The Strategic Levers of Yield Management

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Abstract

Yield management, controlling customer demand through the use of variable pricing and capacity management to enhance profitability; has been examined extensively in the services literature. Most of this work has been tactical and mathematical rather than managerial. In this article, the authors suggest that a broader view of yield management is valuable to both traditional and nontraditional users of the approach. Central to this broader view is the recognition of how different combinations of pricing and duration can be used as strategic levers to position service firms in their markets and the identification of tactics by which management can deploy these strategic levers. The authors also propose that further development of yield management requires that when the service is delivered be treated as a design variable that should be as carefully managed as the service process itself.

The Strategic Levers of Yield Management

Although commonly associated with marketing as a revenue management tool, yield management has significant impacts on other service business functions. It affects operations in capacity planning, human resource management in worker selection and training, and business strategy through the way the service firm positions itself in the market. Despite this widespread impact and the considerable attention it has received, formal yield management is still viewed primarily as a pricing/inventory management tool. What is lacking is a broader theory of yield management that would permit other service industries to gain the benefits of yield management-type thinking and provide insights into new areas in which experienced companies might further apply the concept. Our objective in this article is to develop the groundwork for such a theory. Our focus will be on the strategic levers available for yield management, how they have been applied in traditional yield management settings, and how they, along with some tactical tools, can be applied to other service settings.

A Modified Definition of Yield Management

A common definition of yield management is the application of information systems and pricing strategies to "sell the right capacity to the right customers at the right prices" (Smith, Leimkuhler, and Darrow 1992). Implicit in this definition is the notion of time-perishable capacity and, by extension, the notion of segmentation of capacity according to when it is booked, when and how long it is to be used, and according to the customer who uses it. In other words, "an hour is not an hour is not an hour" when it comes to customer preferences or capacity management. In light of this subtle point, we offer a slightly modified definition of the term. That is, yield management may be defined as managing the four Cs of perishable service:

calendar (how far in advance reservations are made), clock (the time of day service is offered), capacity (the inventory of service resources), and cost (the price of the service) to manage a fifth C, customer demand, in such a way as to maximize profitability.

Strategic Levers

A successful yield management strategy is predicated on effective control of customer demand. Businesses have two interrelated strategic levers with which to accomplish this: pricing and duration of customer use. Prices can be fixed (one price for the same service for all customers for all times) or variable (different prices for different times or for different customer segments), and duration can be predictable or unpredictable.

Variable pricing to control demand is conceptually a straightforward process. It can take the form of discount prices at off-peak hours for all customers, such as low weekday rates for movies, or it can be in the form of price discounts for certain classes of customers, such as senior discounts at restaurants.

Duration control presents a more complicated decision problem but at the same time represents an area that would improve the effectiveness of yield management. By implementing duration controls, companies maximize overall revenue across all time periods rather than just during high-demand periods. If managers want to increase control over duration, they can refine their definition of duration, reduce the uncertainty of arrival, reduce the uncertainty of the duration, or reduce the amount of time between customers. We will discuss each of these tactics later.

Different industries use different combinations of variable pricing and duration control (Figure 1). Industries traditionally associated with yield management (hotel, airline, rental car, and cruise line) tend to use variable pricing and a specified or predictable duration (Quadrant 2).

Movie theaters, performing arts centers, arenas, and convention centers use a fixed price for a predictable duration (Quadrant 1), whereas restaurants, golf courses, and Internet service providers use a fixed price with unpredictable customer duration (Quadrant 3). Many health care industries charge variable prices (Medicare or private pay) but do not know the duration of patient use (Quadrant 4). There is no fixed demarcation point between quadrants, so an industry may lie partially in one quadrant and partially in another. The intent of this classification method is to help industries not currently using yield management develop a strategic framework for developing yield management. More specifically, what we are trying to show is which quadrant industries are in and what they can do to move to Quadrant 2. For example, restaurant management does not have control of duration; they need to pursue some duration management approach. Or, if hotel management does not adequately control length of stay, they may want to modify their forecasting system from room nights to arrivals to enhance their reservation system. As indicated above, successful yield management applications are generally found in Quadrant 2 industries.

The reason is that a predictable duration enables clear delineation of the service portfolio, and variable pricing enables generating maximum revenue from each service offering within the portfolio. We hasten to point out that even those industries that are listed in this quadrant have structural features that inhibit them from achieving their full profit potential. A brief review of the development of yield management in the airline and hotel industries will help illustrate these points.

Airline Industry

Deregulation of the American airline industry was the major impetus for the development of yield management. Before deregulation in 1978, major carriers offered one- price service

between cities. Essentially, most airlines were operating in Quadrant 1: Their flight durations were extremely predictable, and their price was fixed (Figure 2).

Immediately after deregulation, many new airlines emerged, and one airline, People's Express, developed an aggressive low-cost strategy. The People's Express story is well known: Their airfares were considerably lower than those of the major carriers, and customers were attracted to the limited service that People's Express flights offered. The major carriers such as American Airlines, United Airlines, and Delta Airlines, aided by new computerized reservation systems, employed variable pricing on a flight-by-flight basis to match or undercut fares offered by People's Express. Cost-conscious passengers then switched to the major carriers, and People's Express was eventually forced out of business. Donald Burr, the former CEO of People's Express, attributes his airline's failure to the lack of good information technology and the subsequent inability to practice yield management (Anonymous 1992; Cross 1997).

Seeing the benefits of differential pricing, most major North American carriers instituted yield management and moved into Quadrant 2. Yield management allowed airlines to determine the minimum fare (of a set mix of fares) that should be available for a specific flight. Differential pricing, in combination with the predictability of flight duration, gave them the enviable position of variable pricing with predictable duration.

Another trend that emerged after deregulation was the hub-and-spoke system. Previously, airlines operated on an origin-destination basis, and although connecting flights existed, the concept of a hub city did not. Most major airlines now operate with a hub-and-spoke system, and their forecasting and yield management systems are based around the associated flight legs (Skwarek 1996). Leg-based solutions have inherent problems and may lead to suboptimal

solutions. Although the revenue on each flight leg may be optimized, revenue over the entire airline network may not. In an attempt to circumvent this problem, some airlines (notably American Airlines) developed virtual nesting systems (Smith, Leimkuhler, and Darrow 1992), in which different origin-destination pairs were classified by revenue generated. Unfortunately, current origin-destination forecasting and yield management systems have a high forecast error that results in an unreliable solution.

The lack of origin-destination forecasting may seem like a minor point, but it prevents airlines from truly managing the predictability of their duration. In a sense, the hub-and-spoke system has caused the airline industry to move into the bottom half of Quadrant 2 or the top half of Quadrant 4. The hub-and-spoke system, in combination with airline pricing systems, has created problems such as passengers attempting to obtain a lower fare by completing only one leg of their multileg flight (a "hidden city"). The empty seat on the remaining flight leg represents lost revenue to the airlines so safeguards have been instituted to avoid this problem. Only one major carrier, Southwest Airlines, has resisted the temptation of the hub-and-spoke system. This represents a competitive advantage for their yield management system because they are better able to manage the predictability of their flight durations (Anonymous 1994b).

Hotel Industry

Unlike the airline industry, traditional hotels are usually located in Quadrant 3. Although group and tour operators have multiple negotiated rates (Hoyle, Dorf, and Jones 1991; Vallen and Vallen 1991), most traditional hotels charge essentially one room rate (or perhaps a low-season and high-season rate) for transient guests. Length of stay is not explicitly considered, and forecasts are designed to predict nightly occupancy (Figure 3). Typically, the goal of the

traditional hotel is to maximize occupancy for a given night, and managers seldom look at long-term revenue generation.

After the airlines started using yield management, many hotel managers were impressed with the increased revenue claimed by the airlines and applied the concept of variable pricing to the hotel industry. When hotels started using variable pricing, they did not apply the concept of qualified rates, in which customers had to meet certain requirements to obtain a lower room rate. They instead relied on top-down pricing, in which reservation agents quoted the highest rate first and, if faced with resistance, offered the next of several lower rates until the customers acquiesced or they reached a minimum level previously established by management. Many major hotel chains still use this pricing method. Although short-term revenue gains may result from top-down pricing, customers view the practice unfavorably (Kimes 1994). Most hotels using this approach forecast room nights and use the forecasted nightly occupancy rate to develop pricing recommendations (Kimes 1989). Length-of-stay issues are not considered, and occupancy and rates are managed for one night at a time.

Some hotel chains, notably Marriott and Forte Hotels, saw the benefits associated with predictable durations (Anonymous 1994a). To reap the benefits associated with duration controls, they switched from forecasting room nights to forecasting arrivals by length of stay and/or room rate. Forte charged only one rate and concentrated solely on length of stay. Guests requesting a 2-night stay might be accepted, whereas those requesting a 1 -night stay might be rejected depending on the projected demand. Marriott forecasted by arrival day, length of stay, and room rate and was able to determine the best set of reservation requests to accept. Still other hotel chains tried to implement length- of-stay controls without changing their forecasting

system from room nights to arrivals. Without arrival information, they had no way of knowing if their restrictions made sense or if they were unnecessarily turning away potential customers.

The focus on length of stay not only changed the forecasting systems in place at leading hotels but also changed the mathematical methods used to develop yield management recommendations. Many hotel chains (e.g., Holiday Inn, Hilton, Sheraton, and Hyatt) have instituted linear- programming-based systems in which length of stay and room rate are explicitly considered (Hensdill 1998; Vinod 1995).

Using the Strategic Levers

Industries in Quadrants 1, 3, and 4 can move into Quadrant 2 to achieve some of the revenue gains associated with yield management by manipulating duration and price. Although there are still problems facing the hotel and airline industries, their experience provides a rich context from which to understand the tactical tools needed to improve revenue generation. Specific tools associated with each strategic yield management lever can allow managers to move their company into a better revenue-generating position.

Duration Methods

If managers want to increase control over duration, they can refine their definition of duration, reduce the uncertainty of arrival, reduce the uncertainty of the duration, or reduce the amount of time between customers (Figure 4).

Repining the Definition of Duration

Duration is how long customers use a service and is measured either in terms of time (i.e., the number of nights or number of hours) or by event (i.e., a meal or a round of golf). When duration is defined as an event rather than time, forecasting the length of duration generally

becomes more difficult. Thus, if duration for an industry could be defined in time rather than events, better forecasting, and hence control of duration, would likely result.

Even industries that use time-based duration definitions can refine this definition and thereby enhance their operations. Most hotels sell rooms by the day, or more specifically, they sell rooms from 3 p.m. (check-in) to noon (check-out). Sheraton Hotels and The Peninsula Hotel in Beverly Hills allow customers to check in at any time of the day and check out at any time without penalty (Anonymous 1997; Barker 1998). By refining their definition of duration, they have improved customer satisfaction, made better use of capacity, and increased revenue.

Uncertainty of Arrival

Because many capacity-constrained firms have perishable inventory, they must protect themselves from no-shows or late arrivals. Firms can use both internal (not involving customers) and external (involving customers) approaches to decrease uncertainty of arrival.

***Internal approaches*.** Most capacity-constrained service firms use overbooking to protect themselves against no-shows. Published overbooking models often use Markovian decision processes or simulation approaches (for example, Lieberman and Yechialli 1978; Rothstein 1971, 1985; Schlifer and Vardi 1975), but in practice many companies use service-level approaches (Anonymous 1993; Smith, Leimkuhler, and Darrow 1992) or the critical fractile method (as suggested by Sasser, Olsen, and Wyck- off 1978). The key to a successful overbooking policy is to obtain accurate no-show and cancellation information and to develop overbooking levels that will maintain an acceptable level of customer service.

Once an overbooking policy is implemented, companies must develop good internal methods for handling displaced customers. The frontline personnel who must assist displaced customers should receive appropriate training and compensation for dealing with potentially

angry consumers. Companies can choose to select which customers to displace on either a voluntary or involuntary manner. The airline industry, with its voluntary displacement system, has increased customer goodwill while increasing long-term profit (Anonymous 1993; Rothstein 1985). Other industries base their displacement decision on time of arrival (if customers are late, their reservation is no longer honored), frequency of use (regular customers are never displaced), or perceived importance (important customers are never displaced).

External approaches. External approaches to reduce arrival uncertainty shift the responsibility of arriving to the customer. The deposit policies used at many capacity-constrained service firms such as cruise lines and resorts are excellent examples of external approaches. In addition, the cancellation penalties imposed by these companies represent an attempt to make customers more responsible for arriving. Restaurants are experimenting with cancellation penalties and ask customers for their credit card numbers when taking reservations (Breuhaus 1998). If patrons do not arrive within 15 minutes of the reservation time, a penalty fee is charged to their credit cards. Interestingly, the car rental industry, which has considerable yield management experience, makes very limited use of external approaches. With the exception of specialty cars and vans, customers are not asked to guarantee their rental and have no responsibility for showing up. With no incentives for customers to arrive, it is not surprising that in busy tourist markets such as Florida, no-shows can account for as much as 70% of the reservations (Stem and Miller 1995). Besides these negative incentives, some companies use service guarantees to encourage people to show up on time. American Golf, for example, offers discounted or free play to golfers whose actual tee-off time is delayed by more than 10 minutes of their reservation time.

Uncertainty of Duration

Reducing duration uncertainty enables management to better gauge capacity requirements and hence make better decisions as to which reservation requests to accept. As in the case of arrival uncertainty, both internal and external approaches can be used for this purpose.

Internal approaches. Internal approaches include accurate forecasting of the length of use and the number of early and late arrivals and departures and improving the consistency of service delivery. By knowing how long customers plan to use the service, managers can make better decisions as to which reservation requests to accept. If a restaurant manager knows that parties of two take approximately 45 minutes to dine and parties of four take about 75 minutes, he or she can make better allocation decisions. Likewise, knowing how many customers will change their planned duration of use enhances capacity decisions. For example, in a hotel, accurately forecasting how many customers book for 4 nights but leave after 3, or request additional nights, facilitates room and staff allocations. Similarly, if a rental car company knows that 20% of its week-long rentals are returned after 5 days, the fleet supply requirement can be adjusted accordingly.

Early research and practice in yield management focused on single flight legs or room nights and did not consider duration. Expected marginal seat revenue (EMSR) based models (Belobaba 1987; Littlewood 1972) are widely used in the airline industry (Williamson 1992) and result in allocation decisions for flight legs at various days before departure. Early hotel yield management systems based minimum rate decisions on forecasted occupancy but did not consider the impact of length of stay (Kimes 1989). Some airlines have tried to compensate for the lack of duration control by using virtual nesting (Smith, Leimkuhler, and Darrow 1992;

Vinod 1995; Williamson 1992) but still have not achieved the goal of full origin-destination control (Vinod 1995).

Linear programming has been used to help make better duration and pricing allocation decisions (Kimes 1989; Weatherford 1995; Williamson 1992). The bid price, defined as the shadow price of the capacity constraint, can be used to determine the marginal value of an additional seat, room, or other inventory unit (Phillips 1994; Vinod 1995; Williamson 1992). This value can then be used to determine the minimum price available for different durations. Dynamic programming (Bitran and Mondschein 1995) has also been suggested as a possible method for considering hotel length of stay.

The accuracy of the forecast affects the effectiveness of the yield management system. Lee (1990), in his study of airline forecasting, found that a 10% improvement in forecast accuracy resulted in a 3% to 5% increase in revenue on high-demand flights.

If duration is to be explicitly addressed, forecasts of customer duration must be developed. Airlines typically forecast demand by flight leg (Lee 1990; Vinod 1995), but to truly practice duration control, airlines must forecast demand by all possible origin-destination pairs. As previously mentioned, the hub-and-spoke system has increased the number of forecasts required and the subsequent accuracy of those forecasts. Some airlines have tried to reduce the number of forecasts needed by using virtual nesting (Smith, Leimkuhler, and Darrow 1992; Vinod 1995). Preliminary research on airline-forecasting accuracy (Weatherford 1998) shows that an increase in the number of daily forecasts required increases the forecast error.

When hotels forecast customer duration, they must forecast by day of arrival, length of stay, and possible rate class (Kimes, O'Sullivan, and Scott 1998). Hotels using linear programming and bid-price approaches forecast at this level of detail, and some have developed even more detailed

forecasts. The magnitude of this problem becomes apparent when you consider that for each day of arrival, a hotel might consider 10 different lengths of stay and 10 different rate classes. If room type is included, a hotel may have 200 to 300 different forecasts per day.

Consistency of duration (i.e., most customers using the service for about the same length of time) is typically achieved through internal process changes. For example, TGI Fridays redesigned their restaurant menus and service delivery systems to make dining time more consistent as well as faster. Some restaurants in the theater district of New York City have placed an hourglass on the table of each party. When the sand in the hourglass is gone, patrons have a visual cue to finish dinner and leave so they will not be late to the theater. Or, in a much different context, if a prison warden knows that 25% of prisoners sentenced to 10 years serve only 4, additional prisoners may be incarcerated.

External approaches. External approaches for handling uncertainty of duration generally reach the customer in the form of deposits or penalties. Some hotels have instituted early and late departure fees (Miller 1995), and airlines have penalized passengers who purchase tickets through hidden cities. Although penalties may work in the short term, they risk incurring customer wrath and hurting the company in the long run. For this reason, internal approaches are generally preferable.

Reduce Time Between Customers

Reducing the amount of time between customers (changeover time reduction), by definition, means that more customers can be served in the same or a shorter period of time. Although changeover time reduction is not normally considered a tool of yield management, it is a tactic that can be used to increase revenue per available inventory unit. Such tactics play an important role in the yield management strategy. Changeover time reduction has become a

common strategy for airlines. Southwest Airlines and Shuttle by United both boast of 20-minute ground turnarounds of their aircraft (compared to the average of 45 minutes at most airlines) and have been able to increase the utilization of their planes (Kimes and Young 1997). Many restaurants have instituted computerized table management systems that track tables in use, the progress of the meal, and when the bill is paid. When customers leave, the table management system notifies bussers, and the table is cleared and reset (Liddle 1996). The result is an increase in table utilization and, hence, revenue per table.

Price

Industries actively practicing yield management use differential pricing—charging customers using the same service at the same time different prices, depending on customer and demand characteristics. Passengers in the economy section of a flight from New York City to Los Angeles may pay from nothing (for those using frequent-flyer vouchers) to more than $1,500. The fares vary according to the time of reservation, the restrictions imposed, or the group or company affiliation. In contrast to such Quadrant 2 pricing, Quadrant 1 and 3 industries use relatively fixed pricing and charge customers using the same service at the same time the same price.

Customers tend to develop reference prices for various transactions. If companies change price, they must do so carefully to avoid upsetting their customers (Kahneman, Knetsch, and Thaler 1986). Although it is possible to charge more solely based on high demand, customers may resent being charged different prices for essentially the same service. Two mechanisms—proper price mix and rate fences—provide opportunities to alter price while maintaining goodwill (Figure 5).

Proper Price Mix

Companies must be sure that they offer a logical mix of prices from which to choose. If customers do not see much distinction between the different prices being quoted, a differential-pricing strategy may not work. Determining the best mix of prices is difficult because management often has little information on price elasticities. This, in turn, often results in pricing decisions based solely on competitive pressures. It should be noted, however, that airlines such as American Airlines have been working hard on the issues of elasticity and of multiple legs and have made some progress.

Optimal pricing policies, in which customers are asked to name the prices that they would consider to be cheap, expensive, too cheap to be of reasonable quality, and too expensive to be considered, have been developed by Taco Bell and have been tested for use with meeting planners (Lewis and Shoemaker 1997). Optimal pricing policies represent a relatively simple way of determining price sensitivity and acceptable price ranges.

Although not widely publicized, some restaurant companies are experimenting with menu pricing based on price elasticities. Large chain restaurant companies analyze the price elasticities of various menu items and make appropriate pricing changes (Kelly, Kiefer, and Burdett 1994).

Rate Fences

The possession of a good pricing structure does not ensure the success of a variable-pricing strategy. Companies must also have a logical rationale or, in industry terms, rate fences that can be used to justify price discrimination. (Or, as one somewhat cynical hotel executive states, “We want something we can say out loud without laughing.”)

Quadrant 2 industries often use rate fences, such as when the reservation is booked or when the service is consumed, to determine the price a customer will pay. Rate fences refer to qualifications that must be met to receive a discount (Hanks, Cross, and Noland 1992). Rate fences can be physical or nonphysical in nature and represent a rationale for why some customers pay different prices for the same service.

Physical rate fences include tangible features such as room type or view for hotels, seat type or location for airlines, or table location for restaurants. Other physical rate fences are the presence or absence of certain amenities (free golf cart use with a higher price, free breakfast with a higher price, or free soft drinks at a movie theater).

Nonphysical rate fences can be developed that can help shift demand to slower periods, reward regular customers, or reward reliable customers. Nonphysical rate fences include cancellation or change penalties and benefits based on when the reservation was booked, desired service duration, group membership or affiliation, and time of use.

Even today, it is common practice for companies to adopt differential pricing schemes without rate fences. Hotels use top-down pricing in which reservation agents quote the rack rate (generally the highest rate) and only quote lower rates if customers ask for them. Knowledgeable customers may know to ask for the lower rate, but inexperienced customers may not. Customers view this practice highly unfavorably (Kimes 1994).

Moving To a More Profitable Quadrant

The strategic levers described above can be used to help companies move into more profitable quadrants by making duration more predictable and/or by varying prices. Generally, companies try to manipulate one strategic lever at a time, but it is possible, although difficult, for

a company to try to simultaneously adjust price and duration. The following examples of potential moves show the possibilities for various industries.

Differential Pricing: Quadrant 1 to Quadrant 2

Movie theaters. Although reservation systems and differential pricing have been used in Europe for many years, American movie theaters usually charge the same price for all seats and offer discounted seats only for matinees or for senior citizens. However, things are changing rapidly, and some new movie houses are now offering differential pricing based on seat location, time of show, and access to amenities. For example, the 70-seat Premium Cinema in Lombard, Illinois, has been booked solid since its opening April 3, 1998. Guests willing to pay $15 for access to a separate entrance with valet parking are admitted to a private lounge, where they can purchase champagne at $12 per glass and buy prime-rib sandwiches at the same price. They offer free popcorn (all you can eat) and have a fulltime concierge to get it for the customers. As of yet, they have not gone to the next step of developing an overbooking strategy.

Control Duration: Quadrant 3 to Quadrant 1

***Golf courses*.** Golf courses seem to be in the worst possible position—they charge a fixed price for an event of unknown duration. Much of the problem stems from the definition of duration as an event, typically 18 holes of golf played during daylight hours. Alternative definitions of duration abound. The golf course could sell 9-hole rounds; it could institute shotgun golf, in which different groups start simultaneously at multiple holes; or it could use express golf, in which golfers run between holes and receive two scores, elapsed time and stroke count, at the end of each round. (The latter perhaps becoming a new Olympic event.) None of these modifications reduce variability in and of themselves; however, they do provide ways of redefining duration for more creative applications of yield management.

Arrival uncertainty could be reduced by instituting deposit policies or by developing good overbooking policies. Duration uncertainty could be reduced by adding marshals to help move golfers along on the course, by provision of free golf carts to speed the time between holes, and by more accurately forecasting play length based on time of day, week, and party size. More golfers could be accommodated if tee-time intervals were reduced or if party size were better regulated.

Control Duration: Quadrant 4 to Quadrant 2

***Health care*.** Health care organizations use differential pricing (often government mandated) but have difficulties managing duration. If hospital or nursing home managers do not know how long patients will be using beds or rooms, it is difficult to effectively plan and manage capacity. In a nursing home, the health of potential patients could be evaluated and actuarial tables used to estimate the duration of patient stay. In private and nonprofit facilities, attempts could be made to select the best mix of private-pay and Medicare patients with a bias toward private-pay patients with a long duration.

The issue of duration control of health care has caused political controversy. During the mid-1990s, insurance companies in New York reduced the maximum length of insurable hospital stay for childbirth to 1 day. After intensive lobbying pressure from hospitals and medical associations, the state legislature outlawed this practice and guaranteed all new mothers a minimum length of stay of 48 hours.

Differential Pricing: Quadrant 3 to Quadrant 4

Internet service providers (ISPs). ISPs offer Internet bandwidth to customers. Because not all customers use their full allotment of bandwidth at the same time, the ISP overbooks the bandwidth. If too many customers try to access the Internet at once, service deteriorates.

ISPs operate at 100% capacity during certain times of the day and at other times have available bandwidth. Currently, most ISPs charge a flat monthly rate for Internet access, and there is no off-peak discount. Some customers are heavy users during the day, whereas others are heavy nighttime users. ISPs must maintain a mix of these customers to operate effectively. By identifying common demographic characteristics within each segment, ISPs could target specific types of users to add to the mix (M. Freimer, personal communication, 1998).

Conclusion

Effective use of the strategic levers of pricing and duration control can help capacity-constrained firms make more profitable use of their resources. Real potential exists for novel use of these tools in industries not typically associated with yield management. Even companies with yield management experience can improve performance by refining their deployment of these levers. The research challenge is to help managers identify yield management opportunities and to develop appropriate pricing and duration control approaches.

Beyond where to apply yield management, there are the questions of how to develop a yield management strategy, how to train people in the tools to implement it, and how to maintain and improve customer satisfaction while applying yield management practices. In the long run, achieving the full potential from yield management lies in management's ability to market and manage every available moment as a unique product. This, in turn, requires that we treat when the service is provided as a design variable that should be as carefully managed as the service process itself. Such a reformulation presents an exciting conceptual challenge to the emerging field of service research.

		Price	
		Fixed	Variable
Duration	Predictable	Quadrant 1: Movies Stadiums/Arenas Convention Centers	Quadrant 2: Hotels Airlines Rental Cars Cruise Lines
	Unpredictable	Quadrant 3: Restaurants Golf Courses Internet Service Providers	Quadrant 4: Continuing Care Hospitals

Figure 1. Typical pricing and duration positioning of selected service industries.

		Price	
		Fixed	Variable
Duration	Predictable	Quadrant 1: Before de-regulation	Quadrant 2: Immediately after de-regulation
	Unpredictable	Quadrant 3: None identified	Quadrant 4: Hub-and-spoke system

Figure 2. The airline industry.

		Price	
		Fixed	Variable
Duration	Predictable	Quadrant 1: Forte	Quadrant 2: Marriott Sheraton Holiday Inn
	Unpredictable	Quadrant 3: Traditional Hotels	Quadrant 4: Initial Yield Management Attempts

Figure 3. The hotel industry.

	Possible Approaches
Refine Definition	Time Event
Uncertainty of Arrival: Internal Measures	Forecasting Overbooking
Uncertainty of Arrival: External Measures	Penalties Deposits
Uncertainty of Duration: Internal Measures	Forecasting by time of arrival, length of stay and customer characteristics
Uncertainty of Duration: External Measures	Penalties Restrictions Process analysis
Reduce Time Between Customers	Process analysis

Figure 4. Methods of managing duration.

	Possible Approaches
Proper Price Mix	Price elasticities Competitive pricing Optimal pricing policies
Rate Fences: Physical	Type of inventory Amenities
Rate Fences: Non-Physical	Restrictions Time of usage Time of reservation Group membership

Figure 5. Methods of managing price.

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