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Improving Hospitality Industry Sales: Twenty-Five Years of Revenue Management

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Abstract

From its origin in the airline industry nearly sixty years ago, revenue management has expanded to other hospitality industries, notably lodging and rental cars. More recently, "nontraditional" service industries, such as restaurants, golf courses, and casinos, have begun to adapt and apply revenue management principles. The first revenue-management–related article appeared in the *Cornell Quarterly* in 1988—an article that introduced revenue management concepts to the hotel industry. Subsequently, the *Quarterly* has published numerous revenue management studies, covering hotels, restaurants, golf courses, and function space. In addition, *CQ* has examined distribution and pricing issues. This review of twenty-plus years of *CQ* articles documents the expansion of revenue management themes as published in the *Quarterly* and suggests directions for future revenue management research.

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Improving Hospitality Industry Sales

Twenty-Five Years of Revenue Management

by CHRIS K. ANDERSON and XIAOQING XIE

From its origin in the airline industry nearly sixty years ago, revenue management has expanded to other hospitality industries, notably lodging and rental cars. More recently, "nontraditional" service industries, such as restaurants, golf courses, and casinos, have begun to adapt and apply revenue management principles. The first revenue-management–related article appeared in the *Cornell Quarterly* in 1988—an article that introduced revenue management concepts to the hotel industry. Subsequently, the *Quarterly* has published numerous revenue management studies, covering hotels, restaurants, golf courses, and function space. In addition, *CQ* has examined distribution and pricing issues. This review of twenty-plus years of *CQ* articles documents the expansion of revenue management themes as published in the *Quarterly* and suggests directions for future revenue management research.

It has been more than twenty years since the first revenue management (RM)–related paper was published in the *Cornell Quarterly*. This 1988 paper, by Eric Orkin, was the first to expose *CQ* readership to RM concepts; and with its focus on demand, it set the stage for today's focus on revenue per available room (RevPAR) as an essential rate-setting strategy. Since that first paper, the *Quarterly* has continued to develop and expand on RM concepts. Here we examine the many RM-related papers published in the *Quarterly*, with an eye to future developments in RM.

Hotel Revenue Management

The definition of *revenue management* has evolved as its application has moved from maximizing yield or average daily rate (ADR) to maximizing revenue—with the current focus on property-wide profits rather than just rooms revenue. In essence, one can now think of RM as managing customer behavior at the

individual level via price and availability of constrained resources to maximize profits. Although the airlines have been at the forefront of RM research and development, the hotel industry has made effective use of its principles. The mid-1980s saw early adopters start to apply RM concepts in hotels, and the *Quarterly* presented increasingly sophisticated RM articles. Exhibit 1 provides a chronological list of papers dealing specifically with hotel-related RM.

Orkin's 1988 article focused on what he called the *yield statistic*, which was a precursor to today's focus on RevPAR. This statistic was a composite of rate and occupancy for measuring performance, total revenue divided by revenue potential, with revenue potential defined as total rooms multiplied by rack rate (or, your maximum revenue if all rooms sold at rack). Orkin outlines conceptually many of tools deployed in RM application today, indicating properties' need to focus on the following four key areas: forecasting, systems and procedures, strategy and tactical plans, and feedback systems. RM starts with estimates or forecasts of future demand combined with a set of automated systems for rate control. The effectiveness of these systems requires a formalized strategy and tactical plan for employees to implement these recommendations, with a feedback loop that allows employees and managers the opportunity to assess the impact of their decisions.

While Orkin outlines the conceptual role of RM, Relihan (1989) provides tactical tools for RM implementation. Relihan introduces the use of booking curves or threshold curves as a method to determine availability of different rate classes. Threshold curves represent a range of typical reservations on hand (ROH) that a firm would expect as a function of days before arrival (DBA). If the current ROH deviate outside the stated range, then the firm would adjust rates by raising or lowering prices depending on whether current ROH seem abnormally high or low. In addition to threshold curves, Relihan introduces readers to the idea of revenue optimization, in which a firm has a revenue maximizing price that balances ADR and occupancy.

Kimes (1989) augments Orkin's argument as she outlines the necessary conditions for RM, as well as implementation issues for hotel managers. As Kimes summarizes, any industry having relatively fixed capacity of a perishable product and facing uncertain demand where some consumers place orders (reservations) in advance is amenable to RM techniques. As a prelude to some current concerns, Dunn and Brooks (1990) caution that the short-term market-driven pricing approach of RM may erode profit margins. They warn properties to maintain a strategic eye on segment-level profitability. Perhaps the first *Quarterly* article to truly drive home the core concepts of RM is that of Hanks, Cross, and Noland (1992). Hanks and his associates outline an argument for a rational approach to room pricing—one that deviates from customers' haggling for lower rates to one where rates are linked to segments and are "fenced" using restrictions designed to exclude certain segments from specific rates. The authors use examples from American Airlines to demonstrate the use of rate fences at the hotel property level. These fences may be physical room characteristics or nonphysical restrictions linked to when the room was reserved (i.e., advance-purchase requirement) or duration of the guest stay (e.g., Saturday night) as the property attempts to differentiate business guests from leisure guests. Hanks and his coauthors illustrate their argument with examples of fenced rates at Marriott.

Lieberman (1993) outlines ten popular misconceptions associated with the adoption of RM. Unlike airlines, which fine-tuned their RM over several years, adoption

Exhibit 1:

Hotel Revenue Management

Year	Author(s)	Title
1988	Orkin	Boosting Your Bottom Line with Yield Management
	Lefever	The Gentle Art of Overbooking
1989	Relihan	The Yield-Management Approach to Hotel-Room Pricing
	Kimes	The Basics of Yield Management
	Lambert, Lambert, and Cullen	The Overbooking Question: A Simulation
1990	Dunn and Brooks	Profit Analysis: Beyond Yield Management
1992	Hanks, Cross, and Noland	Discounting in the Hotel Industry: A New Approach
1993	Lieberman	Debunking the Myths of Yield Management
1994	Kimes	Perceived Fairness of Yield Management
1995	Weatherford	Length of Stay Heuristics: Do They Really Make a Difference?
1997	Cross	Launching the Revenue Rocket: How Revenue Management Can Work for Your Business
1998	Orkin	Wishful Thinking and Rocket Science: The Essential Matter of Calculating Unconstrained Demand for Revenue Management
1999	Quain, Sansbury, and Quinn	Revenue Enhancement, Part 3: Picking Low-Hanging Fruit—A Simple Approach to Yield Management
2001	Weatherford, Kimes, and Scott	Forecasting for Hotel Revenue Management: Testing Aggregation against Disaggregation
	Kimes and Wagner	Preserving Your Revenue-Management System as a Trade Secret
2002	Toh and Dekay	Hotel Room-Inventory Management: An Overbooking Model
2004	Schwartz and Cohen	Hotel Revenue-Management Forecasting: Evidence of Expert Judgment Bias
2006	Choi	Group Revenue Management: A Model for Evaluating Group Profitability
2007	Rohlfs and Kimes	Customers' Perceptions of Best Available Hotel Rates
2009	Cross, Higbie, and Cross	Revenue Management's Renaissance: A Rebirth of the Art and Science of Profitable Revenue Generation

of RM within hotels occurred without as much internal development. As a result, hotels faced certain misunderstandings about RM applications. Among the ten myths that Lieberman explodes is the idea that RM was a computer system that is going to redefine a property. Instead, he points out the reality that RM represents a set of tools and systems to aid employees in better managing their business.

Like Lieberman, Kimes (1994) cautions hotels regarding the application of RM. She argues that airline customers are accustomed to variable pricing, but RM was at that time still in its infancy for hotels. Kimes reported the results from a survey of hotel guests, indicating customers perceived pricing actions as fair if the customers were made aware of their options and if reasonable restrictions were tied to discounted rates. In contrast, respondents perceived offering insufficient benefits in exchange for restrictions and not informing customers of their options as unacceptable practices.

While the early RM research in the *Quarterly* focused on the adoption of rational and acceptable approaches to variable pricing, Weatherford (1995) summarizes the impacts to a property from controlling rates for different customer-stay durations. As Weatherford summarizes, traditional RM has been shown to provide revenue gains of 4 to 5 percent by managing rates and by using overbooking to control for no-shows and cancellations. On top of that, he argues that hotels have the opportunity to achieve upwards of an additional 3 percent through managing guests' length of stay. Weatherford outlines a linear programming approach for setting availability controls for different lengths of stay similar to what airlines use to control seats on planes, in view of the many different itineraries passengers might have. In this regard, managing hotel guests' length of stay is analogous to an airline managing passengers' diverse itineraries.

Cross (1997) outlines a pathway for all hospitality operations to follow, not just hotels or airlines, on the adoption of RM principles. Cross indicates that managers need to define and document the issues their firm must address to maximize its revenue. These issues include the needs of the market and the organization. He encourages firms to outline how RM's benefits will be quantified. He then argues for the technological side of RM including the adoption of technology for the forecasting and optimization of prices. Finally, he asserts the human side of RM through the adoption of teams and product champions to ensure proper execution and evaluation of RM strategies.

As RM systems look to control rates across different guest lengths of stay with a goal of accepting the best reservations and maximizing demand, they are limited by the data they receive. Orkin (1998) outlines the concept of demand inference from sales data in his well-titled article, "Wishful Thinking and Rocket Science." Orkin argues for the use of denials data, recorded when a potential guest calls but does not make a reservation, as a way to impute true demand from actual sales or reservations. While he indicates that there is the potential for over-estimating demand using this method, making an estimate of true demand is an essential step in the application of RM. Weatherford, Kimes, and Scott (2001) look at other demand estimation issues as they focus on the level of forecasting detail. Using data from two large Marriott properties, the authors indicate that the more granular a forecast is, the more accurate its predictions will be, indicating that firms should attempt to work with data that are as disaggregated as possible. As an example, one might forecast each rate class and length of stay combination separately, rather than create an occupancy forecast and back-out data for the different rate classes. In a related article, Schwartz and Cohen (2004) indicate that the way that the forecast information is communicated to the revenue manager is as important as the accuracy of the forecast itself.

Airlines have long overbooked flights in an effort to ensure that planes fly as full as possible. Overbooking is facilitated at the flight operations level because passengers

who are not accommodated due to over-booking can be readily rescheduled on later flights and are often eager to receive compensation for a moderate delay in their travel plans. Because all passengers are boarding at the same time, it is possible to ask for volunteers to give up their seat, and denied boarding is relatively rare. Unlike an airline, a hotel's guests do not all arrive at the same time. Thus, the hotel might inadvertently deny a room to a guest who is unwilling to be walked, given that a hotel is unable to host the reverse auction that we commonly see at the departure gate. The complexity of overbooking for hotels was first discussed by Lefever (1988), who noted the particular complication of multiple-night stays. Lambert, Lambert, and Cullen (1989) employ a simulation model for a 317-room hotel to investigate the complexities associated with hotel overbooking. Toh and Dekay (2002) summarize no-show, early departure, and unexpected stayover data resulting from a survey of room managers at six hotels, along with related research on setting overbooking levels. They then present simple heuristics for estimating over-booking levels. The authors caution that rooms managers overbook as a function of the planned arrivals, but they also must consider both unexpected stayovers and early departures to avoid having unused rooms (early departures) or walked guests (in the case of unexpected stayovers).

RM at an airline is applied in a centralized manner, but most hotels are decentralized with regard to RM, with properties usually controlling RM systems. Consequently, each property's application of RM is relatively customized and hotels are concerned about losing their proprietary information to other organizations. Kimes and Wagner (2001) outline precautions firms can take in an effort to protect their RM systems as trade secrets. Group and negotiated rates is an area of hotel RM that may

need special protection. Many city center hotels have upwards of 50 percent of their reservations blocked far in advance by large groups at discounted rates for conferences or special events. RM of groups, as outlined by Choi (2006a, 2006b), focuses on estimating the number of transient guests potentially displaced by acceptance of the group. Choi presents models to determine minimally acceptable rates for contracted group rates given the estimated displaced transient demand.

The growth of online travel agents (e.g., Expedia, Orbitz, and Travelocity) has resulted in more transparency in hotel pricing. One of the results of this transparency is a move to best available rates (BAR). Historically hotels have offered different rates for different lengths of stay. Thus, if you stay for one night the rate may be $99, but if you stayed a second night (say, a high-demand night) the rate may be $129. Depending on the RM system, best-rate pricing results in guests' potentially paying $99 for the first night and $129 for the second, instead of an average ($114) or the highest rate ($129) per night. Rohlfs and Kimes (2007) conducted a survey at three airports to gauge customer reactions to being quoted average rates for an entire stay versus different rates each night. Generally speaking, customers preferred as much information as possible and would prefer to see each night's rate separately rather than pay an average rate across their stay.

Cross, Higbie, and Cross (2009) is the most recent property-level RM article in the *Quarterly* at this writing. This article serves as summary of the current status of hotel RM, with thoughts about its future. Cross and coauthors summarize interviews with a series of RM executives, linking these interviews to the state and future of RM. Although the discussion is conceptual, it argues toward a customer-centric approach to RM—one focused on demand

management rather than simply RM. In sum, we find that the bulk of the hotel RM research covered within the pages of the *Quarterly* has been focused on educating the *CQ* readership on tools and techniques developed by airlines and adapted for hotel properties. As we discuss next, the *Quarterly* has played a substantial role in the extension of RM into other industries, such as restaurants, golf, and function space. Exhibit 2 summarizes the key *Quarterly* articles dealing with the extension and development of RM in formerly uncharted territory.

Revenue Management in Other Industry Segments

Kimes (1989) outlines the industry characteristics amenable to the application of RM—essentially any service setting. Airlines, rental car firms, and hotels are considered traditional RM applications, while other hospitality businesses are considered nontraditional, including restaurants. Kelly, Kiefer, and Burdett (1994) outline a pilot study designed to determine the resistance to changing menu prices at a restaurant, a key element of RM. To test customers' price sensitivity, they varied the price of one menu item (four different prices within a $2 range). The authors found no impact on the propensity of guests to choose the variably priced item even when prices were increased by as much as 20 percent, indicating that the pilot restaurant could raise its prices, at least on this item. While the results of the study are interesting, the authors did not look at the propensity of guests to change their restaurant choice, only their menu item given their restaurant choice.

Kimes et al. (1998) is the first of many *Quarterly* articles outlining the potential benefits of restaurant RM. Since restaurants have relatively fixed capacity and high fixed costs, with predictable demand for items of low variable cost, they have the opportunity to maximize their constrained resources through RM. Kimes and associates define this in terms of revenue per available seat hour (RevPASH). Restaurants face considerable uncertainty in managing the use or duration of their capacity because guests may not abide by reservations, or they may take longer to dine than expected. To support RM, restaurants can focus on efficiency measures to improve revenues as they try to turn tables quicker. Kimes (1999) elaborates on the specifics of implementing a restaurant RM strategy, while Kimes, Barrash, and Alexander (1999) summarize a case study deploying those techniques. Restaurant RM involves managing both price and dining duration to maximize RevPASH. Kimes, Barrash, and Alexander discuss the development of a baseline RevPASH measure for the test restaurant using a combination of point of sale (POS) data and time study data. Unlike traditional RM, restaurant RM takes more of an operational view of improving revenues because it focuses on managing duration in addition to price. Similar to Relihan (1989), the authors use their RevPASH baselines to categorize operations in hot and cold periods. Hot periods (high RevPASH) require more structured service delivery (e.g., limited menus, specialized employees, limited reservations) with a focus on increasing turns and getting guests through as quickly as possible. In contrast, in cold periods (low RevPASH), restaurants should provide more flexibility to guests (e.g., accept reservations, larger menus, promotions).

Perhaps the most important aspect of restaurant RM is the way a restaurant's capacity is configured, specifically, the mix of table sizes (e.g., 2-tops versus 4-tops), as analyzed by Thompson (2002, 2003). First, he focuses on the trade-off between having tables of different sizes (2-, 4-, 6-, and 8-tops) and combinable tables (two 2-tops serving a party of four). Although

Exhibit 2:
Nontraditional Revenue Management

Year	Author(s)	Title
1994	Kelly, Kiefer, and Burdett	A Demand-Based Approach to Menu Pricing
1997	Norman and Mayer	Yield Management in Las Vegas Casino Hotels
1998	Kimes, Chase, Choi, Lee, and Ngonzi	Restaurant Revenue Management: Applying Yield Management to the Restaurant Industry
1999	Kimes	Implementing Restaurant Revenue Management: A Five-step Approach
	Kimes, Barrash, and Alexander	Developing a Restaurant Revenue-Management Strategy
2000	Kimes	Revenue Management on the Links: Applying Yield Management to the Golf-Course Industry
2001	Kimes and McGuire	Function-Space Revenue Management: A Case Study from Singapore
2002	Pullman and Thompson	Evaluating Capacity- and Demand-Management Decisions at a Ski Resort
	Thompson	Optimizing a Restaurant's Seating Capacity: Use Dedicated or Combinable Tables?
	Kimes and Wirtz	Perceived Fairness of Demand-Based Pricing for Restaurants
	Kimes	Perceived Fairness of Yield Management
2003	Thompson	Optimizing Restaurant-Table Configurations: Specifying Combinable Tables
2004	Susskind, Reynolds, and Tsuchiya	An Evaluation of Guests' Preferred Incentives to Shift Time-Variable Demand in Restaurants
	Kimes and Robson	The Impact of Restaurant Table Characteristics on Meal Duration and Spending
	Kimes	Restaurant Revenue Management: Implementation at Chevys Arrowhead
2006	Pinchuk	Applying Revenue Management to Palapas: Optimize Profit and Be Fair and Consistent
	McGuire and Kimes	The Perceived Fairness of Waitlist-Management Techniques for Restaurants
2007	Peister	Table-Games Revenue Management: Applying Survival Analysis
	Noone, Kimes, Mattila, and Wirtz	The Effect of Meal Pace on Customer Satisfaction
2008	Kimes	The Role of Technology in Restaurant Revenue Management
2009	Thompson	(Mythical) Revenue Benefits of Reducing Dining Duration in Restaurants
	Kimes and Singh	Spa Revenue Management
	Anderson and Xie	Room-Risk Management at Sunquest Vacations

the combinable tables offer flexibility, they may result in table idle time when a table sits empty until a nearby table is freed so that the two can accommodate a larger party. On the other hand, tables of fixed size may generate lower RevPASH if a party of two is seated at a 4-top. Subsequently, Thompson modified his earlier paper to determine the impact of how tables are combined. He examined whether, for instance, a party of six is better served by combining a 2-top and a 6-top or by combining two 4-tops. His most intriguing finding is that fixed tables are best suited for large restaurants (two hundred seats), whereas small restaurants (fifty seats) can benefit from combinable tables.

Susskind, Reynolds, and Tsuchiya (2004) conduct a survey of restaurant guests to determine their reaction to a set of demand-shifting tactics, including coupons and discounts, discounted menus, and unusual food and service offers. More than 77 percent of respondents indicated they would be willing to receive promotional offers that encouraged them to dine during off-peak hours. While Susskind and coauthors evaluate the ability of price to balance demand, Kimes and Robson (2004) investigate the impact of table characteristics on dining duration and check size. Kimes and Robson analyze POS data to determine whether table type and location affect guests' spending and dining duration. The authors indicate that guests in booths tend to spend more, while guests in banquette tables tended to spend less but also to linger—a combination detrimental to revenues. Kimes (2004) extends that spending and dining duration analysis into a full restaurant RM implementation at Chevys Arrowhead. The implementation focused on adjusting the table mix away from larger tables to small tables to better accommodate the patron mix, given low seat utilization and long guest waits with the existing table mix. In addition to table mix, Kimes recommended reducing dining duration (notably, by bussing tables and speeding check settlement) to move more guests through the restaurant. As a note of caution, Noone et al. (2007) indicate that customer satisfaction can be diminished if restaurants attempt to unduly hasten dining times. Using a scenario-based survey that asked respondents to reflect on recent dining experiences, Noone et al. found that satisfaction could be increased and dining duration reduced before and after the meal, but attempts to rush the meal itself tended to reduce customer satisfaction. Thompson (2009) indicates that the revenue effects of reducing duration are smaller than initially predicted, although there is a benefit in busy times.

Kimes and Wirtz (2002) investigate the perceptions of fairness when restaurants adopt differential pricing. Specifically, they compare surcharges with discounts for lunch and dinner, weekdays and weekends, time of day, and table location, as well as considering the use of coupons. As one might expect, customers perceived coupons and discounts for off-peak dining to be fair, but they saw surcharges as unfair. The results indicate restaurants should be able to smooth demand by encouraging off-peak dining through promotions. Kimes (2002) looks at the perceived fairness of different techniques to manage queues during peak dining times. They found that customers generally perceive the seating of guests according to their party size and the use of call-ahead seating to be fair, as long as those techniques are properly communicated to guests. On the other hand, they saw priority seating for preferred guests or larger parties as unfair. Kimes (2008) provides a framework for the adoption of technology in the implementation of restaurant RM strategies and urges suitable cost-benefit analysis.

Golf courses. Kimes (2000) argues for the use of RM principles in the management of golf tee times. Analogous to restaurants, golf courses applying RM would have to forecast both demand for tee times and the duration of rounds. As is the case with other hospitality firms, courses may need to estimate no-show behavior and overbook some tee times. Finally, courses may manage demand, perhaps by requiring the use of carts during busy times or offering discounts to shift demand to slow periods.

Function space and spas. Hotels are seeking to apply RM to other revenue centers within the property. Kimes and McGuire (2001) summarize a case study involving function space at the seventy-thousand-square-foot Raffles City Convention Center in Singapore. Function space is subject to similar strategies as restaurants, but the measure in question is contribution per available space per day-part (ConPAST). Similar to restaurant RM, Kimes and McGuire estimate current ConPAST as a baseline and then recommend RM-type strategies to manage the facilities as a function of the baseline. During periods of low ConPAST, the authors recommend that the sales force focus on discounting to fill the space. Kimes and Singh (2009) provide a similar illustration of RM for spas. Spa performance can be measured by revenue per available treatment-hour (RevPATH), and spas are generally subject to conventional RM strategies.

Casinos. Norman and Mayer (1997) summarize early adoption of RM at Las Vegas casino hotels. Of the seven hotels they surveyed, only one had a computerized RM system at that time, with four other properties employing some level of RM. The computerized system employed a threshold system similar to that presented in Relihan (1989). The authors indicate that at the time of writing, the rooms division within the casino hotel was still dominated by the casino floor and focused more on feeding the casino with potential gamblers than on maximizing revenue.

Casino RM had advanced considerably when Peister (2007) focused specifically on manipulating the minimum bet on casino table games. The idea is to maximize WPASH (win per available seating hour), with the minimum bet fulfilling the function of room rates. Adjusting the minimum bet manages demand—too low and tables fill with low rollers (even as potential high rollers wait to play), but too high and tables are empty. Like all applications of RM, table game RM suffers from constrained data, because it is hard to tell whether an empty seat simply means there are no players or whether the minimum bet excluded players who wished to wager less. Peister uses a Cox proportional hazard regression model to estimate table demand as a function of the table minimum and then uses common RM heuristics to determine the minimums that should be set.

On the beach. Pinchuk (2006) extended RM principles to the management of *palapas* at a beach resort. The resort faced excess demand for its limited supply of beachfront palapas, often resulting in guest conflict and dissatisfaction over their allocation. Pinchuk suggests methods to increase beachfront capacity as well as ensure that guests have fair access to the palapas. He argues for the potential use of pricing and packaging to allocate the scarce resource, as well as offering substitutes (chairs and umbrellas).

Tour operators. In a study of a tour operator managing rooms, we presented a series of optimization models used by a Canadian tour operator (Sunquest Vacations) to manage its inventory (Anderson and Xie 2009). The tour operator must manage two types of room contract, one that carries no financial loss if the tour operator does not sell the rooms and one involving prepaid rooms.

Exhibit 3:
Pricing and Distribution

Year	Author(s)	Title
1991	Russo	Variance Analysis: Evaluating Hotel Room Sales
1992	Quain	Analyzing Sales-Mix Profitability
1997	Lewis and Shoemaker	Price-Sensitivity Measurement: A Tool for the Hospitality Industry
2001	Gourville and Soman	How packaging Services Can Hurt Consumption: The Potential Downside of Bundling
2002	Choi and Kimes	Electronic Distribution Channels' Effect on Hotel Revenue Management
	O'Connor and Frew	The Future of Hotel Electronic Distribution: Expert and Industry Perspectives
	Quan	The Price of a Reservation
2003	Carroll and Siguaw	The Evolution of Electronic Distribution: Effects on Hotels and Intermediaries
	Verma and Plaschka	Customer-Choice Modeling: Reflections, Advances, and Managerial Implications
	O'Connor	On-Line Pricing: An Analysis of Hotel-Company Practices
2005	Choi and Mattila	Impact of Information of Customer Fairness Perceptions of Hotel Revenue Management
2006	Choi and Mattila	The Role of Disclosure in Variable Hotel Pricing: A Cross-Cultural Comparison of Customers' Fairness Perceptions
	Chen and Schwartz	The Importance of Information Asymmetry in Customers' Booking Decisions: A Cautionary Tale from the Internet
2009	Enz, Canina and Lomanno	Competitive Pricing Decisions in Uncertain Times

Our optimization model focuses on how the tour operator should manage its rooms to meet its airline seat obligations, with a particular eye to minimizing rooms it paid for but does not sell.

As noted above, restaurant RM has truly flourished within the *Quarterly*, expanding from frameworks to the assessment of customer reactions to potential RM tactics and full implementations. In particular, the work on restaurant table mix has had considerable impact, because table mix is a first-order effect. That is, if firms get their table mix wrong, they may have difficulty overcoming this drag on performance. The matter of table mix analysis illustrates that nontraditional RM goes far beyond adapting airline-style RM. Instead, these novel implementations involve development of

new science and the expansion of the art of RM itself.

Distribution and Pricing

A key element of RM practice involves finding ways to set prices to avoid commoditization of the service. The experience of airlines and rental cars provides a cautionary tale for other service firms in this regard. The following section examines pricing research published in the *Quarterly* (see Exhibit 3).

Russo (1991) illustrates the concept of variance analysis, which compares actual results with expected outcomes, in an effort to understand the impacts of price changes at a hotel. Variance analysis is a useful benchmarking tool as it allows firms to assess the results of changes to a hotel's

demand mix—particularly highlighting the changes that have resulted in favorable or unfavorable outcomes. While Russo focused on revenues, Quain (1992) looks at profitability by segment to assess the effects of sales and marketing efforts (extending the work of Dunn and Brooks 1990). Quain provides a framework for looking at total segment level profitability as he incorporates room revenues and other revenue streams into his analysis. While Russo (1991), Dunn and Brooks (1990), and Quain (1992) focus on understanding the profit impacts of past pricing decisions, Lewis and Shoemaker (1997) illustrate methods to determine customers' price sensitivity, which can then be used to aid in future price setting. Lewis and Shoemaker illustrate how answers to the following simple survey can be used to determine customers' sensitivity to prices: At what price would you consider the service (1) cheap, (2) expensive, (3) too expensive to purchase, and (4) too cheap (of questionable quality)? While price sensitivity measurement as illustrated by Lewis and Shoemaker has qualitative elements, Verma and Plaschka (2003) present an introduction to the more rigorous world of customer-choice modeling and its potential impact on price setting.

Gourville and Soman (2001) illustrate the impacts of product bundling on consumption. Bundling has long been used as a way to increase sales, on the grounds that creating packages can stimulate demand. Gourville and Soman focus on postpurchase consumption rather than the purchase decision itself. They indicate that people who purchase goods individually (versus as a bundle) are more aware of the items' cost and are more likely to consume the product. The implications for services are threefold: customer satisfaction may decline with nonconsumption, ancillary sales may decrease as no-shows tend to be higher with bundled items (e.g., seasons tickets), and repeat sales may decrease with nonconsumption.

Quan (2002) illustrates the relationship between a hotel reservation and a financial option. Guests make reservations for future stays in an effort to lock in prices (in addition to being ensured of accommodation). By issuing a reservation, a hotel forgoes the opportunity to sell that room later at potentially higher prices. Quan explains that a reservation of this type is analogous to a financial call option, because if prices do go up the consumer's reservation shields him from that price increase. Consequently, the more dynamic or volatile a hotel's prices are, the more valuable is the option (and the reservation). Guests may also act strategically by canceling and rebooking if prices decline. While hotels may not wish to recoup this cost by charging for reservations, the analogy to financial options provides hotels with benchmarks to set discounts on reservations that have cancellation penalties or are not refundable.

Quarterly researchers have investigated the increasing role of electronic distribution and the effect of online travel agents. Choi and Kimes (2002) use simulation to assess the impact of controlling rates and length of stay across distribution channels. They find that if hotels are currently revenue managing by rate and length of stay, they will gain little incremental revenue by also controlling reservations by distribution channel, assuming a straightforward reallocation of existing demand across channels. O'Connor and Frew (2002) conduct two surveys to determine perspectives on the increased role of electronic distribution for hotels. The survey results, from both industry and experts, indicated that electronic distribution would increase in prevalence, and brand and hotel websites would play an increasing role in distribution. O'Connor (2003) found considerable variation in prices quoted across various distribution channels. Rates were equal across all channels for economy properties 46 percent of the time, but that was true for midprice hotels just 21 percent of

the time and 28 percent for luxury properties. The hotel's website offered the lowest rate most often for economy and midprice hotels, but Expedia usually posted the lowest rate for luxury hotels.

Carroll and Siguaw (2003) summarize the changing distribution landscape and the resulting implications for hoteliers. They see a decreasing role for wholesalers as hotel chains continue to develop their online presence—both for distribution and marketing. Carroll and Siguaw further suggest that online travel agents would continue to play dominant roles in electronic distribution as they shift market share among firms and provide more value added services. Chen and Schwartz (2006) hypothesize that the internet will reduce information asymmetry, as consumers become more aware of prices and inventory availability when purchasing travel services. The authors developed an online experiment to investigate the impact of information availability on purchase incidence. Respondents were exposed to two rate scenarios (low and high) and three levels of room availability (few rooms reserved, many rooms reserved, and no information) and asked to either book now or wait. Respondents tended to book immediately (92 percent booking) when offered a low rate regardless of inventory levels, but they did not book when faced with a high rate, unless there were only a few rooms left (many rooms reserved). The major result of interest is the increase in booking under the high-rate scenario, as consumers shifted from 45 percent booking to 83 percent booking as inventory became restricted. Choi and Mattila (2005, 2006) argue for the provision of increased levels of information to increase perceived fairness towards variable pricing. They conducted a survey to compare Americans' and Koreans' fairness perceptions. The respondents were provided three levels of information (no information, limited information,

and full information) on hotel pricing practices. The full-information scenario indicated that the hotel charged different rates by day of week, length of state, and days before arrival and, furthermore, that rates tended to be higher for weekdays, shorter lengths of stay, and closer to arrival. Lastly Enz et al (2009) explore 7 years of aggregate hotel occupancy and revenue data from Smith Travel Research concluding that properties that maintain a small price premium tend to achieve a RevPAR premium as well.

Next Steps

RM research within the *Quarterly* has largely focused on the extension of existing science into additional hospitality venues. Early research was devoted to the adoption of airline RM at the hotel property level. More recent examples include overviews of how RM principles can be applied across other facets of hospitality (e.g., restaurants, meeting rooms, spas, and golf courses). The *Quarterly* has been instrumental in the adoption of RM practices in nontraditional industries, with the literature on restaurant RM moving a discipline forward. The restaurant RM research within the *Quarterly* illustrates how a research in a field can move from concept to implementation.

Most RM science has been developed by or for airlines and later adapted to hotels. The recent economic climate has shed light on the need for further development in the application of property-level RM and pricing, because the contraction in travel demand has illustrated the shortcomings of traditional RM. While airlines and rental car firms have been able to reduce supply in response to this contraction, hotel supply cannot be reduced so quickly. Traditional RM requires that demand exceed capacity, but with the drop in demand, RM systems respond simply by opening all rate classes. Historically RM systems

allocate inventory across the different rate classes using some form of analysis of marginal sales. The marginal-sales model is often referred to as the *newsvendor* problem, because it involves a situation where inventory must be purchased in advance (as a newspaper seller would do). With too few units or papers in inventory, excess demand is lost. In theory, if demand is less than inventory, one adjusts the price downward to encourage demand. At the extreme, if the selling price is lower than the cost of acquiring the newspaper, there is no point in maintaining any inventory. Thus, one must determine the price at the margin. The matter is complicated for hotels by multiple-night stays.

For the hotel, like the newsvendor, if demand does not exceed capacity, then the marginal value of capacity is zero. Hotels cannot sell what rooms they have on hand, so additional capacity is worthless, and the RM system opens all rate classes. The result is a downward spiral in rates as guests who would otherwise be willing to pay more accept reduced rates. This phenomenon occurred in airline RM when traditional airlines removed their Saturday night stay restrictions to compete with the low-cost point-to-point carriers.

The Saturday night stay is one example of a rate fence, meant to prevent a downward price spiral (as discussed in Hanks, Cross, and Noland 1992). Firms need to improve their ability to segment customers, then use non-posted-price methods to reach price-sensitive customers. This would allow firms to continue to have higher posted prices for those who are less price-sensitive. These non-posted-price methods include targeted email offers, linked offers advertised through search-engine campaigns, campaigns through travel deal providers similar to Travelzoo.com, opaque pricing (Hotwire, Priceline, and Travelocity), and packaging. The key to these methods is

reaching price-sensitive customers without diluting revenues from less-price-sensitive customers (as all customers have some price sensitivity). These methods are all marketing-intensive, reinforcing the need for integrating RM and sales and marketing as much as possible, even as a seamless department. RM (in cooperation with marketing) needs to create the demand as well as manage the yield from that demand.

In a surplus capacity, environment RM also needs to pay more attention to price, being more responsive to price as market share shifts quickly. We have seen Inter-Continental Hotels Group (IHG) and Carlson Hotels move to price optimization (versus marginal-rate yielding newsvendor-type models), representing a conscious effort to understand the impacts of price changes. Ideally these price impacts are choice-driven (see Verma and Plaschka 2003) incorporating nonprice impacts (e.g., user-generated content, brand, location, amenities) in an effort to avoid the commoditization of hotel rooms.

Hotel RM also needs to do a better job of integrating data sources beyond reservations into pricing decisions. Pricing-based systems need to include market-level prices. Again, we see movement in that direction as Carlson and IHG have incorporated market-level pricing data into pricing actions. One now can incorporate not only price data but also inventory data, since firms like TravelCLICK provide competitor-level reservations data for future arrival dates. Properties can also track relative positions online through online travel agents, search engines, and social media sites in an effort to understand their relative strength at reaching prospective customers. RM also needs to become more behavioral in its approaches to pricing, with offerings such as Nor1's eupgrade and Hilton's efforts to upgrade customers online. Properties have long

advocated upselling, but that effort must be integrated into online transactions.

Despite its ubiquitous application, RM still needs considerable additional research to enable firms to become more marketing-focused. The new frame for RM is demand management, a system that both creates reservations and yields revenue from them. As customers become more knowledgeable about RM practices, firms need to realize the implications of strategic or forward-looking consumer behavior on their inventory control decisions (and the resulting implications on demand). Given these additional developments, we anticipate that the next twenty-five years of RM research published in the *Cornell Hospitality Quarterly* will continue to shape the art, science, and practice of RM.

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