

The Effectiveness of CRM Approach in Improving the Profitability of Korea Professional Baseball Industry Measured by Entropy of ID3 Decision Tree Algorithm

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Abstract

Korea professional baseball industry has grown to take the lion's share of the domestic sports industry, but still does not make break even. The purpose of this study is to examine the financial impact of adopting the Customer Relation Management (CRM) approach on the profitability of Korea professional baseball industry. We use a measuring tool called entropy used in ID3 decision tree algorithm.

In the paper, we specify five the most important factors that affect spectator satisfaction based on the previous literature, perform survey analysis, calculate entropy values, and find the results. We predicted the change in revenues when we adopt CRM by checking the spectators' willingness to pay more when the conditions of each factor are improved. We find that we can reap significant fruits of the effect of CRM introduction through enhancing 'game content factor' and 'game promotion factor' among the five factors. We also find that we can increase the revenues of domestic professional baseball teams to 2.4 times or 2.1 times the current level if we manage intensively those two factors, respectively. It is very surprising to see that the improvement in total revenues makes both ends meet for domestic professional baseball teams. This clearly demonstrates the effectiveness of CRM approach in improving the profitability of organizations.

Keywords : CRM, Profitability, Entropy, Professional Baseball Industry, Spectator Satisfaction

1. Introduction

The number of spectators of Korea professional baseball game has shown a steady growth to reach 6 million people during 2010 season. As a result, the revenues of Korea professional baseball teams in 2010 have also increased to four times those of 2006 as <Table 1> shows. This trend may be due to the good performances of Korean national baseball team in both the World Baseball Classic and Beijing Summer Olympic Games and the remarkable activities of Korean major players in foreign professional baseball leagues.

Despite the steady growth, the revenues of domestic professional baseball industry are showing red numbers yet and it is not making both ends meet. This is the first reason that domestic professional baseball industry must find ways to boost their revenues. Besides, this is also an important issue nationally because the growth of domestic professional baseball industry contributes to the vitality of local economy where baseball games are played and the growth of related industries [Korea Sports

Promotion Foundation's report, 2010].

It is well known that customer satisfaction is developed to customer loyalty which will also increase the number of visits, unit price of product, and duration of usage when they visit. Lee [2010] recently studies the relationship between team variables (team attraction and team involvement) and behavioral team loyalty in a pro-baseball and finds that psychological commitment and resistance to change mediate between team variables and behavioral team loyalty in a pro-baseball. The qualitative enhancement together with the quantitative increase of customer reduces marketing expenses and strengthens the negotiating power of sellers [Lee and Seo, 2003]. The extent of satisfaction and immersion of sports spectators affect their decisions on whether they visit again or not. So enhancing the extent of satisfaction and immersion of spectators reduces the risks and costs related to new product development and waste of resources in sports industry [Kim, 2008].

The introduction of Customer Relation Management, CRM makes it possible to under-

<Table 1> Yearly Spectators, Unit Price and Revenues¹⁾

Year	Number of Games (games)	Number of Spectators (persons)	Average Unit Price (won)	Revenues from Spectators (won)
2006	504	3,040,254	3,498	10,641,941,525
2007	504	4,104,429	4,042	16,589,937,300
2008	504	5,256,332	4,738	24,903,698,100
2009	532	5,925,285	5,708	33,821,251,600
2010	532	5,928,626	6,952	41,214,148,900

1) www.koreabaseball.com Annals of 2011 Professional Baseball.

stand specific desires and types of spectators in sports business. As you can see in the previous studies, the purpose of CRM is to develop and enhance value from customers. Although domestic professional baseball market succeeded in attracting more spectators and generating more revenues recently, it still has to advance further to make both ends meet. Therefore, this paper tries to suggest how to increase the profitability of domestic professional baseball teams by showing the possibility of changing the perception of spectators who were just regarded as unspecified multitude into loyal customers who will provide lifelong value through the adoption of CRM approach.

2. Definition and Objective of CRM

Previous marketing focused on publicity and advertisement of products without specific analysis of customer information. However, new marketing activities appear as firms have realized the limitations of traditional marketing activities in enhancing their profitability and CRM is one of them.

CRM is defined as a series of activities that restructure the processes of sales, marketing and customer service based on the understanding of customers. CRM is a process of measuring and verifying the efficiency and effectiveness of marketing strategy and programs developed by collecting customer information through various sources and based on which by analyzing customer behavior. CRM can also be viewed as the activities to improve and automate the processes in customer management area

such as data collection and service.

Now, thanks to the development of information technology, it is possible to measure customer value by individual customer unit and develop efficient ways to implement and maintain the relationship with loyal customers. CRM eventually helps firms generate steady profits by providing them with new definition, efficient grouping, and more development of customers and new ways of reducing costs and improving sales unit price. The objective of CRM is to start an efficient customer management, develop a long-term relationship with customers throughout their lifespan, and eventually generate more profits by so doing.

3. Characteristics and Success Factors of Korea Professional Baseball Industry

One of the characteristics of modern professional sports is that they cannot be separated from commercial viability. In domestic professional baseball sports industry, big conglomerates monopolize the markets to enhance their brand and company image and enjoy economic benefits derived indirectly or invisibly from owning and operating their own teams as well, although they claim that they are losing lots of money in operating their teams.

The quest for profit through sports is working as a common factor in all sports and various ways for increasing profit are proposed in marketing field. Among them, 'sportainment' gains a spotlight recently. The nexus of sportainment is to maximize the demand for sports by adding

a 'fun' element to games in selling sports products [Kang and Kim, 2009].

According to Jeong [2008], sports industry has the following commercial aspects : First, sports activities are one of many business activities to maximize profits. Second, sports activities try to achieve a financial independency by making both ends meet even though they do not have the objective of accumulating money. Third, sport activities help to make profits indirectly through sales and services for sports instruments. Fourth, organizations which are unrelated with sports activities pursue economic profit by sponsoring them.

We need to study on what benefits spectators want to get as well as what they want to see in games. Based on the study, we can develop marketing programs that can satisfy the expectations of spectators through various events and fan services. In his recent paper, Kim [2010b] claims that the management of professional baseball franchises and Korean professional baseball federation need to develop marketing programs in terms of spectatorship motives. Therefore, it is very essential to identify what factors are important in spectator satisfaction.

3.1 Satisfaction Factors of Spectators

The reason that spectators watch games is to get satisfactions by watching games. So we need to define the factors of satisfaction that spectators are seeking by watching games. We categorize the factors of spectator satisfaction into five based on the following previous studies.

They are proximity, crowdedness, cleanness, game content, and game promotion.

Kim [2008] categorizes the factors of spectator satisfaction into arena facility, game content, and game promotion. The arena facility satisfaction indicates not only such factors as geographic proximity to arena, parking space, public transportation, toilets, auxiliary facilities, but also comfortable exterior appearance and proper control on drinking, making noise and violence. The game content satisfaction indicates whether or not star and favorite players appear, whether it is well-organized, teamwork, dynamics, etc. The satisfaction of game promotion indicates publicity of game and players, giving away free gifts, free entry event, promotions such as sales in arena shops and entry fee discount.

Lee et al. [2001] defines five factors of spectator satisfaction : arena facility, game content, fan service, overall stadium atmosphere, and fun. He explains the arena facility factor by proximity and crowdedness and also the game content factor by players and importance of a game. Jeong [2005] considers arena, promotion, fun, and players as factors that affect spectator satisfactions.

(1) Proximity

This factor covers such things as geographical location, accessibility of public transportation, spacious parking facility, and easiness of entry and exit [Bitner, 1992].

(2) Crowdedness

Such things as compact seat arrangements, small exits, and improper signs cause negative

reaction from spectators [Lee et al., 2001]. Kim [1999] gives the similar explanations to [Lee et al., 2001]'s with saying that efficient space allocation and proper sign enhance the comfort of spectators.

(3) Cleanness

Kim [1999] also says that cleanness of facility inside and outside stadium, for example, toilets and shops affects the willingness of spectators to visit the stadium again.

(4) Game Content

Game content includes such things as players, team, performance record, accuracy of umpire judgement, and rivalry relationship among teams. Kim [2010a] claims that team attribute should be considered because it affects directly and indirectly spectator satisfaction and loyalty on team. Team attribute is known as a critical factor for spectators to decide the specific team they would prefer and choose which game they watch.

(5) Game Promotion

According to Kim [2010a], this factor includes giving away free gifts, free entry on specific dates and for specific persons, and entrance fee discount service.

3.2 Satisfaction of Spectators and Revisit

From the previous studies we can find that team favor influences positively on revisit decision of spectators. However, there are some differences in the degree of influence of team favor

among them. Lee et al. [2001] claims that game content, arena, and game promotions directly influence on revisit decisions, but companion, life style, and team favor indirectly influence on it. However, Beatty et al. [1988] argue that team favor is a major factor directly influencing on revisit decisions. On the other hand, Wann and Branscombe [1993] interpret that team favor is a representation of sense of belonging to a team and players, and find that it has a strong relation with an attitude factor.

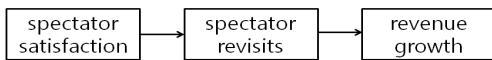
For our professional baseball teams, there are many fan clubs that favor specific team or team player. Since these clubs are formed to support specific team or player, they visit arena whenever there is a game for their favorite team or player, regardless of game content or result. Lee et al. [2001] claims that each team should introduce and magnify membership program aiming at specific fan clubs, provide differentiated events, and establish the image as a regional team to pull their team favor up.

It is also important to provide spectators with convenience and comfort by offering roomy parking space and seats and keeping arena stores and toilets as clean as possible in order to increase spectator satisfaction.

However, the most important thing for making them visit again is the game content factor because they visit stadium to watch games above all. So teams should do their best to nurture and dig out star players, enhance game performance, and umpires also should make great efforts to increase the accuracy of their judgement.

Therefore, based upon the above literature, we

conclude that spectator satisfaction increases the possibility of revisits and, as a result, team income will also grow, which is illustrated in <Figure 1>.



<Figure 1> Drivers of Revenue Growth for Baseball Teams

3.3 Financial Status of Domestic Professional Baseball Teams

The number of spectators of Korea professional baseball games has steadily grown from 3 million to 6 million people during last four years since 2006. The compounding growth rate of spectators during this period is 18.2% annually. For the same period, the unit price of entry ticket has increased from 3,498 to 6,952 won, which shows the annual compounding growth rate of 18.7%. As a result, the revenues of Korea professional baseball teams have grown remarkably from 10,642 million to 41,214 million won, which gives the annual compounding growth rate of 40.3%. <Table 1> summarizes the results.

However, as you notice in <Table 2>, the revenues of eight domestic professional baseball teams still are not enough to cover the operating expenses and make break even. <Table 2> shows brief income statements of eight domestic professional baseball teams. As of 2008, all the revenues of Korea professional baseball teams were estimated to record about 200 billion won, of which 76% were used for the cost of goods sold (COGS), and 26% were used for the

selling and administration (S&A) expenses. As a result, earnings before interest and taxes (EBIT) recorded negative amount of -4 billion won (-2% of revenues)²⁾.

<Table 2> Abbreviated 2008 Income Statement of Korea Professional Baseball Teams

Category	Amount (billion won)	Proportion (%)
Total Revenue	200	100
Direct Revenue	50	25
Spectators	30	15
Commercial	20	10
Indirect Revenue	150	75
Broadcasting	16	8
Group Support	134	67
- Cost of Goods Sold	152	76
- Selling and Administration Expenses	52	26
= Earnings Before Interest and Taxes	-4	-2

Total revenues of Korea professional baseball teams are decomposed into direct and indirect revenues. Direct revenues have two sources : one from spectators entry and the other is commercial revenues such as rent paid by stores, product sales in arena and user fee for advertisement spots. Indirect revenues also have two sources : one from broadcasting fees evenly distributed by the Korea Baseball Organization (KBO) and the other is support from conglomerates that own the teams.

As of 2008, direct revenues of Korea pro-

2) <http://sports.media.daum.net> (Yoon Pil Sang).

fessional baseball teams accounted for 25% of total revenues (50 billion won) and the remaining 75% of total revenues (150 billion won) came from indirect revenues. One of the major problems in revenue structure of Korea professional baseball teams is that 67% of total revenues came as team support from conglomerates. And the other major problem is the portion of spectator revenues is so low as to explain only 15% of the total revenues. The observations make it essential and urgent to increase the number of spectators with the unit price increase per spectator to reach a break-even point. To accomplish this, our professional baseball teams should enhance spectator satisfaction which results in spectator revisits. This is what the paper is trying to suggest through CRM approach. However, together with the endeavor to increase revenues, great efforts to reduce both COGS and S&A expenses by professional baseball teams should be accompanied as well.

To specify which factors affect spectator satisfaction most, the paper chooses five factors such as proximity, crowdedness, cleanliness, game content, and game promotion. After finding out the relative importance of each factor, we show the effect of introducing CRM approach on the profitability of domestic professional baseball teams.

4. Research Methodology

4.1 The Sample

As the population of the sample, the study set the spectators who visited Jamsil Baseball

Stadium to see the penant race of 2011 professional baseball. Samples were collected from the spectators who saw two different games on the same day. For each game, fifty questionnaires were circulated using simple random sampling method and ninety two questionnaires were used as the sample for the analysis because we were concerned about the credibility of eight questionnaires.

We modified the survey items used in Lee and Seo [2003], Cho [2003], Kim et al. [2006], Choi [2006], Yun [2008], and Hur [2002] to match them to our research purpose and after preliminary survey, amended and supplemented them to finalize. The survey questions are classified to two categories : one for demographic characteristics and the other for five satisfaction factors for spectators specified in section 3.

4.2 Measuring Tool

To extract the factors that can have big CRM effects among the five satisfaction factors for spectators, we apply entropy used in ID 3 decision tree algorithm to our problem.

CRM is the approach to prepare strategic alternative solutions to the problems we face by analyzing and predicting the behaviors of target customers. However, CRM cannot be effective financially if the dispersion of distribution is too high when we classified target customers because the characteristics of customers included in each category are too diverse to prepare proper action plans for those customers with small costs. Consequently, it is important to check whether we can achieve desirable CRM effects

by looking at the possibility of inadequate classification due to randomness, which can be found by measuring entropy of target customers. After this, among the alternatives we found, we select the one that maximizes the financial performance.

In the process of analysis, some attributes split the data up more purely than others. This means that their values correspond more consistently to the instances that have particular values of the target attribute (the one we want to predict) than those of other attribute. Therefore, we may say that such attributes have some underlying relationship with the target attribute. However, to quantify this idea, we would like to have some measure that enables us to compare attributes to each other and then to select ones that split the data more purely higher up the tree.

A measure used from Information Theory in the ID3 algorithm and many others used in decision tree construction is that of entropy. Informally, the entropy of a dataset can be considered to mean how disordered it is. It has been shown that entropy is related to information, in the sense that the higher the entropy, or uncertainty, of some data, then the more information is required in order to completely describe that data. In building a decision tree, we aim to decrease the entropy of the dataset until we reach leaf nodes at which point the subset that we are left with is pure, or has zero entropy and represents all instances of one class (all instances have the same value for the target attribute).

We measure the entropy of a dataset, S , with respect to one attribute, in this case the target

attribute, with the following calculation :

$$Entropy(s) = - \sum_{i=1}^C p_i \log_2 p_i$$

where p_i is the proportion of instances in the dataset that take the i th value of the target attribute, which has C different values.

This probability measure gives us an indication of how uncertain we are about the data. And we use a \log_2 measure as this represents how many bits we would need to use in order to specify the criterion based on which we determine classes. Now, we want a quantitative way of seeing the effect of splitting the dataset by using a particular attribute (which is part of the tree building process). We can use a measure called Information Gain, which calculates the reduction in entropy (gain in information) that would result from splitting the data on an attribute, A .

$$Gain(S,A) = Entropy(S) - \sum_{v \in A} \frac{|S_v|}{|S|} Entropy(S_v)$$

where v is a value of A , $|S_v|$ is the sample size of the subset of instances of S where A takes the value v , and $|S|$ is the sample size of instances of S .

Now, we can see which attribute splits the data more purely. If we want to select an attribute for the root node, then we perform the above calculation for all attributes.³⁾

3) <http://www.decisiontrees.net/?q=node/27>.

4.3 Survey Reliability

Survey reliability means the variance of different values for each factor when it is repeatedly measured. The paper uses Cronbach α coefficient to measure confidence of survey. Cronbach α coefficient is defined as ‘{number of items÷(number of items-1)}×{1-(sum of variances of items÷variance of the whole sample)}’.

Cronbach α coefficient can take values between zero and one and the higher the value, the more reliable the item. Usually, if an item’s Cronbach α coefficient has values between 0.8 and 0.9, we say that the item is very reliable, and if it has value above 0.7, the item is regarded as reliable. The reliability of satisfaction factors of spectators is given in the following <Table 3>. Based on the results given in <Table 3>, we say that ‘cleanness factor’ and ‘game promotion factor’ are the most reliable, and ‘crowdedness factor’ is reliable, but ‘proximity factor’ and ‘game content factor’ are a little less reliable.

<Table 3> Cronbach α coefficients for factors

Factor	Cronbach α	Number of Questions
proximity	.647	5
crowdedness	.728	5
cleanness	.873	5
game content	.644	12
game promotion	.804	9

4.4 Survey Method and Data Processing

After distributing questionnaires titled “survey on spectator satisfaction about domestic professional baseball” to the spectators and using

self administered method, we collected the completed questionnaires immediately on the spot. Surveys were done in and out of the stadium and before and in the middle of the games. Among the collected questionnaires, we excluded the ones that have either no answers on some questions or many answers on the same questions. SPSS 18.0 was used for the analyses for confidence and frequency.

4.5 Analysis of Results

<Table 4> summarizes the demographic characteristics of our sample data. Males are more

<Table 4> Demographic Characteristics of Samples

		Frequency (Persons)	Percentage (%)
Sex	Male	55	59.8
	Female	37	40.2
	Sum	92	100
Age	10’s	3	3.3
	20’s	39	42.4
	30’s	30	32.6
	40’s	20	21.7
	Sum	92	100
Average Monthly Income ⁴⁾	less than 1.5	8	8.7
	less than 2.5	15	16.3
	less than 3.0	10	10.9
	less than 4.0	20	21.7
	more than 4.0	39	42.4
	Sum	92	100
Job	Sales/Service	8	8.7
	Self Business	8	8.7
	Office/Technical	18	19.6
	Management	6	6.5
	Professional	7	7.6
	Housewife	3	3.3
	Student	26	28.3
	Other	16	17.4
	Sum	92	100

4) million won.

than females. Regarding age groups, twenties, thirties, forties, and tens are in a decreasing order. We guess that teenagers most of whom are middle and high school students are not that many in the sample because we collected data in the evening on week days. There are many salary men and college students instead. The average monthly income of the sample is a little high since there are many people aged between 30's and 40's who have a relative economic stability.

<Table 5> shows mean and standard deviation and number of questions of factor items of spectator satisfaction. Questions are made based on five points Likert scale. When responding to a Likert questionnaire item, respondents specify their level of agreement or disagreement on a symmetric agree-disagree scale for a series of statements. Each question has '① very high', '② high', '③ average', '④ low', '⑤ very low', so a lower average value means a higher satisfaction of spectators on the factor.

According to <Table 5>, under the current conditions, respondents are satisfied the most with 'game promotion factor', 'game content factor', 'proximity factor', 'crowdedness factor', and the least with 'cleanness factor.' We also asked how much they would be willing to pay for the seat they usually purchased or on the

day if satisfactory conditions would be provided for all the five factors. We offered them current prices based on the average prices on weekdays and weekends in Jamsil Stadium and also price lists that were calculated by current prices multiplied by 1.5, 1.8, 2.0, 2.2, and 2.5 for each level of seats. <Table 6> shows the price list for different seat levels.

<Table 5> Mean and Standard Deviation of Likert Scale Values of Factors

Factor	Mean	Standard Deviation	Number of Questions
Proximity	2.60	0.99	5
Crowdedness	2.76	1.05	5
Cleanness	3.16	0.92	5
Game Content	2.15	1.13	12
Game Promotion	2.05	1.00	9

<Table 6> shows the results of respondents' answers. When we want to classify spectators based on their preferences for each factor and know their desires, we first calculate entropy of each factor to examine the randomness of each factor, using the results in <Table 6>.

- Entropy (proximity factor) = 0.587545,
- Entropy (crowdedness factor) = 0.941695,
- Entropy (cleanness factor) = 0.998636,
- Entropy (game content factor) = 0.52811,
- Entropy (game promotion factor) = 0.641541.

<Table 6> Price List for Different Seat Levels (Won)

Seats	Current	1.5X	1.8X	2.0X	2.2X	2.5X
Yellow	8,500	13,000	15,000	17,000	19,000	21,000
Red	11,000	17,000	20,000	22,000	24,000	28,000
Blue	14,000	20,000	24,000	27,000	30,000	34,000
Table	35,000	53,000	63,000	70,000	77,000	88,000

From the well-known fact that if entropy value is less than 0.7, the item has significant consistency, we can find out the characteristic of spectators consistently when we focus on and analyze ‘proximity factor’, ‘game content factor’, and ‘game promotion factor.’ Looking at <Table 6.1>, while ‘proximity factor’ has a low entropy value, it is slanted towards spectators who do not want to pay more than double the current price. So we know that spectators have no intentions of paying more for the enhancement of proximity factor. However, because the survey results are slanted towards spectators who want to pay more than double the current price in the cases of game content factor and game promotion factor, we know that we can accomplish a significant CRM effect through enhancing these two factors.

<Table 6.1> Number of Spectators Who Pay More or Less for Proximity Factor

Proximity	Persons	Percent
Less than twice	79	85.8
More than or equal to twice	13	14.2

<Table 6.2> Number of Spectators Who Pay More or Less for Crowdedness Factor

Crowdedness	Persons	Percent
Less than twice	59	64
More than or equal to twice	33	36

<Table 6.3> Number of Spectators Who Pay More or Less for Cleanness Factor

Cleanness	Persons	Percent
Less than twice	48	52
More than or equal to twice	44	48

<Table 6.4> Number of Spectators Who Pay More or Less for Game Content Factor

Game Content	Persons	Percent
Less than twice	11	12
More than or equal to twice	81	88

<Table 6.5> Number of Spectators Who Pay More or Less for Game Promotion Factor

Game Promotion	Persons	Percent
Less than twice	15	16
More than or equal to twice	77	84

Now, we can do an experimental revenue analysis to find out the effectiveness of CRM introduction, based on how much more they are willing to pay when the conditions of the above two factors are improved. <Table 7.1>

<Table 7.1> CRM Effect of Game Content Factor

	Persons	Current	New
1.5X	2	17,000	25,500
	2	22,000	33,000
	0	0	0
	0	0	0
1.8X	3	25,500	45,900
	2	22,000	33,600
	1	14,000	25,200
	1	35,000	63,000
2.0X	1	8,500	17,000
	0	0	0
	1	14,000	28,000
	4	14,000	28,000
2.2X	1	8,500	18,700
	2	22,000	48,400
	1	14,000	30,800
	5	175,000	385,000
2.5X	11	93,500	233,750
	15	165,000	412,500
	19	266,000	665,000
	21	735,000	1,837,500
Sum		1,777,000	4,188,850

and <Table 7.2> show the results. From the <Table 7.1> and <Table 7.2>, we find that we can increase the revenues of domestic professional baseball teams to 2.4 times or 2.1 times the current level if we manage intensively game content factor or game promotion factor, respectively. However, there is a big difference between the <Table 7.1> and <Table 7.2>. Most people selected 2.5 times in the <Table 7.1>, but many people selected 2.0 times in the <Table 7.2>. It shows that most people are willing to spend their money more than twice and half, if the game content are nicer. It also shows that game content is more important than game promotion if we compare the two.

<Table 7.2> CRM Effect of Game Promotion Factor

	Persons	Current	New
1.5X	3	25,500	38,250
	1	11,000	16,500
	1	14,000	21,000
	0	0	0
1.8X	4	34,000	61,200
	1	11,000	19,800
	2	28,000	50,400
	3	105,000	189,000
2.0X	9	76,500	153,000
	7	77,000	154,000
	12	168,000	336,000
	14	490,000	980,000
2.2X	5	42,500	93,500
	4	44,000	96,800
	6	84,000	184,800
	10	350,000	770,000
2.5X	4	34,000	85,000
	2	22,000	55,000
	3	42,000	105,000
	1	35,000	87,500
Sum		1,693,500	3,496,750

In section 3.3, we saw that our professional baseball teams have not reached break-even point yet. However, if the professional baseball teams could double the direct revenues by enhancing game content and promotion to satisfy spectators as we showed in this section, then they would realize positive profits as shown in <Table 8>. <Table 8> is constructed under the assumptions that only direct revenues become twice the one given in <Table 2>, but all the other items there remain the same. In this case, the portion of direct revenues accounts for 40.0% of total revenues up from 25.5% for the previous case and the portion of COGS and S&A expenses combined reduces from 102.0% to 81.6%. As a result, EBIT can increase from -4 billion won to 46 billion won. If we realize that the composition of total revenues between direct and indirect revenues for famous international professional sports team is about 65% vs. 35%

<Table 8> Abbreviated New Income Statement of Korea Professional Baseball Teams (Calculated)

Category	Amount (billion won)	Proportion (%)
Total Revenue	250	100
Direct Revenue	100	40
Spectators	60	24
Commercial	40	16
Indirect Revenue	150	60
Broadcasting	16	6.4
Group Support	134	53.6
- Cost of Goods Sold	152	60.8
- Selling and Administration Expenses	52	20.8
= Earnings Before Interest and Taxes	46	18.4

like that for the Manchester United Football Team, this improvement, of course, would be just the first step, but in the right direction, though.

5. Conclusions and Suggestions

The purpose of the paper is to show the effectiveness of CRM adoption as a solution for generating profits continuously for domestic professional baseball teams. According to the previous studies, satisfaction of spectators affects their decision to visit again. Satisfaction of spectators increases the possibility of revisits, which will increase the number of spectators. So, satisfaction of spectators is an essential key to the growth of baseball team income.

In this paper, we predicted the change in revenue when we adopt CRM by checking the spectators' willingness to pay more when the conditions of each factor are enhanced. To do this, we first calculate entropy of each factor to examine its randomness and then classify spectators based on their preferences for each factor which is meaningful in the sense of consistency measured by entropy and finally, identify what they want.

We find that 'proximity factor', 'game content factor', and 'game promotion factor' have significant consistencies based on their entropy values. Because 'proximity factor' is slanted towards spectators who do not want to pay more than double the current price, we conclude that spectators have no intentions of paying more for the enhancement of 'proximity factor.' However, because the survey results are slanted towards

spectators who want to pay more than double the current price in the cases of 'game content factor' and 'game promotion factor', we conclude that these two factors are the most critical factors for the industry to pay attention to.

We also find that we might increase the revenues of domestic professional baseball teams to 2.4 times or 2.1 times the current level if we could improve successfully 'game content factor' or 'game promotion factor', respectively. It is very surprising to see that the improvement in total revenues in this case makes both ends meet for domestic professional baseball teams. This clearly demonstrates the effectiveness of CRM approach in improving the profitability of organizations including Korea professional baseball teams.

Besides these practical implications, the paper also contributes academically in the following ways : First, the paper attempts an interdisciplinary research among database, management information system, marketing, and finance fields. We try to find out the most important marketing drivers that increase the performance of our professional baseball industry financially through the adoption of CRM approach. Second, the paper applies the entropy measure used in ID 3 decision tree algorithm to our problem since it is important to check whether we can achieve desirable CRM effects by looking at the possibility of inadequate classification due to randomness, which is also a new attempt.

Finally, we conclude the paper with the following limitations among many others : First, the baseball teams need to spend more money to enhance game content factor and game pro-

motion factor. The cost aspect should be considered. Second, to practically implement the suggestions given in the paper, such questions as when, how, and how much the baseball teams should enhance game content factor and game promotion factor should be answered.

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〈Appendix〉 국내 프로야구 관람만족도에 관한 조사

안녕하십니까?

먼저 본 연구에 참여해주셔서 감사드립니다.

본 설문지는 귀하의 관람만족도에 따른 채 관람 의사를 알아보고 요인을 파악하여 대한민국 프로야구산업의 지속적인 발전 방안을 모색 하고자 합니다. 귀하께서 응답해 주신 내용은 학문적 목적이외에는 절대로 사용하지 않으며, 통계적인 자료로만 사용될 것입니다. 본 설문에는 정답과 오답이 없습니다. 응답요령을 확인하시어 최대한 귀하의 생각을 한 문항도 빠짐없이 솔직하게 응답해 주시면 감사하겠습니다.

바쁜 시간을 내어 설문에 응답해 주신 귀하께 진심으로 감사의 말씀 드립니다. 즐거운 관람되시길 바랍니다.

2011년 6월
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정보통신경영학과
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다음은 귀하에 대한 일반적인 문의사항입니다.

귀하께서 동의하는 해당 번호에 “V”표를 하여 주시기 바랍니다.

1. 귀하의 성별은 무엇입니까? ① 남성 ② 여성
2. 귀하의 연령층은 몇 세입니까?
① 10대 ② 20대 ③ 30대 ④ 40대 ⑤ 50대
3. 귀하의 가족 월평균 수입은 얼마나 되십니까?
① 150 미만 ② 151~250만원 ③ 251~300만원 ④ 301~400만원 ⑤ 400만원 이상
4. 귀하의 현재 직업 유형은 다음 중 어디에 속하십니까?
① 판매/서비스 ② 자영업 ③ 사무/전문 기술직 ④ 경영자/관리직
⑤ 전문직/자유업 ⑥ 주부 ⑦ 학생 ⑧ 기타
5. 귀하의 주 관람형태는 무엇입니까?
① 서포터 ② 일반관람 ③ 연간회원권
6. 귀하는 한 달에 몇 회 경기를 관람하십니까?
① 1~3회 ② 3~5회 ③ 5~7회 ④ 7회~10회 ⑤ 10회 이상

1. 다음은 국내 프로야구의 ‘접근성’에 대한 질문입니다. 귀하께서 동의하는 해당 번호에 “V”표를 하여 주시기 바랍니다.

	매우 그렇다	대체로 그렇다	보통이다	그렇지 않다	전혀 아니다
이 경기장까지의 교통시설은 편리하다.	①	②	③	④	⑤
이 경기장의 주차시설은 좋다.	①	②	③	④	⑤
이 경기장의 시설 이용은 전반적으로 편안한 관람에 도움을 준다.	①	②	③	④	⑤
이 경기장의 직원들은 예의바르고 친절하다.	①	②	③	④	⑤
이 경기장의 직원들은 정직하고, 믿음이 간다.	①	②	③	④	⑤

♠ 이 경기장의 ‘접근성’ 조건이 완벽하게 만족된다면 귀하께서는 입장요금을 얼마까지 지불할 의사가 있습니까?

	현재	1.5배	1.8배	2배	2.2배	2.5배
Yellow(옐로우)석	8,500원	① 13,000	② 15,000	③ 17,000	④ 19,000	⑤ 21,000
Red(레드)석	11,000원	① 17,000	② 20,000	③ 22,000	④ 24,000	⑤ 28,000
Blue(블루)석	14,000원	① 20,000	② 24,000	③ 27,000	④ 30,000	⑤ 34,000
Table(테이블)석	35,000원	① 53,000	② 63,000	③ 70,000	④ 77,000	⑤ 88,000

2. 다음은 국내 프로야구의 ‘혼잡성’에 대한 질문입니다. 귀하께서 동의하는 해당 번호에 “V”표를 하여 주시기 바랍니다.

	매우 그렇다	대체로 그렇다	보통이다	그렇지 않다	전혀 아니다
이 경기장의 안내 표지시설은 잘 되어 있다.	①	②	③	④	⑤
이 경기의 입장권을 편하게 구입했다.	①	②	③	④	⑤
이 경기장의 좌석 배열 상태는 좋다.	①	②	③	④	⑤
이 경기장의 좌석의 크기 및 여유 공간은 넓다.	①	②	③	④	⑤
이 경기장의 전광판 시설은 좋다.	①	②	③	④	⑤

♠ 이 경기장의 ‘혼잡성’ 조건이 완벽하게 만족된다면 귀하께서는 입장요금을 얼마까지 지불할 의사가 있습니까?

	현재	1.5배	1.8배	2배	2.2배	2.5배
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Red(레드)석	11,000원	① 17,000	② 20,000	③ 22,000	④ 24,000	⑤ 28,000
Blue(블루)석	14,000원	① 20,000	② 24,000	③ 27,000	④ 30,000	⑤ 34,000
Table(테이블)석	35,000원	① 53,000	② 63,000	③ 70,000	④ 77,000	⑤ 88,000

3. 다음은 국내 프로야구의 ‘청결성’에 대한 질문입니다. 귀하께서 동의하는 해당 번호에 “V”표를 하여 주시기 바랍니다.

	매 우 그렇다	대체로 그렇다	보 통 이 다	그렇지 않 다	전 혀 아니다
이 경기장의 매점은 청결하다.	①	②	③	④	⑤
이 경기장의 화장실은 청결하다.	①	②	③	④	⑤
이 경기장의 좌석은 청결하다.	①	②	③	④	⑤
이 경기장의 통로, 복도는 청결하게 정리되어 있다.	①	②	③	④	⑤
이 경기장의 제반환경은 청결하게 정리되어 있다.	①	②	③	④	⑤

♣ 이 경기장의 ‘청결성’ 조건이 완벽하게 만족된다면 귀하께서는 입장요금을 얼마까지 지불할 의사가 있습니까?

	현재	1.5배	1.8배	2배	2.2배	2.5배
Yellow(옐로우)석	8,500원	① 13,000	② 15,000	③ 17,000	④ 19,000	⑤ 21,000
Red(레드)석	11,000원	① 17,000	② 20,000	③ 22,000	④ 24,000	⑤ 28,000
Blue(블루)석	14,000원	① 20,000	② 24,000	③ 27,000	④ 30,000	⑤ 34,000
Table(테이블)석	35,000원	① 53,000	② 63,000	③ 70,000	④ 77,000	⑤ 88,000

4. 다음은 국내 프로야구의 ‘경기관련’에 대한 질문입니다. 귀하께서 동의하는 해당 번호에 “V”표를 하여 주시기 바랍니다.

	매 우 그렇다	대체로 그렇다	보 통 이 다	그렇지 않 다	전 혀 아니다
이 경기는 라이벌 팀 간의 경기이다.	①	②	③	④	⑤
이 경기의 응원 팀에는 스타 선수가 있다.	①	②	③	④	⑤
이 경기의 상대 팀에는 스타 선수가 있다.	①	②	③	④	⑤
이 경기는 팀이나 선수에게 중요한 경기이다.	①	②	③	④	⑤
이 경기는 내가 좋아하는 선수가 출전하고 있다.	①	②	③	④	⑤
이 경기의 심판의 판정하나가 승패를 좌우 할 수 있다.	①	②	③	④	⑤
이 경기의 심판이 승부를 조작할 수 있다.	①	②	③	④	⑤
이 경기의 명확한 심판 판정은 나에게 만족감을 준다.	①	②	③	④	⑤
이 경기의 심판 판정으로 인해 나는 경기장을 다시 찾지 않을 수도 있다.	①	②	③	④	⑤
이 경기를 나는 취미생활을 즐기기 위해 관람한다.	①	②	③	④	⑤
이 경기를 보면 나는 스트레스가 해소 되는 것 같다.	①	②	③	④	⑤
이 경기를 나는 동료 또는 가족과 즐거운 시간을 보내기 위해 관람한다.	①	②	③	④	⑤

♠ 이 경기장의 ‘경기관련 조건’이 완벽하게 만족된다면 귀하께서는 입장요금을 얼마까지 지불할 의사가 있습니까?

	현재	1.5배	1.8배	2배	2.2배	2.5배
Yellow(옐로우)석	8,500원	① 13,000	② 15,000	③ 17,000	④ 19,000	⑤ 21,000
Red(레드)석	11,000원	① 17,000	② 20,000	③ 22,000	④ 24,000	⑤ 28,000
Blue(블루)석	14,000원	① 20,000	② 24,000	③ 27,000	④ 30,000	⑤ 34,000
Table(테이블)석	35,000원	① 53,000	② 63,000	③ 70,000	④ 77,000	⑤ 88,000

5. 다음은 국내 프로야구의 “마케팅”에 대한 질문입니다. 귀하께서 동의하는 해당 번호에 “V”표를 하여 주시기 바랍니다.

	매우 그렇다	대체로 그렇다	보통이다	그렇지 않다	전혀 아니다
이 경기의 입장권의 가격에 만족한다.	①	②	③	④	⑤
이 경기의 입장권 구입의 편리성에 만족한다.	①	②	③	④	⑤
이 경기의 입장권 할인 가격이벤트에 만족한다.	①	②	③	④	⑤
이 경기의 경기 내용에 대하여 만족한다.	①	②	③	④	⑤
이 경기의 팬 서비스에 대하여 만족한다.	①	②	③	④	⑤
이 경기장의 전반적인 분위기와 환경에 대하여 만족한다.	①	②	③	④	⑤
이 경기장에 다음 경기를 보러 올 것이다.	①	②	③	④	⑤
이 경기의 관람을 타인에게 권유할 것이다.	①	②	③	④	⑤
이 경기와 다른 여가 활동이 같은 가격이면 이 경기장을 찾을 것이다.	①	②	③	④	⑤

♠ 이 경기장의 ‘마케팅 조건’이 완벽하게 만족된다면 귀하께서는 입장요금을 얼마까지 지불할 의사가 있습니까?

	현재	1.5배	1.8배	2배	2.2배	2.5배
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Table(테이블)석	35,000원	① 53,000	② 63,000	③ 70,000	④ 77,000	⑤ 88,000

♠ 마지막으로 프로야구를 관람하는데 있어서 5가지 요인 중 귀하께서 가장 중요하게 생각하는 조건은 무엇입니까?

- ① 접근성 ② 혼잡성 ③ 청결성 ④ 경기관련 ⑤ 마케팅

끝까지 성의껏 답변해 주심에 진심으로 감사 드립니다!

■ Author Profile



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Professor Sekyung Oh is currently a full-time finance professor at the department of business administration of Konkuk University in Seoul. He earned

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She earned her BA degree from Seoul National University and Ph.D. degree at Purdue University. She is currently working as a Vice President of The Korea Database Society and as a board member of The Korean Operations Research and Management Science Society. She published many papers in *Applied Economics Letters*, *the Journal of Futures Markets*, *Journal of Applied Mathematics and Computing*, *Information Systems Review*, *Journal of Information Technology Applied and Management*, etc. She also wrote a book “Basic Mathematics for Economics, Business and Finance”.