards instead of atmosphere and interior decoration.

Managerial Implications

Furthermore, this research study offers recommendations for managers and marketers on how to undertake the 7Ps mixed marketing strategy to enhance FCB efficiency. Three implications are provided as follows.

First, the research findings imply that more than one product development per year is the significantly strongest driver that affects FCB efficiency scores. Managers could place emphasis on sports science adaptation into FCB product development, including new patterns of individual exercise for members, new group class exercise, personal training with periodization integrated, innovations with exercise equipment, or various types of membership. Research and development need to be conducted to confirm the possible results of the products. Later, marketers could launch those products in terms of purchasing stimulation. Products presentation, promotion, and negotiation could be served to members in appropriate durations during the year.

Second, atmosphere and interior decoration of FCBs should be economized for attaining efficiency scores. Entrepreneurs have to design FCB's building or exercise area to create an atmosphere as well as interior decoration for exercise. Economy of scale concepts should be applied, beginning with standard and safety materials utilization, space allocation and optimization, and equipment self-cleaning by the members after use (monthly cleaning still

performs by FCB staffs). In terms of economy decoration, hard copies of announcements and signs should be replaced by digital media. Managers will thus have to coordinate with graphic design staff or social media staff to release the media. Lights and mirrors are obvious decorations for creating an exercise atmosphere.

Finally, the findings of this study indicate that international qualifications have significantly affected FCB efficiency scores. Entrepreneurs should determine training policies of personal trainer standards simultaneously with human resource development planning. All personal trainer staff levels, i.e., beginner, intermediate, or advanced, should be enrolled in a career-path development plan. A payback contract for registration fees in the examination or training might be included. Beginner staff should be trained either by in-house staff, managers, or accredited staff/organization and then promoted to intermediate staff. Advanced staff should hold at least one international qualification related to personal training or exercise instruction. Importantly, all staff need to be encouraged to use English communication in their daily work by managers and entrepreneurs in the examination of international qualifications.

Conclusion

Brief Summary

In conclusion, this work fills in previous research gaps by identifying the influential factors of marketing strategies on fitness center business performance. The methodology pioneered new principles for assessing and benchmarking FCB efficiency by employing DEA, followed by Tobit regression analysis from 60 qualified FCBs in Thailand. The results showed that half of the FCB is efficient, especially low-cost. Implementing personal trainer standards is a practical marketing strategy, which influences FCB performance. The findings of this research establish impacts on sports management aspects of innovation and entrepreneurship for driving policies and decision-making regarding the sports industry for regional and continental regions.

Limitations and Directions of Future Research

Several limitations from this study point out the solution for scholars in future research. Firstly, we found from the informal survey that local FCBs, especially start-ups and individual business owners were unregistered in the DBD DataWarehouse, which is a because standard requirement of government and tax measures. Next the DMU database has to include all FCBs by combining the data from local surveys. Secondly, secondary data collection from FCBs in 2020 cannot directly be generalized to other FCBs or period. FCB sampling from other countries and longitudinal data collecting by duplication of this study are our suggestion for an upcoming study. Thirdly, FCB performance and the inputs and outputs are incompletely explained by marketing strategy. A replication of this research methodology with other sport businesses in the sport industry as well as additional inputs and outputs from other theories, such as digital online marketing or the Bio-Circulation-Green (BCG) economic model would yield insights into the validation and benchmark of the results.

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