Evaluating Management Efficiency of Korean Pro-Soccer Teams Using DEA Analysis

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Evaluating Management Efficiency of Korean Professional Teams Using Data Envelopment Analysis (DEA)

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At the outset, the groundwork for this study began with the work by Kang, Lee, and Kwon (2007). Specifically, the researchers evaluated management efficiency of professional baseball teams in Korea using Data Envelopment Analysis (DEA) technique. Kang, Lee, and Kwon (2007) intended to raise the issue that professional teams in the baseball league must undergo management evaluation each year in order to improve operation efficiency and find ways to generate profit. In the meantime, all major sports leagues in Korea are having difficulties due to same financial and management problems as the baseball league. Therefore, the purpose of this study is twofold. First, evaluate management efficiency for each of the three major sports leagues in Korea. Naturally, this will help to understand the relative management efficiency of each team and provide managers an idea which categories need to be improved for higher efficiency when comes new season. These issues are addressed separately for each of the three major sports leagues: Korea Football Association (KFA), Korea Baseball Organization (KBO), and Korean Basketball League (KBL). Second, compare the management efficiency of the three leagues collectively and discover the common trend across each league. According to the evaluation, individual leagues displayed a common trend that wealthier teams performed poorly in the evaluation being ranked in the bottom of each leagues. Comparing the three leagues' management efficiency collectively, the KBL (74.9%) scored the highest while KBO scored 70.7%, and KFA scored only 53.6%. This result indicates that the salary cap system applied to the KBL has contributed in a positive way to encourage economic parity within the league and promote overall high management efficiency. The study suggests that a certain extent of institutional control is required over the leagues to control cost and improve fan base via implementing various marketing activities.

Key words: Data Envelopment Analysis (DEA), Efficient Team Management, Professional Team Sports, Production Function
Introduction

Since the establishment of professional baseball in 1982, followed by soccer and basketball, the three major sports have propelled the development of the Korean professional sport industry. Players participating in foreign leagues such as Chan Ho Park (MLB) and Ji Sung Park (English Premier League) have displayed that overall game quality of the Korean professional sport has improved. Moreover, the number of professional leagues and teams in each league considerably elevated throughout the years. In addition, the size and number of sponsorship deals and media rights have significantly increased over time (Choi, 2001). Despite the development of the Korean professional sport industry, Kang, Lee, and Kwon (2007) denote that the number of total fan attendance and TV ratings for all three major sports have declined, if not stalled over the past few decades. Moreover, the distorted ownership structure of professional teams that has been constantly holding the teams back from improvement has yet to be changed; consequently, there are no Korean professional sport teams that generate profit. According to Choi (2001), on average, the portion of the deficit is three times larger than the revenue. The debts compile as time goes by and the problem is becoming more severe. Due to this fact, evaluation based on direct financial measurement is meaningless. Hence, Kang, Lee, and Kwon (2007) attempted to utilize a method to evaluate management efficiency instead of financial performance as an effort to induce managers to control costs, apply affective marketing activities, and devise strategic planning in order to guide teams into financial success. The authors depicted Samsung Lions, which was ranked 6th among eight teams in efficiency, as the bad model that other teams should not resemble when it comes to efficient team management. The goal for Samsung is to become the top team every year. It does not matter how much money and resources it takes to employ high profile players as long as the team win games. Naturally, the amount of total player salary for Samsung was the most in the league and the Win-Loss percentage was the highest. However, the number of fan attendance was not positively affected by the team’s star players or high W-L percentage since it was only the fifth highest in the league.

Although the findings may be true, the study lacks in dimension and the results may only be valid in professional baseball teams. Thus, the study recognized the need that the phenomenon depicted by Kang, Lee, and Kwon (2007) need to be examined via evaluating teams in different kind of sport settings in Korea and
included professional soccer and basketball for the evaluation. Moreover, as suggested by Kang, Lee, and Kwon (2007), efficiency may be compared between different sport leagues on a macro level; hence, the study attempted to compare the phenomenon between the three major sports in Korea. This effort is in need since the epidemic of the financial crisis is spread on all professional leagues. League officials and managers are well aware of the current negative situation; however, do not have proper knowledge and scientific tools to solve the perpetuating financial problems. Therefore, the problem needs to be viewed as a whole and solutions ought to be sought on a macro sense so that all professional leagues obtain financial security and bring prosperity to the general professional sport industry in Korea. In addition, the article by Kang, Lee, and Kwon (2007) only discussed the phenomenon and the reason of the DEA outcome and came short in addressing the practical usage of DEA evaluation. It provides awareness and knowledge to encourage managers to develop operation efficiency, however, does not provide insights on what can actually be done to bring teams to higher efficiency and help secure financial security. Therefore, the purpose of this paper is to evaluate three major sport leagues’ management efficiency within each league to discover a common trend and compare the aggregate efficiency of all three leagues. The findings from the study will provide insights to devise and provide practical marketing and operating examples to managers and league officials to improve management efficiency. In addition, the study attempted to send a message to the managers of the professional teams in Korea that disclosure of financial data is required for accurate analysis of the current situation so that proper solutions can be developed.

**Production Functions In Team Sports**

Professional team sports are uniquely suited industries for empirical analyses of production and performance (Hadley et al., 2000). Both the input of playing talent and the output of team performance are easily observable and measurable. Rottenberg (1956) first proposed the concept of a sporting production function in his economic analysis of MLB (Major League Baseball) in the study that embarks on the economics of team sports. Thereafter, the work by Scully (1974) was the first to estimate a production function for team performance and became the
stepping-stone for much of the ensuing work in resembling areas. Scully (1974) was able to construct a methodology that related sport teams’ output to a variety of team input measures using OLS regression analysis and applied to US baseball teams. Medoff (1976), Sommers and Quinton (1982), Hill (1985) and Bruggink and Rose (1990) have stipulated the original model developed by Scully in various ways. Zech (1981) estimates a production function for team performance in baseball teams and similar studies have been administered by Zak, et al., (1979) and Scott, et al., (1985) utilizing data from the NBA (National Basketball Association) in North America, while Atkinson et al. (1998) used data from the NFL (National Football League). Moreover, Schofield (1988) took the opportunity to estimate production functions for English county cricket league for the seasons 1981 to 1983.

In the meantime, an important limitation exists in most of the empirical studies of sporting production functions conducted by scholars from Scully (1974) onwards. Most studies are based on OLS regression analysis and related statistical techniques. This implies that empirical estimates generated correspond to estimates of the ‘average efficiency’ production function. In other words, efficiency of individual teams is established on comparisons with an average efficiency benchmark instead of the full efficiency benchmark. As a result, the OLS method is unable to generate any estimates of the absolute scale of technical inefficiency of individual teams. This approach is only capable of supporting a ranking of the production efficiencies based on the estimated average efficiency production function. This in fact, provides another limitation on the Scully-type research, a focus on teams rather than individuals, of not being able to verify and separate individual contributions to team performance. The two problems of measuring separately the contribution of players and coaches to team performance and determining the degree of technical efficiency relative to the full efficiency production function can both be resolved by estimating a production frontier (Kalirajan & Shand, 1999). Due to this fact, recent Scholarly contributions have displayed a move away from OLS regression analysis to frontier analysis.

Farrell (1957) first developed a deterministic frontier analysis using a non-parametric method and it was further practiced by Aigner et al. (1977), Battese and Corra (1977), and Meeusen and van den Broeck (1977). Later, Charnes et al. (1978) developed a Data Envelopment Analysis (DEA) model, which the main logic was established on the theory of Farrel. DEA extends the single-input to single-output engineering ratio approach to multiple-inputs to multiple-outputs
without requiring a priory specification of weights and/or explicit delineation of assumed functional forms of relations between inputs and outputs (Kang, Lee, Kwon, 2007). In the meantime, Zak et al. (1979) first introduced the use of frontier analysis in sport studies by analyzing cross-sectional data from the NBA (National Basketball Association) in the US. Furthermore, Hofler and Payne (1997) have conducted a frontier analysis using the data from the same NBA, however for the season 1992-1993 and compared the results of Zak et al. (1979). In addition, Sueyoshi et al. (1999) argues that the DEA technique has a weakness in evaluating baseball performance since it produces too many efficient players. Therefore, the study implemented a Slack-Adjusted DEA model and then proposed a new use of its combination with OERA (offensive earned-run average).

Meanwhile, several scholarly researches indicate an increase of issues in regards of managerial efficiency of professional sport teams. Porter and Scully (1982) used data from the Major League Baseball (MLB) over the period of 1961-1980 in order to estimate managerial efficiency, marginal revenue, and the rate of change in efficiency over years of experience and relative factor price efficiency. The study implemented two input variables, batting percent and ratio of strikeouts to base on balls, and applied a deterministic parametric approach. In essence, the results of the study displayed that managerial skill in baseball contributes significantly to the production process. Carmichael and Thomas (1995) utilized data from the English rugby league and attempted to measure team performance using true input data in the form of performance influencing variables, as well as performance-related inputs. The study entailed that poor quality inputs cannot ensure high efficiency even if it is used properly. Hofler and Payne (1997) investigated teams in the National Basketball Association (NBA) during the 1992-1993 season using stochastic production frontier model for efficiency measures and attempted to reveal how closely teams play up to their potential. In the meantime, Hass et al. (2003), used player and coaches salary as input variables and pointes, average stadium utilization, and total revenue as output items in order to measure the relative managerial efficiency of the German Bundesliga football teams. The study by Kang, Lee, and Kwon (2007), as to date, marks the latest in employing frontier analysis technique on sport team settings. The study used data from the KBO (Korea Baseball Organization) to evaluate management efficiency of the teams. The study is noteworthy for its explicit recognition that a team’s efficiency score is not necessarily correlated to the outcome (regular season rankings) and DEA, which
Methodology

The formula renders a non-parametric piece-wise surface based on a linear model that generates output $Y_1$ from the Input $X_1$ and generalizes the single-output to single-input classical engineering-science ratio definition to multiple outputs and inputs without requiring pre-assigned weights. DEA indicates efficient DMUs as 100% while inefficient DMUs are displayed in lower scores. Charnes, Cooper, and Rhodes (1978) provide the equation and the motivation behind the model specifications presented below.

Max $\text{TE} = \sum_{j=0}^{J} v_{nj} Y_{nj} - \sum_{i=0}^{I} u_{ni} X_{ni} \leq 0$

s. t.:

$\sum_{i=0}^{I} u_{ni} X_{ni} = 1$ \hspace{1cm} $u_{ni} \geq \varepsilon > 0$

$Y_{nj} : n^{th}$ DMU’s output $J$ ($j = 1, 2, \cdots, J$)

$X_{ni} : n^{th}$ DMU’s input $I$ ($i = 1, 2, \cdots, I$)

As indicated in the formula, primary subject DMU is noted as $n$ and its efficiency will be $\text{TE}$ (technical efficiency). The score of the primary DMU is set not to exceed 1. The variables are indicated as $X_{ni}$ for input and $Y_{nj}$ refers for output; while, $u_{ni}$ and $v_{nj}$ are noted as input and output weights, respectively. In addition, DMU must have one positive input and one positive output for proper analysis and $\varepsilon$ is the closest constant number to zero.

The dual problem is as follows:

Min $\text{TE} = a_{n} - \varepsilon \left( \sum_{i=1}^{I} S_{i} + \sum_{j=1}^{J} S_{j} \right)$ \hspace{1cm} (2)
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\[
\text{s. t.: } \sum_{n=1}^{N} \lambda_n Ynj - Sn\hat{ }j = Ynj \quad j = 1, 2, \cdots J
\]

\[-a_n Xni + \sum_{n=1}^{N} \lambda_n Xni + Sn\hat{ }i = 0 \quad i = 1, 2, \cdots I
\]

\[Sn\hat{ }, Sn\hat{ }, \lambda n \geq 0\]

In reference to formula (2), \(a_n\) indicates technical efficiency of the relative amount of input resource utilized to generate certain amount of outputs compared to other DMUs. Thus, if \(a_n = 1\) then it indicates the DMU is efficient, however, it can be understood that a DMU’s input resource is being over used compared to other DMUs if \(a_n < 1\). Meanwhile, \(\lambda_n\) is indicated as the decision variable that measures the \(n^{th}\) DMU’s contribution to the efficient frontier. Finally, the slack variables are indicated as \(Sni\) and \(Snj\) in the formula below.

\[
\text{Min PTE = } \beta n - \varepsilon \left( \sum_{i=1}^{J} S\hat{ }i + \sum_{j=1}^{J} S\hat{ }j \right) \quad \cdots \cdots \cdots \cdots (3)
\]

\[
\text{s.t.: } \sum_{n=1}^{N} \lambda_n Ynj - Sn\hat{ }j = Ynj \quad j = 1, 2, \cdots J
\]

\[-a_n Xni + \sum_{n=1}^{N} \lambda_n Xni + Sn\hat{ }i = 0 \quad i = 1, 2, \cdots I
\]

\[\sum_{n=1}^{N} \lambda n = 1 \quad Sn\hat{ }, Sn\hat{ }, \lambda n \geq 0\]

Data

For this study, 2007 season data from KFA (Korea Football Association), KBO (Korea Baseball Organization), and KBL (Korean Basketball League) were collected from team managers and league affiliates. If there were to be more teams in the Korean professional sport industry more input and output items would be selected and analyzed in various ways, however, due to lack of abundance in number of
teams and limitation of data availability a total of three variables, one input and two output items were chosen.

After thorough investigation of DEA literature regarding data selection (Kang, Lee & Kwon, 2007; Hong, 2003; Carmichael & Thomas, 1995), total expenditure for KFA, and Player Salary for KBO and KBL were selected to be the input items and number of Average Fan Attendance and Season Win-Loss percentage were chosen to be the output items. Although considering ticket sales to be a more reasonable output item, it was inevitable to select average fan attendance as a proxy to ticket sales, since information regarding ticket sales was either not provided by team officials or valid. Season Win-Loss percentage was chosen to be the other output item since it simply represents team performance. Other possible input items that emerged during the course of data selection procedure such as marketing expenditure, salary of coaching staffs, number of players, coaching staffs, and front employees, were left out since total expenditure or player salary make up more than 70% of total team expenditures (Choi, 2001) and justify most of the possible input items. In addition, number of players can be replaced by player salary, and number of coaching staffs and front employees were recognized to be insignificant for the research, during preliminary analysis, therefore ignored. Other possible input and output items that were beyond control such as hometown population, stadium size, distance, and so on were also omitted for the study. Finally, team Gwangju from KFA was left out from the research since players are militants and did not conform to the characteristics of the study.

Results

Tables 1 through 3 display the results of DEA evaluation of individual teams in each of the three sport leagues. In addition, goals for improvements are provided for each team in order to obtain higher efficiency in the upcoming season.
In the KFA, Daejeon was the only efficient team; all others required to make modifications in their operation structure in regards of resource management for higher efficiency. Daejeon ranked sixth in the final standings of the regular season, a subpar performance, however, the team induced the third most number of average fan attendance by spending the least amount of financial resources. This effort positioned Daejeon to be the efficient team. Naturally, the remaining twelve teams turned out to be relatively inefficient and required to benchmark Daejeon in order to gain higher efficiency.

Daegu, Oolsan, and Gyungnam scored 69.7, 62.8, and 62.1 and required to decrease 30.8%, 37.2%, and 37.9% on total expenditure, respectively. Daegu spent second least amount of total expenditure and produced above average number of average fan attendance. However, the team needs to improve their W-L percentage by 6.3% for higher efficiency. Oolsan and Gyungnam are similar in operation structure. They both managed to produce moderately high W-L percentage during the regular season and ranked third and fourth in the final standings. In addition, Oolsan and Gyungnam need to improve average fan attendance by 89% and 70%, respectively.

Suwon and Incheon scored 57.6 and 54.5, respectively. As for Suwon, 42.4% cut from total expenditure and 30% increase on W-L percentage was required. Suwon has the highest W-L percentage in the league, however, total expenditure amount is
almost three times larger than Daejeon and more than two times larger than Daegu; thus, the team still required improvement on W-L percentage. This, in fact, is a major letdown for Suwon since they had the most number of average fan attendance in the league, the only team other than Daejeon and Daegu with no improvements required in this particular category. As for Incheon, 45.5% cut on total expenditure and 8.5% increase on average fan attendance was advised.

In total, six teams scored in the 40s range and all six teams were suggested to improve the number of average fan attendance and cut total expenditure. Jeonbuk scored 49.3 and was advised to cut 50.7% on total expenditure. In the meantime, Busan, ranked eighth in the evaluation with a score of 48.1, was suggested to cut 51.9% on total expenditure. In addition, Incheon and Jeonbuk share almost identical size of total expenditure. They also share similar W-L percentage and final standings. However, the difference was the number of average fan attendance. While Incheon only has to improve 8.5%, Jeonbuk has to improve over 50% in number of average fan attendance for higher efficiency. Busan has the lowest W-L percentage and number of average fan attendance among all teams. However, the team managed to position itself in the middle class due to its relatively small size of total expenditure. Pohang and Jeju scored 45.6 and 42.8, respectively. Both teams required to make improvements on average fan attendance by increasing 117% and 125%, respectively. The team performance by Pohang was mediocre with an average W-L percentage. In addition, the team has relatively large size of total expenditure and small size of average fan attendance, thus placing the team to be ranked fourth from the bottom. The reason Jeju is placed rather in the lower class despite having a small size of total expenditure is that average fan attendance is the lowest in the league, in addition to the third lowest W-L percentage. The last two teams in the 40s range, Sungnam and Seoul identically scored 41.7 and was suggested to cut 58.3% on total expenditure. The difference between the two teams is that Sungnam required 125% improvement on average fan attendance and Seoul required 13% improvement on W-L percentage. In fact, Seoul and Sungnam shares great similarities in operation structure. Both teams are top two in total expenditure size and have identical DEA score. However, the difference that split the two teams is that Seoul has a relatively low W-L percentage and Sungnam has small number of average fan attendance relative to their total expenditure amount.

Jeonnam has the tenth lowest W-L percentage and the number of average fan attendance is second to last, however, the total expenditure amount is the fourth
largest. In order to escape from the bottom the team needs to increase 45% on average fan attendance and decrease 65.5% of its total spending.

Table 2. Korea Baseball Organization

<table>
<thead>
<tr>
<th>Teams</th>
<th>Efficiency Score(%)</th>
<th>Player Salary*</th>
<th>Target Salary (%)</th>
<th>W-L %</th>
<th>Target W-L %</th>
<th>Avg. Fan Attendance</th>
<th>Target avg. Fan Attendance(%)</th>
<th>Final Standing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doosan</td>
<td>100</td>
<td>3.12</td>
<td>-</td>
<td>.56</td>
<td>-</td>
<td>12,477</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>LG</td>
<td>84.3</td>
<td>4.25</td>
<td>-15.7</td>
<td>.48</td>
<td>.65(+34)</td>
<td>14,304</td>
<td>-</td>
<td>5</td>
</tr>
<tr>
<td>SK</td>
<td>79.7</td>
<td>4.18</td>
<td>-20.3</td>
<td>.60</td>
<td>-</td>
<td>10,419</td>
<td>13,316(+27.8)</td>
<td>1</td>
</tr>
<tr>
<td>Lotte</td>
<td>76.3</td>
<td>3.95</td>
<td>-23.7</td>
<td>.45</td>
<td>.55(+22)</td>
<td>12,055</td>
<td>-</td>
<td>7</td>
</tr>
<tr>
<td>Hanwha</td>
<td>62.3</td>
<td>4.79</td>
<td>-37.7</td>
<td>.54</td>
<td>-</td>
<td>5,119</td>
<td>11,925(+133)</td>
<td>3</td>
</tr>
<tr>
<td>Kia</td>
<td>60</td>
<td>3.75</td>
<td>-39.9</td>
<td>.41</td>
<td>-</td>
<td>3,289</td>
<td>9,010(+174)</td>
<td>8</td>
</tr>
<tr>
<td>Woori</td>
<td>59.1</td>
<td>4.19</td>
<td>-40</td>
<td>.45</td>
<td>-</td>
<td>2,135</td>
<td>9,893(+363)</td>
<td>6</td>
</tr>
<tr>
<td>Samsung</td>
<td>43.6</td>
<td>6.44</td>
<td>-56.4</td>
<td>.51</td>
<td>-</td>
<td>5,348</td>
<td>11,218(+110)</td>
<td>4</td>
</tr>
</tbody>
</table>

In total, eight teams in the KBO were evaluated and only one team, Doosan, turned out to be the efficient team. Doosan ranked second in their final season standings, hence, the team managed to excel both in team performance and operation efficiency. In fact, Doosan used the least amount of total player salary, yet managed to obtain the second most number of average fan attendance and second highest W-L percentage. LG was the team with the second highest score of 84.3 and the number of average fan attendance was the highest among all teams. However, the amount of total player salary was the third highest in the league and a sub-par W-L percentage was the reason that placed them on second in operation efficiency. Thus, a 34% increase on W-L percentage was required for higher efficiency. SK and Lotte are the two teams from the upper half of the evaluation, scoring in the range of 70s. SK scored 79.7 and was the top team in the final standings and W-L percentage; however, the size of the total player salary was relatively larger than Doosan and the number of average fan attendance was relatively lower than both Doosan and LG. Thus, SK needs to reduce 20.3% from its spending on total player salary and improve the number of average fan attendance by 27.8% in order to gain higher efficiency. Lotte scored 76.3 and has the third most number of average fan attendance and the second lowest amount of total player, however, the team finished seventh place in the final standings, and thus an increase of 22.1% in W-L percentage and a reduction of 23.7% on total
player salary is suggested for higher efficiency. The bottom of the four starts from Hanhwa with a score of 62.3. In the final standings, Hanhwa was ranked third, however, the amount of money spent on total player salary was the second most in the league. In addition, the number of average fan attendance was second from the last. In order to obtain higher efficiency, Hanhwa requires cutting 37.7% on total player salary and increasing the number of average fan attendance up by 132.9%. In the meantime, Kia and Woori need to reduce 40% on total player salary and increase 174% and 363% on average fan attendance, respectively. Samsung, the team with the lowest efficiency score, 43.6, spent two times more than Doosan, moreover, the number of average fan attendance is the third lowest and the W-L percentage is only the fourth highest among all teams. Therefore, a 56.4% reduction in player salary is needed and a 110% increase on average fan attendance is suggested for efficient operation.

Table 3. Korean Basketball League

<table>
<thead>
<tr>
<th>Teams</th>
<th>Efficiency Score(%)</th>
<th>Player Salary*</th>
<th>Target Expense (%)</th>
<th>W-L %</th>
<th>Target W-L %</th>
<th>Avg. Fan Attendance</th>
<th>Target avg. Fan Attendance(%)</th>
<th>Final Standing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dongbu</td>
<td>100</td>
<td>1.57</td>
<td>-</td>
<td>.70</td>
<td>2,874</td>
<td>-</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>SK</td>
<td>100</td>
<td>1.3</td>
<td>-</td>
<td>.54</td>
<td>5,844</td>
<td>-</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>KCC</td>
<td>87.6</td>
<td>1.6</td>
<td>140(-12.4)</td>
<td>.61</td>
<td>4,120</td>
<td>-</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>ETLAND</td>
<td>86.9</td>
<td>1.42</td>
<td>123(-13)</td>
<td>.54</td>
<td>3,563</td>
<td>-</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>Samsung</td>
<td>77</td>
<td>1.8</td>
<td>139(-23)</td>
<td>.59</td>
<td>4,906</td>
<td>-</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>KT&amp;G</td>
<td>76</td>
<td>1.65</td>
<td>126(-24)</td>
<td>.56</td>
<td>2,809</td>
<td>-</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>LG</td>
<td>72</td>
<td>1.78</td>
<td>128(-28)</td>
<td>.54</td>
<td>5,574</td>
<td>-</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>KTF</td>
<td>61</td>
<td>1.72</td>
<td>105(-39)</td>
<td>.44</td>
<td>4,187</td>
<td>-</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Movis</td>
<td>51</td>
<td>1.2</td>
<td>61(-49)</td>
<td>.26</td>
<td>2,458</td>
<td>-</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>Orions</td>
<td>37</td>
<td>1.70</td>
<td>63(-62)</td>
<td>.22</td>
<td>2.6(+18.5)</td>
<td>2,863</td>
<td>10</td>
<td>10</td>
</tr>
</tbody>
</table>

There are currently ten teams in the KBL and two teams were evaluated as efficient teams, Dongbu and SK. In the meantime, no teams were placed in the 90s range. KCC scored 87.6 and a reduction of 12.4% on total player salary was suggested. In the meantime, ETLAND scored 86.9 and required to cut 13.1% on total player salary. Samsung was able to retain the third highest number of average fan attendance and W-L percentage; however, the team spent the most on player salary. Thus, a reduction of 22% on total player was required in order to perform higher efficiency. LG scored 72.2, in fact, the team has the same W-L percentage
as SK and ETLAND, however, the amount of player salary is higher than the two teams. Although LG has the highest number of average fan attendance, the second largest amount of player salary and an ordinary W-L percentage were the reasons for the setback. The number of average fan attendance for KTF is the fourth most in the league, however, the W-L percentage is the third lowest and the amount spent on player salary is the third highest. Therefore, 39% on total player salary was suggested to be reduced for higher efficiency. Movis and Orions are placed in the final two spots in the bottom. While Movis required improvement on reducing player salary by 48.8%, Orions required a reduction of 62.8% on player salary and an 18.5% improvement on W-L percentage, in addition, Movis and Orions ranked tenth and eighth in number of average fan attendance.

Discussion

According to the study by Carmichael and Thomas (1995), efficient teams in the first division rugby league in England were not the ones that performed greatly during the regular season. In fact, there were teams from the second division that made wise use of resources and obtain higher efficiency than some teams in the first division. In addition, Hass (2003) discovered that teams with higher game performance level did not obtain high efficiency in the German football league and concluded that efficiency scores did not correlate with the final ranks of the season. Porter and Scully (1982) studied the managerial efficiency of MLB over the period 1961 to 1980 and found that the correlation between managerial efficiency and win record is by no means perfect. Meanwhile, Kang, Lee, and Kwon (2007), denote that teams with relatively less financial resources will have very little chance against the richer teams as far as overall game performance is concerned since the richer teams are capable of constantly acquiring high profile players. However, this does not necessarily mean that richer teams are also capable of efficient management. In fact, financially inferior teams have displayed higher efficiency scores in the evaluation and wealthier teams were criticized for wasting resources and not performing to its maximum potential.

The results from this study support the general notion from the previous researches that management efficiency is not always correlated with game performance and that managers need to understand the wise use of resources is
prominent in achieving high level of both game performance and management efficiency.

For instance, Sungnam in the KFA (Korea Football Association) finished on top in the regular season; naturally, the team has the highest winning percent, however, spent tremendous amount of money to acquire high profile players and coaching staffs. Consequently, the team was successful in game performance; however, not successful in efficient team management as they failed to gather fans to the stadium in regards to the money they had spent. In other words, Sungnam wasted its resources too much to get on top. In the meantime, Daejeon and Daegu were the two teams with the lowest total expenditure size among all teams. Consequently, they had not enough financial power to dispense on recruiting high profile players; as a result, both teams’ final standings at the end of the regular season were sixth and second from the bottom, respectively. In the meantime, the two teams managed to be the top two efficient teams by outperforming all others in maintaining large number of average fan attendance relative to their low budget. This implies that a team with no high paid star players and low game performance is still capable of inducing the fans to visit the stadium. It is possible that comprehensive marketing tactics or building loyal fan base activities have played a significant role in the case of the two teams’ success. On the contrary, Jeju is one example that failed greatly in resource management. The team had mediocre budget that was not enough to employ high profile players for superior game performance but at the same time not a thrifty amount that would benefit team efficiency. The message in the case of Jeju is that either the management would have to spend enough money to aim for high team performance, since some teams strategically set their goal for high performance, or spend less as possible and aim for efficiency. Positioning the team in the middle of nowhere is not an ideal strategy.

In the case of the KBO (Korea Baseball Organization), it is possible that Doosan was able to acquire players with quality skills with relatively less amount of financial resources and utilized effective marketing strategy to gain fans. Lotte ranked seventh at the end of the regular season, however, the team managed to be ranked fourth in the evaluation. Obtaining relatively high efficiency score was possible because average number of fan attendance was the third most in the league. Historically, Lotte is known to have loyal fan base regardless of game performance due to strong bonding between the team and the hometown. Despite a below average W-L percentage and relatively high salary, Lotte was able to score high in
efficiency score due to its large amount of fan attendance influenced by strong relationship between the team and the local fans. In the meantime, Samsung spent twice as much than Doosan on player salary; however, the outputs were not twice as much. In fact, the W-L percentage is just average and the number of average fan attendance is not even close to the numbers of the top four teams. Samsung spent tremendous amount of money only to be ranked fourth in the final standings and last in the evaluation. In the meantime, the difference between the team with the lowest W-L percentage and the team with the highest is only 0.19 and all teams’ W-L percentage fall in the range between .41 and .60. This can be explained that there was not a dominant team or an inferior team in this particular season. Based on this fact, the game performance of each team can be viewed as relatively even. Thus, the outcome of the DEA evaluation was focused relatively more on improving average attendance.

In the KBL (Korean Basketball League), the number of average fan attendance for Dongbu is third from the bottom, however, the team managed to maintain the highest W-L percentage during the season while spending the fifth highest amount of player salary. As for SK the W-L percentage is mediocre, however, the amount spent on total player salary was the second lowest in the league and had the highest number of average fan attendance. Both teams managed to operate efficiently in different ways. Dongbu was able to obtain superior W-L percentage while SK was able to obtain superior number of average fan attendance. Although Dongbu is an efficient team, it may not be the best model to advocate since the reason for success is primarily based on high W-L percentage. The number of average fan attendance is below average, in fact, it is two times lower than the highest team. Dongbu was winning most of its games; however, game performance did not have much impact on fan attendance. The team is not balanced in performance and needs to improve areas such as marketing or fan relationship management in order to increase the number of fan attendance. SK on the other hand, may not have the highest W-L percentage in the league; however, the team has the highest number of average fan attendance and second least amount of player salary. SK is more efficient in a financial sense since fan attendance is directly related to ticket sales. Compared to Dongbu, SK used less resources to gain twice as much output.

Comparing the three leagues collectively, a common trend is that wealthier teams such as Sungnam (KFA) and Seoul (KFA), Samsung (KBO), and KTF and Orions (KBL) did not perform to their maximum potential relative to their spending
amount. The teams, either, failed to acquire large number of fans or displayed poor game performance, or both. The reason for such failure is that wealthier teams spend too much money on acquiring high profile players and do not allocate enough resources on other management activities, instead, managers dwell on the thought that winning is the only main factor that will allure fans to the stadium, which is not always true.

Furthermore, efficiency scores of all three leagues indicate that teams in the KFA are operating relatively less efficient than teams in the other two leagues. The average efficiency score for KFA is 53.6 while KBO is 70.7 and KBL is 74.9. In the KFA, no teams are in the 70s and 80s range. In addition, more than half of the teams scored less than 50 and the team with the lowest score was 34.5. On the other hand, KBO and KBL produced only two teams under 50 and the team with the lowest efficiency score in both leagues combined was 37. The main reason KFA displayed relatively less efficient as a whole is due to larger disparity in total expenditure compared to other leagues. On the contrary, KBL operates under the salary cap system, which is set at $1.8million (USD). KBL produced two efficient teams and all teams scored above 50, except Orions, and the aggregate efficiency score was the highest. Only one team was recommended to improve W-L percentage and no teams were required to improve average fan attendance. In addition, the suggested target expense percentage is quite evenly distributed among all teams. Due to the salary cap system, teams are evenly distributed in total player salary expenditures. In turn, on average, teams in the KBL are managed relatively more efficient than the teams in the KFA or KBO.

Conclusion and Recommendation

The study recognized a common trend in all three leagues. Wealthier teams not only in one league, however, in all three have performed poorly in the evaluation. The teams that spent most money on either total expenditure or player salary ranked at the bottom of the evaluation, indicating that the teams vastly wasted their resources only to perform at mediocre level. The results of the DEA suggest that conventional thinking of merely possessing high profile players and winning games will naturally induce fans to the stadium is an immature thought. In fact, acting upon this thought will eventually lead teams into operation inefficiency and nurture
economic disparity within the league. Hence, managers need to utilize creative and scientific strategies such as utilizing new technology, improving targeting efforts, using creative financing, implementing relationship marketing, utilizing adjacent stadium facilities, and increasing synergy in order to thrive.

For instance, recent cases of SK Wyverns and Lotte Giants from the KBO offer examples of creative strategy. SK Wyverns baseball team recently developed a motto “Sportainment (sport+entertainment)” in order to bolster their marketing efforts. The idea is to provide additional fun by combining entertainment to sports. This is done via upgrading seats, converting empty spaces into family, dining, and exciting zones, promote various shows and programs during the game, facilitate media display infrastructure, and reengineering the park to resemble an amusement park. In return, team witnessed an increase of 80% in number of fan attendance than the previous year, the highest in the KBO. Moreover, Lotte Giants detoured from a traditional mindset of team management. The significant change was first made in the coaching staffs by employing a foreign coach, followed by redesigning, expanding, and tailoring team merchandise according to the needs of the fans. The new attempt in merchandising strategy led to partnerships with local firms and opened doors for aggressive co-marketing opportunities. As a result, the online shopping website was shut down at some point due to exploding transactions and shops adjacent to the stadium recorded sales that was worth 25% of previous year’s total, during the opening game.

Another prominent trend detected from analyzing the three leagues collectively was that a league with a salary cap system scored the highest in aggregate efficiency score, KBL. This implies that economic parity effectively controls and restricts teams from over spending and not performing up to their potential. However, there is lack of institutional control to avoid financial disparity in leagues such as the KFA and KBO. Wealthier teams continuously sign high-cost contracts in order to reap the benefits of immediate popularity and success only to later find themselves in financial difficulty because of it. This in turn, jeopardizes the entire league not only to lose financial security but it also handicaps the sport from prospering. For this reason, the need for economic parity is even more pronounced. Hence, either the salary cap system or other policies such as luxury tax, limit to free agent salary, or a combination of diverse policies must be implemented to control cost and induce efficient management system.

Meanwhile, the result of the analysis does not imply that teams must decrease or
increase the exact portion (figures) that DEA suggests, rather it helps to know where the team is positioned in the league and provides an idea where and how much needs to be improved compared to other teams. For instance, if a baseball team with nine players cuts player salary as suggested by DEA and it results into having less than nine players in the team then it is not a baseball team anymore. Obviously, this kind of logic does not make sense, rather the team should release a player with high salary and get two for the money, or hire a less expensive player who can contribute to the team in different ways; find ways to produce better outputs with the same payroll such as effective training sessions or changing the head coach. A trade or recruiting a younger player for future success can be another option. In other words, DEA only provides the relative efficiency of the team, the results should not be taken literally, and actions need to be taken in a reasonable manner.

In the meantime, the study was restricted in using Total Expenditure of KBO and KBL as input item due to undisclosed information. This in fact reduced the clarity of the information that needs to be brought out to the readers. It also diminished the potential and the impact of the study when it comes to educating the public in regards of efficient management among professional teams in Korea. It is regretful to mention this incident as a limitation since information as such in other parts of the world is open to the public. It is a shame that teams speak on behalf of their teams of becoming one of the greats such as Manchester United in the English premier league yet the most important action as a first step towards greatness, transparency, is ignored. Thus, this paper strongly recommends teams to disclose their financial information to the public in order to allow researchers and scholars to investigate and study the problems at hand and discover practical solutions for the betterment of all.

Meanwhile, as for future studies, DEA analysis can further stretch down into the micro level and analyze individual players such as a baseball pitcher’s relative efficiency compared to other pitchers in the league. On the other hand, on a macro sense, DEA can be utilized in private and participant sport organizations such as fitness centers, local amateur teams, health care centers, and sport facilities.

Moreover, different input and output variables such as stadium capacity ratio, hometown population, marketing expenditures, and so on can be applied in the evaluation as well as applying weights to the items. In addition, the more the number of teams to be evaluated the more the number of input and output items
can be applied. There are much more number of teams in the professional leagues in North America or European countries than in Korea, thus, a more sophisticated and detailed efficiency evaluation is possible.

References


