

Enhancing Revenue in College Sport Events by Practicing Yield Management and E-commerce

**Johnny C. Ho; The University of Texas at El Paso; ho@utep.edu
Pingjun Jiang; LaSalle University; jiang@lasalle.edu**

ABSTRACT

Many colleges and universities have been facing increasingly tight budgets in recent years and have been struggling to provide more funding for their own athletic programs. In some cases, specific sport programs of a college or university have had to be terminated due to lack of monies appropriated from the central administration. Yield or revenue management is a method of assigning capacity or inventory to meet demand in such a way to maximize revenue. This paper examines the feasibility and discusses the benefits of applying yield management via e-commerce to increase surplus/decrease deficit in those college sport programs where paid tickets are required for admissions, including, but not limited to, football and basketball games.

INTRODUCTION

Many colleges and universities have been facing increasingly tight budgets in recent years and have been struggling to provide more funding for their own athletic programs. In some cases, specific sport programs of a college or university have had to be terminated due to lack of monies appropriated from the central administration. The University of Kansas announced in 2001 that it would cut its men's tennis and swimming programs due to tight budgets, even though the university's swim program is 76 years old and has 35 All-Americans. This is the first time the university has deleted a sports team since 1980 (USA Today, 2001). The University of California at Los Angeles (UCLA), a school with a long and rich tradition in sports, decided to cut men's gymnastics program in a cost-cutting move in 2001, despite the fact that UCLA has produced dozens of Olympic- and world-champion gymnasts (New York Times, 2001). Therefore, it is becoming more and more critical for sport programs to generate their own sources of income so as to ensure their long-term health and survival.

An athletic department's annual budget generally consists of central university appropriation, revenue from advertising, and revenue from ticket sales of sport events. The athletic department generally cannot do much to increase the central appropriation since this income source depends on macro-factors such as the state of the university finance and state budget (for state universities), which are outside the domain of the department. However, the revenue from ticket sales is an income source that the athletic department generally can control. Hence, athletic departments should aggressively maximize revenue generated from ticket sales so as to minimize the possibility of further elimination of their sport programs. Since ticket sales

and advertising revenue tend to correlate positively, maximizing revenue from ticket sales should lead to an increase in advertising revenue.

One of the most well known revenue enhancing business practices is yield, also known as revenue, management. Yield management was pioneered by American Airlines (AA) over 20 years ago, and has since been employed by every major airline in the airline industry. According to American Airlines, the objective of yield management is to maximize passenger revenue by selling the right seats to the right customers at the right time (Bitran and Mondschein, 1995). Yield management has enabled airlines to market a primarily homogenous product and maximize revenue and profits by market segmentation. Since its successful application in the airline industry, yield management has been successfully adapted to numerous industries in recent years, including cruise lines, hotels, rental cars, and others.

Revenue management, as it relates to service industries, is defined as the process of allocating the right type of capacity, to the right kind of customer, at the right price, in order to maximize revenue or yield (AA Annual Report, 1987). The college sport events fall right into the potential applications of yield management, since they belong to a service category with both limited capacity and perishable characteristics. The athletic department's objective is to maximize revenue, because the variable cost is extremely low.

The applications of revenue management have grown along with the evolution of e-commerce in the past two decades. Many e-commerce concepts were indeed pioneered in the airline industry, including the first business-to-business electronic information exchange and industry-wide electronic marketplace. Moreover, the use of information technology for reservation systems is instrumental for the successful practice of revenue management. Therefore, e-commerce and revenue management have shared a long and intertwined relationship.

E-commerce is the execution of business transactions over the Internet (Chopra and Meindl, 2001). Since the price of a game ticket is significantly lower than that of an airline ticket, e-commerce plays an especially important role in cutting down the business-to-consumer transaction cost in college games. Utilizing the Internet for ticket sales is a dramatic but clear opportunity for college ticket sales. Furthermore, college students belong to one of the most wired groups and should have the highest usage of the Internet, which make the application of e-commerce particularly relevant.

This paper examines the feasibility and discusses the benefits of applying yield management via e-commerce to increase surplus/decrease deficit in those college sport programs where paid tickets are required for admissions, including, but not limited to, football and basketball games. Section 2 reviews the necessary conditions for successful yield management applications and examines how college sport events are able to satisfy the conditions. In Section 3, we discuss the important elements and issues of applying yield management via e-commerce to college sport events. Lastly, Section 4 concludes this paper.

CONDITIONS FOR EFFECTIVE YIELD MANAGEMENT APPLICATION

This section reviews the six conditions identified by Kimes (1989) and Oberwetter (2001) for effective Yield Management (YM) application. Furthermore, we also discuss how college sport events meet each of the six necessary conditions with flying colors, since YM is only appropriate for some organizations.

First of all, the service or product is perishable. This implies that the product or service must have very limited useful life. If it is not consumed or sold before its useful life, then it will lose its worth or value. The classic example in the literature is newspaper, which has a useful life of one day. In the airline industry, the unsold seats in a plane will lose all their values once the airplane has taken off, since the empty seats cannot be inventoried and then sold later. Similarly, once the college sport event is over, the unsold seats lose all their value.

Second, the service or product has limited capacity. That is, the capacity cannot be increased in the short term or without significant amount of investment. Hence, only a fixed amount of service or product is available to meet demand. This is necessary since YM attempts to determine the efficient allocation of fixed capacity to maximize revenue. In the airline industry, a flight has limited capacity since it can only carry a set number of passengers. However, an airline can switch to a larger plane to handle more passengers when the demand is overwhelmingly high. Nonetheless, its capacity is quite limited. Similar to an airline flight, the number of available seats is clearly fixed in a college sport game. In fact, the number of available seats should be even more rigid than an airline flight.

Third, the market could be segmented into different types of customers. This enables YM to determine and charge the maximum bearable price to each type of customer. However, the customer must be able to understand the reason(s) for the price differential (Lieberman, 1993). In most cases, the time of purchase is used to segment markets. Based on the time remaining until the service or product can be bought and other demand factors, it can be priced to appeal to different market segments (Weatherford and Bodily, 1992).

The airline industry distinguishes the market into two major categories: business and leisure travelers. Business travelers are less price-sensitive but more time sensitive, while leisure travelers are more price-sensitive but less time sensitive. Therefore, an airline is able to charge higher prices to business travelers than leisure travelers, even though the airline essentially sells the same product, i.e., seats, to both groups of travelers. In order to qualify for the lower fares as leisure travelers, airliners generally put requirements related to the time of purchase (14-day advance) and length of stay (with Saturday night stay) to differentiate leisure travelers from business travelers. College sport games can also employ the time of purchase as a characteristic to qualify for lower ticket price, though the length of stay is not relevant here. The college sport games can also segment customers based on their status, such as students, alumni, faculty and staff, and the general public. Moreover, there is even greater potential to segment the market via season ticket packages when combined with yield management technologies.

Fourth, the service or product can be sold in advance. This characteristic requires an effective reservation system to enable YM to keep track of the capacity. So that YM is able to perform forecasting and control to manipulate demand and pricing. The airliners, based on their

demand forecasts, apply YM to set prices to maximize their revenue. The airlines do not want to set prices too low too early, if higher paying customers will appear later. Tickets for college sport events can certainly be sold in advance and pricing strategies similar to those used by the airlines may also be applied to college sport games.

Fifth, the marginal costs of the service or product are low. This characteristic provides flexibility to set a wide range of prices without incurring a per unit loss before covering fixed costs, which is very important for the operations of YM. Hence, the additional revenue generated in excess of the marginal sales costs would either go to cover the fixed costs to reduce losses or go towards profits. The airlines meet this requirement perfectly since most of their costs are fixed, i.e., a near-empty flight costs appropriately the same to operate as a near-full flight. Similar to the airlines, college sport games has essentially no or extremely low variable cost. Perhaps the only major marginal cost is for cleaning up after a game.

Finally, demand for the service or product fluctuates over time. Yield management can take advantage of this characteristic by careful pricing the service or product. That is, YM can be used to stimulate capacity utilization during slow demand times by decreasing price, and to maximize revenue during times of high demand by increasing price. Demand for college sport tickets certainly varies. Many factors are involved in the demand for a particular game. They include the teams that are playing, locations of the game, and time and day of the game.

APPLYING YM TO COLLEGE SPORT EVENTS

YM, originated in the airline industry, is a method of assigning capacity or inventory to meet demand in such a way to maximize revenue. It studies the behaviors of different types of customers and determines the right selling price of each inventory unit so as to achieve its objective. Many businesses practice some form of YM intuitively to help stimulate demand and maximize revenue. For example, many restaurants charge different prices for lunches and dinners even though essentially the same foods are served. In some instances, they offer discounts for dinner to the early birds (customers who arrive early, say before 5 p.m.) In college sports arena, athletic departments often charge different prices for different groups of customers: students, faculty and staff, alumni, and others. They cannot be considered as truly practicing YM, since YM requires a systematic and dynamic approach to the revenue problem.

YM is most applicable to organizations with high fixed cost and very low marginal cost; hence, it is particularly appealing to college athletic departments. Many airlines have reported at least 5 percent increase in revenue after applying YM (Kimes, 1989), with well over 80% of that going directly into profits (Cross, 1997). College athletic departments should also experience an increase in revenue from tickets sale as in the airlines. But unlike the airlines, they have the potential of harvesting additional revenue via concession sales accompanied by improved attendance. And unlike the restaurants, college sports can further cut down a good portion of their marginal costs by utilizing the business-to-customer e-commerce technology.

Four Key YM Elements

There are four major elements that need to be examined and understood before practicing YM. The first element is the demand elasticity. To maximize the effectiveness of YM, one needs to understand how sensitive the quantity demanded is to a change in price. While college students (primary customers of college sport events) are generally quite sensitive to a change in price, there is usually a group of sports enthusiasts who are willing to pay higher prices for tickets. Moreover, hosting a college sport event is a monopoly, i.e., the game between two teams is unique and therefore has no direct competitor, which enables its ability to set prices.

The second critical element is market segmentation. Segmenting the market is necessary to make optimal pricing decisions. To segment the market accurately, YM needs to be able to collect large amount of demand data efficiently and analyze the data to identify the behaviors of different types of customers. The data, as in most cases, are based on historical demand. Probability distribution models can be developed to fit the different types of demands.

The third element that is essential to YM is an integrated computer information system. The integrated information system serves as the heart of YM and is necessary to keep track of the number of each type of tickets sold for every game accurately. After collecting the historical demand data efficiently, the system would be able to perform analysis to make forecasts of future demands. Moreover, it is needed to identify and model the demand patterns of different customer groups. All these elements together are required to set YM pricing decisions. Furthermore, the system should be integrated so that e-commerce can be carried out to minimize the variable cost of transactions. Lastly, the integrated system allows for advance sale of tickets, which is instrumental to the implementation of YM.

The last important element is an overbooking policy. Overbooking is very common in the airline industry and has been studied extensively (Alstrup et al. 1986). Overbooking refers to selling more tickets in a game than the number of available seats and can increase revenue if employed effectively. The integrated information system would collect and analyze data on the historical no-show rates and make decisions on the optimal overbooking policies.

Putting YM and E-commerce to Work for College Sport Events

With the popularity of the Internet and the advance of e-commerce, it is inevitable that universities will utilize computer technologies in the near future to begin selling tickets over the Internet. Today, most college students are computer literate and have been using the Internet for many years. The computer reservation system and e-commerce, combined with YM technologies of forecasting, demand modeling, and pricing analysis, can contribute greatly to the well-being of many athletic programs. And best of all, customer satisfaction should improve since customers have the option of purchasing their tickets online, which saves time and eliminates the possibility of experiencing the sold out situation at the gate.

To practice YM and e-commerce technologies operationally, the reservation system needs to be able to accept online purchase by credit card and to enable customers to print out tickets via their printers. Each ticket should carry a valid code number that can be read and validated by bar code machines. Recent research has indicated that delivery cost and on time

delivery are two of the biggest sources of dissatisfaction which may deter people from purchasing online (Clarke, 2001). Hence, we propose athletic departments to employ college identification cards to serve as admission tickets, similar to the e-ticket system employed by many airlines.

College identification cards today have become very sophisticated in that they either carry a magnetic strip that can store information and/or a bar code. The following illustrates one feasible avenue to handle paperless ticket via college identification cards. First, when a customer affiliated with the college purchases a ticket online by credit card, the customer will be asked to provide his or her college identification number which will serve as a valid ticket code for that particular game. Then the integrated reservation system would update this purchase information. To gain admission, the customer would have his or her identification card bar coded or identification card's magnetic strip scanned at the gate to check the validity of its identification number and to confirm attendance.

While most of the customers of sport events are affiliated with the college, many may not be affiliated with the college. The college can issue identification cards to people from the general community in order to increase the usage of paperless ticket. Furthermore, discounts could be given to customers who use their identification cards as tickets to promote paperless tickets. With the use of paperless admission tickets, athletic departments will be able to drive the delivery cost down to virtually zero and to make delivery time instantaneous. Therefore, the proposed paperless system completely resolves the delivery issue and constitutes a perpetual long-term cost savings initiative.

The integrated computer system not only minimizes the transaction costs by eliminating the task of printing and mailing tickets, but it also helps collect invaluable data. The system can easily track the buying behavior of each customer, which, in turn, provides essential information for analyzing the types of demands. Furthermore, it can automatically track the actual attendance of each sport game - the attendance data are critical when performing statistical analysis on no-show rates. The historical no-show rates are then used to formulate the overbooking policies.

An additional benefit of YM via e-commerce is the ability to perform customer tracking. Tracking attendance enables athletic departments to make special offers to frequent customers. A frequent sport events customer program, similar to an airline's frequent flier program, can encourage loyalty and generate goodwill from the customers because they potentially can receive free tickets. Moreover, customer tracking creates marketing opportunities via e-mail. Since we know who is going to which sport events, we can directly market and offer discount alert to them. For instance, a person would be e-mailed regarding a special sport event that they might be interested in. In order to make the buying process quick and simple, the e-mail could provide a Web link to the ticketing system which is able to identify that person's special offer.

The college sports market could be much more segmented with YM and e-commerce. Because of the advanced Internet sales, a lot of market segmentation opportunities become available. The airlines present a great model of what athletic departments can do for market

segmentation. However, market segmentation would be much simpler in the college sport events than in the airline industry, since athletic departments do not need to consider the issues of connecting flights, one-way trips, or stop-over trips.

Multiple price segments can also be employed in the college sport events, that is, there should be at least the discount and full priced market segments. As time approaches the game time, the athletic department needs to be able to perform an analysis to determine whether the discount priced market segments should be opened or closed. The analysis should consider the current demand relative to the historical sales figures and other factors, such as the current ranking of the two competing teams. To maximize revenue, the reservation system must be able to sell the ticket at the highest price that the market and customer will pay. Moreover, a seat should be sold for a reduced price if there is a high probability that it will eventually go empty. However, the athletic department should not sell it for a reduced price if somebody is willing to purchase it at a higher price later. YM enables the department to perform these analyses very efficiently.

Market segmentation can be further exploited by marketing multiple tickets for a game and single ticket for every home game. The following are some examples: (1) season tickets - tickets for all home games of a particular sport; (2) double date - four tickets to the same game at a discount; (3) repeat date - two tickets and two consecutive games; and (4) family fun package - four tickets, hot dogs, and drinks. The number of possible packages that could be designed is indeed unlimited. YM can be applied to these multiple ticket market segments in conjunction with the individually priced market segments. YM can also be used to perform trade-off analyses to make decisions, such as whether an athletic department is better to forego a higher paying customer if it expects to get more revenue by selling that ticket to a repeat date customer (two tickets and two consecutive games). If the demand of the second game in the date series is low, then the athletic department would likely be better off to forego the higher paying customer for the repeat date customer.

Furthermore, market segmentation could be location-based. The pricing of specific seats of course depends on the type of sport game. In the case of basketball, the highest priced zone may be the front rows. The middle priced zone may be the middle rows and middle seats, and the lowest priced zone would be the back rows.

YM Techniques

There are four techniques generally used for solving YM problems. They are: (1) mathematical programming, (2) economic-based, (3) threshold curve, and (4) expert systems (Kimes, 1989). These techniques have been used in the airliners and are most likely applicable to other organizations. A comprehensive review of YM research in the airline industry is given in Belobaba (1987).

One of the important characteristics of a YM problem is that it must be solved repeatedly. Hence, any feasible method has to be fast and not too expensive. The economic-based and threshold curve approaches have been quite popular in the past. With the lowering in

computation costs in recent years, the mathematical programming approach has become viable and preferable, since it provides optimality.

The linear programming model for YM is quite straight forward with an objective function of maximizing revenue subject to the following constraints: (1) the sum of the number of seats allocated to each inventory bucket (an inventory bucket is formed to meet a type/class of customer demand) must be less than the capacity of the service, and (2) the number of seats allocated to an inventory bucket must be less than the expected demand for that inventory bucket.

CONCLUSIONS

Many colleges and universities have experienced curtailments in their sport programs due to insufficient funding. In order to maintain or even expand the current programs, the athletic departments have to generate additional revenue for themselves to avoid further reduction of their sport programs. Furthermore, the advance in the Internet has caused many organizations to reconsider their current business models and to open up opportunities to capture additional revenues.

This paper proposes the applications of yield or revenue management and e-commerce technologies to college sport events to enhance revenue. Yield management was pioneered by American Airlines to maximize revenue about twenty years ago. Yield management for the college sport events is all about selling game tickets at the right price to the right customer at the right time. All of this is complemented by the sale of tickets via the Internet to further cut down on transaction and variable costs. Finally, the applications of revenue management and e-commerce could also be extended to other college events as long as paid tickets are required for admissions, such as musical events.

REFERENCES

Alstrup, J., Boas, S., Madsen, O., and Vidal, R. (1986), "Booking policy for flights with two types of passengers," *European Journal of Operational Research*, 27, 274–288.

American Airlines Annual Report (1987), "The art of managing yield," 22–25.

Belobaba, P.P. (1987), "Air travel demand and airline seat inventory management," doctoral dissertation, Massachusetts Institute of Technology. Unpublished.

Bitran, G.R., and Mondschein, S.V. (1995), "An application of yield management to the hotel industry considering multiple day stays," *Operations Research*, 43, 427–443.

Chopra, S., and Meindl, P. (2001), *Supply Chain Management: Strategy, Planning and Operation*, Prentice-Hall, Englewood Cliffs, N.J.

Clarke, K.R. (2001), "While more shoppers purchased online this holiday season, online shopping satisfaction slips PriceWaterhouseCoopers's survey reports," www.pwcglobal.com, January 19, 2001.

Cross, R.G. (1997), *Revenue management hard-core tactics for market domination*, Broadway Books, New York, N.Y.

Kimes, S.E. (1989), "Yield management: A tool for capacity-constrained service firms," *Journal of Operations Management*, 8, 348–363.

Lieberman, W. H. (1993), "Debunking the myths of yield management," *Cornell Hotel and Restaurant Administration Quarterly*, 34, 34–41.

New York Times, "College cutting gymnastics program," The Associated Press, August 7, 2001.

Oberwetter, R. (2001), "Can revenue management land a starring role in the movie theater industry?" *OR/MS Today*, 28, 40–44.

USA Today, "Budget trouble forces Kansas to make cuts," The Associated Press, June 18, 2001.

Weatherford, L.R. and Bodily, S.E. (1992), "A taxonomy and research overview of perishable-asset revenue management: yield management, overbooking, and pricing," *Operations Research*, 40, 831–844.

ABOUT THE AUTHORS

Johnny C. Ho is an associate professor of operations management at The University of Texas at El Paso. He holds a Ph.D. in operations management from Georgia Institute of Technology. He has published in journals such as *Annals of Operations Research*, *Naval Research Logistics*, *Journal of the Operational Research Society*, *Computers and Operations Research*, *Computers and Industrial Engineering*, and *European Journal of Operational Research*. His current research interests include supply chain management and interface between operations and marketing. He holds the Certified Quality Engineer and Certified Quality Auditor titles awarded by the American Society for Quality, and is a member of the Decision Sciences Institute and Production and Operations Management Society.

Pingjun Jiang is an assistant professor of marketing at LaSalle University. She has a Ph.D. in marketing from Southern Illinois University at Carbondale, and has published several articles in journals such as *Journal of Segmentation in Marketing* and *Journal of Internet Research*. Her current research interests include consumer behavior, e-commerce, and research methodology.