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Using SAS® Enterprise Miner™ for Resort Profit Optimization: How to Systematically Provide Individual Consumers with Personalized Rates and Offers to Unleash Total Profit Optimization

Marco Benvenuti
Duetto Consulting, Las Vegas, Nevada

Abstract

The continued increase in competition in the gaming and resort industry combined with one of the worst recessions in history make traditional revenue management and marketing strategies ineffective and obsolete. Traditional approaches maximize top-line revenue or, at best, they maximize the income of a specific segment of business. Unfortunately, most companies are using traditional methods and during the recession have focused on deep discounts and cost-cutting because there did not seem to be any other options. Profit optimization is the ideal solution because by providing individual consumers with personalized rates and offers resorts can offer high value services and products to customers willing to pay for them while discounting selectively to price-sensitive customers. This can be tough to achieve but with clear objectives, modern systems, including a data warehouse, SAS® Enterprise Miner™ and a revenue management system, the right talent, effective training, aligned incentives, and updated processes, companies can unlock tremendous profit opportunities. This strategic marketing approach will allow companies to grow EBITDA significantly without focusing on cost-cutting initiatives that risk compromising customer experience.

Introduction

Revenue Management (RM) is the science of selling the right hotel room, at the right price, to the right customer, at the right time, using the right distribution channel. In traditional lodging companies with limited revenue beyond hotel rooms, there is a relatively stable and predictable relationship between revenue and operating profit so RM strategies that focus on maximizing revenue are successful at driving profits.

Software tools are available to assist hotel general managers make informed decisions about setting hotel rates. These systems are typically maintained by revenue managers who previously worked in operations and have limited technical expertise. Competence in RM varies greatly between companies but a revenue manager with an RM system and a GM that “trusts” the science can successfully drive revenue per available room (RevPAR).

With the rise of integrated resorts in Las Vegas with a multitude of product offerings including luxury hotel rooms, casinos, restaurants, spas, retail, meeting space and more, the relationship between hotel revenue and operating profit breaks down. In the clearest example, a casino customer who receives a complimentary hotel room can generate far more profit than a cash-paying hotel customer so a strategy of maximizing RevPAR may hurt performance. Initially, this issue did not surface widely within casino resorts because they were slow to recognize the potential of revenue from non-casino assets. Once the realization of the power of RM began to spread, operators were then faced with the conundrum of figuring out what to maximize and slowly RM moved toward a more useful model known as Profit Optimization (PO) and casino resorts invested in technology to facilitate the new requirements. Unfortunately, for a number of reasons that will be discussed in detail below, the move to PO has been largely unsuccessful at delivering on the promised potential.

The recession proved that the time has run out for integrated resort operators to master the science of PO because the industry was left with the wrong people, tools and processes to accurately forecast demand, precisely set optimal rates and smartly design offers to maximize enterprise-wide profits. The well-known result was a destructive and prolonged price war among competitors with no option except to cut rates to fill hotel rooms in the hope that guests would spend throughout the resorts. Despite the clear need for investment in strategic marketing to fully leverage PO, little progress has been made for the past two years because budgets have been too tight to hire skilled employees and develop expensive systems. Some companies have renewed spending in light of the nascent recovery but it is critical that decision makers take a step back to consider why these efforts have failed in the past to ensure that millions more are not spent on information technology that will never be used as intended.

This paper describes how the traditional RM discipline can evolve into a Profit Optimization (PO) strategy that is appropriate for the complex challenges of optimizing an integrated resort. New advanced analytics technology such

as SAS® Enterprise Miner™, if setup the right way, can transform a traditional RM software package into a 1-to-1 personalized pricing system as long as there are clear objectives, the right talent, effective training, aligned incentives and updated processes.

The Current Status of Revenue Management for Integrated Resorts

Today, Revenue Management and Profit Optimization are poorly understood and poorly executed disciplines in almost all integrated resorts, which has fostered significant distrust among many senior executives. In order to understand how this happens, it is important to briefly describe the history and the common reasons for failure.

The industry first and foremost considers RM and PO to be technology-driven and so, in response to advice from experts, integrated resorts spent millions of dollars on technology. This created a small niche market for technologists to develop RM systems capable of accounting for casino play, handling zero dollar rates and optimizing profit through yielding room rates. Few in the industry would admit it but implementations of these new systems failed at every company because they did not realize how many other things need to be worked out in order to utilize these systems.

Companies discovered that capturing, transforming, storing and exporting the data required by RM systems is extremely difficult. Property Management Systems designed for non-casino hotels did not contemplate the need for this type of data so custom integrations and workarounds had to be built. Also, customer data was split among multiple systems and was not readily available for calculating the profit of customers so that casino and non-casino customers can be compared and segmented. In other cases, companies had data warehouses that were designed for database marketers and were not useful for RM. There are solutions for these technological and data challenges, several of which are offered by SAS, but it takes time to upgrade systems, structure data, improve data capture, remove duplicate records, etc.

Many companies are sprinting ahead with large IT budgets focused on solving these problems with the idea that once the systems are in place they will finally earn a return on investment from a decade of technology development. There is a serious risk though that integrated resort operators will once again be disappointed.

First, operators lack the right human resources. Despite a realization that PO requires much more sophisticated technology than traditional RM, operators have been slow to realize what this means for human capital. These systems must be configured, maintained and interpreted by talented and well-trained employees with technical education rather than drawing from operations departments. Of course, in order to hire these people, companies will have to be prepared to pay much more for these employees, and offer meaningful recognition and incentive plans based on performance.

Second, many resorts have been slow to make procedural changes necessary to dynamically yield rates and offers. For instance, PO cannot be achieved if hotel operations executives are empowered to override rates because they do not have the skills to understand the algorithms nor do they have the time since it is hard enough to provide exceptional service in a large resort. Similarly, it is impossible if casino marketers refuse to yield casino rates or comp criteria, or if the call center and website have no method of quoting dynamic rates. These sorts of changes are both procedural and cultural requiring significant buy-in by key stakeholders.

Third, there are shortcomings to the RM systems. Software companies have created very robust and complex RM systems capable of providing a bid price that is used as a threshold to determine which segments of customers should be allowed in the resorts on any given day and at what rates. Where the systems fall short is usually the capability of transforming a bid price into a selling price taking into account the willingness to pay (or price elasticity) of patrons. Additionally, the systems are not flexible enough to easily accommodate business rules that may not be statistically sound but are imposed for organizational or strategic reasons. Finally, the systems require user sophistication that is not easily found in the talent hired by integrated resorts companies.

Fourth, strategic marketing disciplines must be integrated. Dynamically yielding rates is only really possible if all marketing disciplines are tightly integrated. In too many resorts, coordination between revenue management, casino marketing, hotel marketing, online marketing, group sales and other departments is dysfunctional with differing priorities. PO requires a common vision.

Fifth, advanced analytical tools must be employed to optimize marketing to individual customers. It is not sufficient to have an RM system and data warehouse to optimize the mix of business and maximize rates. This can only be achieved with advanced real-time models created in a tool like SAS® Enterprise Miner™.

The shortfalls described above are the reason why, even today, most companies do not really use systems to price their rooms and select their offerings. It is not uncommon today to find a multi-billion dollar integrated resort that does not have or does not use a system to optimize revenue or profits. Considering the investment that is ramping up at

resort operators and assuming that companies will address many of the key organizational issues discussed above, the rest of the paper will focus on how RM systems work and how they can be enhanced with SAS® Enterprise Miner™ to systematically provide individual consumers with personalized rates and offers to unleash total profit optimization.

How Does a Traditional Revenue Management System Work?

Revenue Management systems are designed to determine a daily value threshold, also known as a bid price, based on demand. The system then uses this threshold to determine which segments of patrons to accept and which ones to reject. The accept/reject process can happen through a price, a complimentary decision, with a length of stay restriction or with a sold out status.

RM systems usually send the decision to a property management system (PMS), and then the PMS validates if the decision is in line with the rules determined by management and makes any necessary adjustments (i.e. minimum and maximum selling rates).

The workflow of a system is usually as follows:

1. Creation of an unconstrained demand forecast by segment and length of stay
2. Creation of a no-show/early arrivals/late departure forecast
3. Calculation of a bid price
4. Calculation of segment bid prices
5. Decision by segment
6. Delivery of decisions to PMS

The most difficult calculation provided by a system is the bid price. A bid price is the value of an extra piece of inventory if it could be available. In order to get that value, a system performs an optimization algorithm (usually based on linear programming) in which the best match between given supply and demand is met. The bid price is then discounted by the value of a specific segment of patrons in order to get the segment bid. The bid price algorithm is very efficient at determining thresholds but it is not designed to infer the price elasticity of patrons. For example, a segment bid price of \$97 does not mean that every patron in that segment is willing to pay a rounded rate of \$99; it is just showing that if any room is sold below \$97 for patrons in that segment, the hotel left potential money on the table.

The most complex systems, when set up the correct way, can calculate a profit-based bid price and then allow yielding patrons within segments based on their daily profit value. Table 1 illustrates an example of profit-based bid price decisions.

Table 1: Example of Profit-Based Bid Price Decision by Segment

Segment	Daily Profit Value	Bid Price	Segment Bid	Decision
1	\$50	\$125	\$75	\$79
2	\$100	\$125	\$25	\$29
3	\$150	\$125	-\$25	COMP
4	\$200	\$125	-\$75	COMP

In this example, the bid price calculated by the system is \$125. The bid price minus the daily profit value provides the segment bid. Assuming that a room rate is rounded to the next "9", segment 1 and 2 get a rate while patrons in segments 3 and 4 receive a complimentary room.

Since the bid price can change daily based on demand and other inputs discussed previously, the patrons in the 4 segments can receive different rates or complimentary offers depending on the dates of their stay. This method has two drawbacks; patrons are grouped in segments (therefore, their segment value has to be an average of some sort) and patrons are not scored for their propensity to pay (i.e. some patrons in segment 1 might be willing to pay more than \$79).

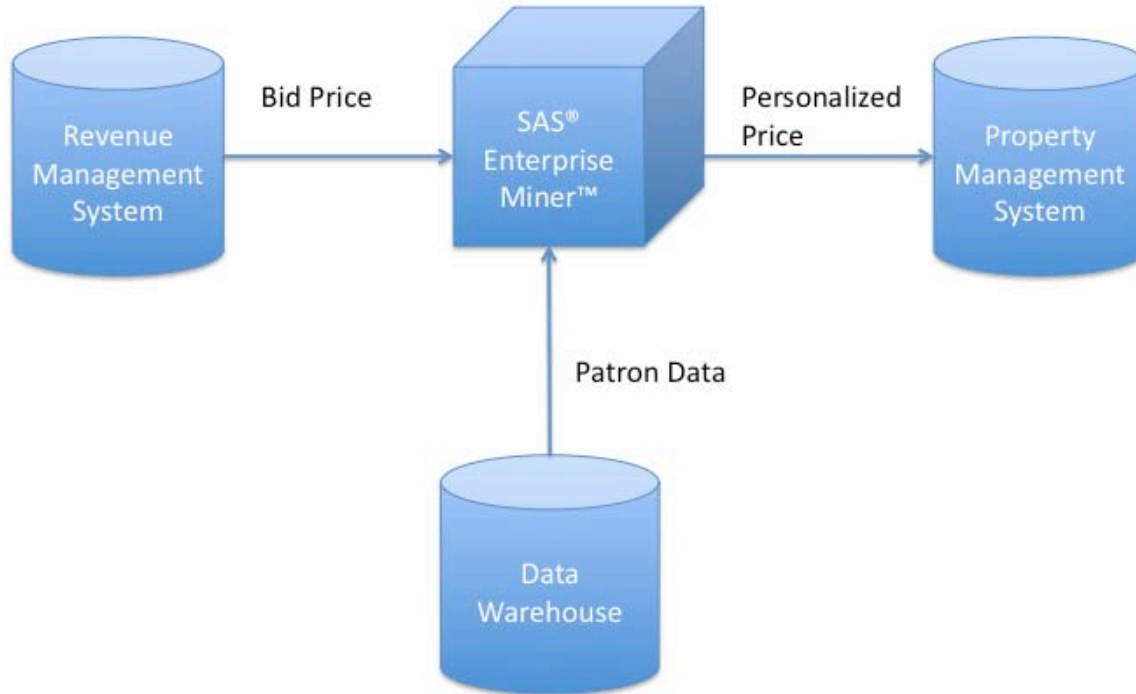
As discussed previously, accepting such recommendations from a system is not a common practice in most integrated resorts. Most management teams override the system recommendations on a daily basis.

Using SAS® Enterprise Miner™ in Conjunction with a Revenue Management System

SAS® Enterprise Miner™ is a very robust tool to create predictive and scoring models. Adding such a tool to the output of an RM system will unleash the ability to optimize the profitability of every yieldable revenue stream by creating personalized prices and offers for each individual patron.

In order to achieve personalized prices and offers, SAS® Enterprise Miner™ has to be installed in a system architecture similar to what is described in Figure 1.

Figure 1: System architecture to use SAS® Enterprise Miner™ as a creator of personalized prices and offers



In this architecture, the RM system provides the daily bid price. The segments in the RM system are mapped 1-to-1 in SAS® Enterprise Miner™. SAS® Enterprise Miner™ then receives patron-specific data from the enterprise data warehouse and uses a pre-built model to score the data, and formulate the final price and offer for that specific patron. The decision is then sent to the PMS. An example of this decision model is described below in Table 2.

Table 2: Example of Profit Based Bid Price Decision To Create Personalized Prices and Offers by Patron

Segment	Patron ID	Daily Profit Value	Bid Price	Segment Bid	Decision	Value Add
1	534687	\$25	\$125	\$100	\$109	
	234567	\$50	\$125	\$75	\$79	
	784958	\$65	\$125	\$60	\$69	
2	756890	\$85	\$125	\$40	\$49	
	630495	\$105	\$125	\$20	\$29	
	756493	\$115	\$125	\$10	\$19	
3	567487	\$135	\$125	-\$10	COMP	
	475689	\$155	\$125	-\$30	COMP	
	384758	\$165	\$125	-\$40	COMP	
4	671938	\$195	\$125	-\$70	COMP	Free Buffet
	492019	\$215	\$125	-\$90	COMP	Free Massage
	304958	\$245	\$125	-\$120	COMP	\$100 Free Play

In this example, the bid price calculated by the system is still \$125. The segment bid is still calculated as the bid price minus the daily profit value. The difference now is that the segment bid becomes unique for each patron in the database since the value used is not an average but the specific value of a patron. Once the segment bid by patron is obtained, SAS® Enterprise Miner™ initiates modeling to provide the specific decision for that patron. This model is built based on hard management rules and self-learning algorithms (e.g. neural networks).

Examples of management rules

- Decision price or offer has to be always above the value of the original bid price
- Minimum and maximum rates
- Competitors positioning
- Early booking window discounts

Examples of answers provided by the self-learning algorithm

- Willingness to pay
- Propensity to respond to a specific offer
- Propensity to convert when offered a complimentary
- Propensity to book discounted dates
- Propensity to respond and upsell based on service preferences

For example, the three patrons in Segment 1 from Table 2 would be offered a rate of \$79 according to traditional RM as detailed in Table 1. Whereas, in the examples in Table 2 for Segment 1, the patrons would receive their own personalized rate that ranges from \$69 to \$109. This decision, powered by SAS® Enterprise Miner™, allows a resort to convert an extra patron (i.e. the patron paying \$69 would have said no to a \$79 rate) and would also make extra profit by charging more than \$79 to the other two since they are less elastic and have a higher willingness to pay.

Furthermore, for patrons in Segment 4, the algorithm can now determine what level of value adds to provide while optimizing the profits for all revenue streams. One patron might like to enjoy a complimentary treatment at the spa while another one might prefer free slot play. The models built in SAS® Enterprise Miner™ will pick the best value add for each patron that maximizes conversion and profit optimization.

This example illustrates how it is possible to achieve personalized prices and offers that optimize profits for integrated resorts by paring up a traditional revenue management system with SAS® Enterprise Miner™.

Conclusion

SAS® Enterprise Miner™ is a versatile tool that creates very powerful predictive models. In this paper, we suggest a potential implementation of SAS® Enterprise Miner™ in conjunction with a revenue management system. The revenue management system provides a bid price by segment (cluster of similar patrons) and the models built in SAS® Enterprise Miner™ transform the bid price into a specific price or offer for each known patron. Being able to create personalized pricing and offers based on the total profitability of each patron unleashes the real opportunity for total profit optimization. An integrated resort that is able to strategically use such a solution will experience increases in GOPPAR (gross operating profits per available room) by increasing RevPAR (revenue per available room) and decreasing marketing allowances for complimentaries.

Biography

Marco Benvenuti is a Partner at Duetto Consulting, which he co-founded in June 2010.

In June 2008, Marco Benvenuti founded and managed a brand new department called Enterprise Strategy at Wynn and Encore in Las Vegas. As Executive Director of Enterprise Strategy, he oversaw revenue management, data analytics, direct marketing and the online channels. Benvenuti stresses that the main goal of Enterprise Strategy is to fill the properties with the most profitable customers. While in Enterprise Strategy, Benvenuti selected and deployed multiple systems, including revenue management, campaign management, analytics and distribution. He also patented two unique inventions: the Pricing Engine for one-to-one dynamic pricing (sole inventor) and the Enterprise Value Algorithm for calculating the value of every customer (co-inventor).

In 2007, Marco Benvenuti began working at Wynn Las Vegas as a Director of IT in charge of hotel systems. He oversaw the following systems: property management, revenue management, room reservations, room keys and uniform control. During his tenure, Benvenuti setup all of the hotel systems for the opening of Encore.

Prior to joining Wynn, Benvenuti worked in the President's Associate Program at Harrah's in the Business Strategy team for the Las Vegas Region. He was a critical part in the profit optimization of the 20,000-room Las Vegas portfolio. Benvenuti also worked for Expedia as a Market Manager and spent a year with Four Seasons in its prestigious management-training program.

Benvenuti completed a Master of Management in Hospitality degree at Cornell University and graduated from the School of Hotel Administration at the University of Nevada, Las Vegas. Marco Benvenuti moved to the US in 1999. Prior to that, he lived in his hometown of Livorno on the beautiful coast of Tuscany.

Contact Information

Marco Benvenuti
2230 Diamond Bar Drive
Las Vegas, Nevada 89117
marco@duettoconsulting.com
607-280-8107

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