Current issues facing revenue management

This dissertation provides an analysis on how revenue management developed through out the years in different industries with more focus on hotels. It discusses the different revenue management strategies including pricing, capacity control, overbooking and forecasting. Related issues such as economic concerns, customer perception, competition, and common techniques and approaches used for solving revenue management problems are also discussed. Finally, I give my suggestion on some important areas that warrant further research.

Introduction

Tradditionally the main purpose of revenue management has been to maximise revenue.

It is the business practice with aim to see the right inventory to the right customer at the right price at the right time in order to maximise total revenue. (B. C Smith, J. F Leimkuhler and R. M. Darrow Vol 22). The concept of right" in this definition means achieving the maximum revenue for the sellers, and gaining maximum value for the buyers(S. E Kimes Vol 40). The basic of revenue management is to offer discounted rates to stimulate demand for inventory that would otherwise go unsold, while limiting the availability of the discounts to customers who are willing to pay a higher price. Hotel companies reported revenue increases of 2 to 5% as a result of using revenue management (Ibid)

The Brief History of Revenue Management

According to Carroll and Grimes 1995; Hanks, Noland, and Cross 1992; Smith, Leimkuhler, and Darrow1992) Revenue management, also known as

yield management, has been widely adopted in the airline, hotel, and rental car industries, but has only recently gained attention in other industries (Kimes 2000; Kimes et al. 1998). Companies using revenue management have reported revenue increases of 2% to 5% (Hanks, Noland, and Cross 1992; Smith, Leimkuhler, and Darrow 1992).

In 1980s The airline industry launched revenue management practices. During that time yield management techniques became a common practice among airlines. On January 17, 1985 American Airlines launched its Ultimate Super Saver fares in an effort to compete with the low cost carrier People Express. (www. ehotelier. com)

The need to fill at least minimum number of seats without selling every seat at discounted was the main reason that triggered the born by revenue management. (www. ehotelier. com)

As new Airline companies started to enter the market in the 1980s, Airline companies were eager to sell enough seats to cover fixed operating expenses. Then once fixed expenses were covered, and there were now fewer remaining seats to sell, the remaining seats could be sold at high prices in order to maximise on revenue and profits.

According to (Boyd, 1998), the application of correct revenue techniques by US Airlines and Delta Airlines resulted of an increase in revenue of US$500 and $300 million respectively, on the other hand Cross (1997) reports that revenue management helps Marriott Hotel to gainUS$100 million additional annual revenue Elliott (2003) presents how revenue management can

contribute substantially to cost savings and revenue maximisation while helping maintain quality.

Research on revenue management has extended to several industries, with three major streams of investigation: descriptive (whether revenue management will work for a particular industry), pricing control, and inventory control. Industries that can use revenue management can be classified further by their relative ability to exercise pricing- and demand-control levers. An important aspect of implementing revenue management is to ascertain the extent to which customers will view pricing controls as being fair. While customers may initially view nearly any manipulation as potentially unfair, research on perceived fairness has found that customers generally will accept price manipulations as long as they believe they are gaining a benefit at the same time the business is receiving a benefit from pricing changes. Duration control involves some combination of manipulating customer arrivals and managing actual duration of use, depending on the industry in question.

Revenue management uses the basic principles of supply and demand economics, in a tactical way, to generate incremental revenues. There are three essential conditions for revenue management to be applicable:

There is a fixed amount of resources available for sale.

The resources to sell are very perishable.

Customers are willing to pay a different price for using the same resources.

The hotel industry fits these criteria extremely well. Obviously, hotels have a fixed inventory of rooms to sell; these rooms are also extremely perishable. Hotel rooms perish every day, any room that is unsold tonight is gone forever. There is also no question that different segments of business are willing to pay different rates under various circumstances.

Revenue management is of especially high relevance in cases where fixed costs are high as compared to variable costs. The less variable costs there are, the more added revenue will contribute to overall profit. This makes revenue management perfect for the hotel industry.

Effective market segmentation is the key to successful revenue management for hotels. Market segmentation begins with seasonal demand. For years, hoteliers recognized that almost all hotels experience periods of high and lower demand. This is even more obvious in hotels, located in resort and attraction areas.

Hotels quickly recognized that consumers would also pay more for rooms with a superior view, such as ocean or mountain views and other unique features of their location; larger or unusual rooms; and rooms with unique features.

Hotel revenue management hit its stride when hoteliers examined airline RM and realized that the factors of supply and demand, beyond natural seasonal demand, present opportunities to generate higher revenue. As room demand increases and room supply decreases, hotel rate opportunities also increase.

The airlines have taught us that supply & demand opportunities appear all year long because of conventions, group bookings, room production through web site marketing, special events and local attractions; all create revenue management opportunities.(Ehotelier)

This dissertation address the way revenue management is applied in hotels in UK and discusses the latest issues that faced revenue managers during the economic down turn last year

This dissertation Study has been undertaken through detailed analysis on how revenue management is applied in hotels and then discuss the issues facing Revenue managers today through the analysis of responses to a survey that was sent to revenue managers working at hotels in UK.

The research also include several working papers, conference proceedings and case studies that I believe are valuable in this study. Overall, 20 articles have been examined.

Several review papers have provided an overview of research on revenue management. A list of these papers is in Table 1. In This dissertation will focus on the progress of revenue management in recent years, especially after 1999.

Literature review

How Revenue Management is Applied

Gallego and Phillips (2004) introduce the concept of flexible products for revenue management. They define a flexible product as a ' menu' of two or more alternative, typically substitute, products offered by a constrained

supplier using a sales or booking process. In this context, products include not only physical products but also service offerings. Researchers have applied revenue management models in a wide variety of industries where suppliers offer flexible products. Airlines, hotels and rental car industries represent three major traditional applications of revenue management. These industries share some similar characteristics. All of their products are perishable, the demand for their products vary significantly over time, and they have large fixed costs while variable costs are small in the short run. Because of revenue management's success in these industries, researchers and practitioners have begun trying to adopt it in a wide range of miscellaneous industries such as restaurants, casinos, cargo, Internet services and apartment renting. These industries share some similar characteristics with the traditional industries. Some of these practices have acquired great success. In fact, all service providers can take advantage of revenue management theory. Just as (Berman 2005) says, revenue management is an effective mechanism to allocate a service provider's relatively fixed capacity and to provide discounts on a much broader scale. The table below provides examples of revenue management application in different industries. We are not going to discuss the application of revenue management in every industry. In the following section, we provide a brief overview and examples of revenue management research in three non-traditional industries

Revenue management practices in different industries (Berman (2005)

Industries

Example of practices

Hospitality Industries

Hotels

Provide special rate packages for periods of low occupancy;

use overbooking policy to compensate for cancellation, no-shows.

Restaurants

Move customers to off-peak periods by offering discount

coupons, or charging reservation fees and higher meal

prices on Friday and Saturday nights.

Attractions

Set different admission charge levels, provide joint-entry

tickets, group discounts, coupons, membership rates.

Cruise lines and ferry lines

Provide luxury class, economy class; change prices

frequently according to demand; sell more tickets than seats

to avoid cancellation and no show.

Casinos

Customize offers such as complimentary room, tickets,

gifts, discounts, etc., based on customers' profitability.

Saunas

Determine price based upon factors such as room type, duration, and service type.

Resort

Provide different resort packages to attract different customers.

Golf

Use different prices to reflect the value of different times of the golf course.

Sports events and distribution

Determine ticket price for an event based on based on factors such as customer tastes and area of seating; determine the price of season tickets; determine the number of tickets sold for each seat segment.

Conference

Provide different packages and rates to satisfy different customers' requirements.

Transportation related industries

Airlines

Provide business class, economy class; adjust prices

frequently according to demand; provide more tickets than

seats to avoid cancellation and no-show.

Rental cars

Adjust prices frequently according to demand; serve highvalued

fleet utilisation with priority; accept or reject

booking requests based on length-of-rent controls.

Railways

Divide customers into standard class and first class; provide

different prices based on the day of travel and the time of

the day.

Subscription services

IT Services and Internet Services

Allocate resources such as human resource, computing

capacity, storage and network capacity among segments of

customers and determine appropriate price for each

segment, high class customers will be served with priority.

Cellular network services

Control call admission based on customer priority, higher

class customers will be served with priority.

Major revenue management problems

Revenue management problems can be categorized into several different, but related, areas: pricing, auctions, capacity control (or inventory control), overbooking, and forecasting. In the following subsections, we will review each of these areas, but before we start, there are two points that need to be mentioned. First, although we categorize revenue management into several areas, this does not mean that these areas are completely isolated. In fact, these areas are highly correlated and need to be considered jointly when solving practical problems and some researchers are indeed trying to solve these problems jointly. For instance, Feng and Xiao (2006) present a comprehensive model to integrate pricing and capacity allocation. Second, auction is a specific type of pricing strategy. Here we separate auctions from pricing, because we want to emphasise the importance of auctions in the future application of revenue management. In addition, in this section, we also discuss other related issues regarding revenue management, including economic theory, the impact of competition and consolidation, customer perception and behaviour, the development and implementation of revenue management, performance evaluation of revenue management and techniques used for solving revenue management problems

Managing Seasonal versus Daily Demand

Revenue management principles apply to all levels of demand. Resort hotels with seasonal rates have been using a form of revenue management for years by posting higher or lower rates based upon seasonal demand; this is the essence of revenue or yield management. If these hotels thought they could get " in-season" rates all year long, they certainly would. They are adjusting for supply and demand. (ehotelier)

Yield management provides the ability to build a base of business by posting a wide range of rates, low to high, to appeal to the broadest range of consumers. For hotels which are capable of handling group business, this is the theory behind quoting lower rates for groups; getting the business on-the-books. Once this base business is booked, either by groups or transient individuals, lower rates can then be closed for sale. This is daily demand.

It's important to understand that yield management is the process of closing-out lower rates when there are fewer rooms to sell; leaving only higher rates as occupancy increases. Rates are not increased; lower rates are closed for sale. There is an important distinction between the two.

As demand increases, there are more methods of yielding higher revenue; the use of restrictions. Many hotels use restrictions very effectively. E. g. hotels with high weekend demand often restrict weekend reservations to a minimum of two nights by placing a minimum of two nights stay on Saturday, the more popular night. This limits stays to Friday/Saturday or Saturday/Sunday, the two weaker nights. The same can be applied to holiday periods.

The key to successful revenue or yield management is to review advance

reservations and make rate close-out decisions as often as might be

necessary; generally, three times per week. Hotels practicing revenue

management gain an insight into the ebb and flow of business, knowledge of

reservations booking pace, and a true understanding of factors which impact

occupancy and average rate.

Capacity control

Koide and Ishii (2005) consider the hotel room allocation policies with early

discount, cancellations, and overbooking, but without no-shows. The

presented model

can provide the optimal solution under certain conditions. They also derive

an optimal

allocation for a simplified problem, which considers early discount but

ignores

cancellations and overbooking. McGill and van Ryzin (1999) consider the

allocation of capacity for rental businesses with two classes of customers.

Their research suggests that the capacity reductions enabled by allocation

schemes can help to lift profit margins significantly.

Zhang and Cooper (2005) address the simultaneous seat inventory control of

a set of

parallel flights between a common origin and destination with dynamic

customer choice

among the flights. They solve this stochastic optimization problem through simulation based

techniques. Most of the current capacity control practices are based on forecasting. However,

forecasting is difficult, costly and the results are sometimes unsatisfactory. Therefore,

researchers are trying to find alternative approaches. van Ryzin and McGill (2000)

present a simple adaptive approach to optimize seat protection levels in airline revenue

management. Instead of using the traditional method that combines a censored

forecasting method with a seat allocation heuristic (EMSR-b), this approach uses

historical observations of the relative frequencies of certain seat-filling events to guide

direct adjustments of the seat protection levels. Their preliminary numerical studies

suggest that this method can be used to augment traditional forecasting and optimisation

approaches.

Overbooking control

A number of researchers have developed dynamic optimization approaches to the airline overbooking problem and the related problem in the hotel/motel industry. The usual objective in these formulations is to determine a booking limit for each time period before flight departure that maximizes expected revenue, where allowance is made for the dynamics of cancellations and reservations in subsequent time periods and for penalties for oversold seats. KOSTEN (1960) develops a continuous time approach to this problem, but this approach requires solution of a set of simultaneous differential equations that make implementation impractical. Rothstein (1968), in his Ph. D. thesis, describes the first dynamic programming (DP) model for overbooking and reviews the results of test runs of the model at American Airlines. ALSTRUP et al. (1986) describe a DP treatment of overbooking for a two-class, nonstop flight and describe computational experience with the approach at Scandinavian Airlines. A DP analysis similar to Rothstein's but developed for the hotel/motel

industry and extended to two fare classes is described in LADANY (1976, 1977) and LADANY and ARBEL (1991). A control-limit type structural solution to the (one class) hotel overbooking problem is described in LIBERMAN and YECHIALI (1977, 1978

Since McGill and van Ryzin (1999) had already presented a list of publications in

overbooking, we will only discuss the new publications. Zhang and Cooper (2005)

focus on the overbooking problem for hotels with multiple tour-operators and conclude

that an overbooking policy that treats the capacity of the hotel as a whole gives better cost

savings than an overbooking policy that allocates the capacity to each tour-operator

separately. Zhang and Cooper (2005) proposes two models (stationary-fares model and

nonstationary-fares model) to deal with a multi-period airline-overbooking problem for a

single-leg flight with a single service class and use the model to calculate the optimal

booking limits. Coughlan (1999) presents an airline revenue maximisation-overbooking

model at a fare class level for one service compartment-cabin where class level demand is

used to determine the number of bookings for each class. He concludes that this model

shows significant improvement over previous methods by testing the model with data of

Ireland's national airline, Aer Lingus. Biyalogorsky et al. (1999) propose that a strategy

using overbooking with opportunistic cancellations can increase expected profits and

improve allocation efficiency, then derive a rule of how to allocate capacity to consumers

optimally. Under their strategy, the seller can oversell capacity when high-paying

consumers show up, even if capacity has already been fully booked, then the seller will

cancel the sale to some low-paying customers while providing them with appropriate

compensation. Toh and Dekay (2002) create an overbooking model for hotels to find the

optimal level of overbooking considering customer service level, unexpected stayovers, and cost of walking displaced guest.

Forecasting

Forecasting is a critical part of revenue management. The quality of revenue management

decisions, such as pricing, capacity control, or overbooking, depends on an accurate

forecast. Pölt (1998) estimates that a 20% reduction of forecast error can translate into a

1% incremental increase in revenue generated from the revenue management system.

Revenue management forecasting includes demand forecasting, capacity forecasting, and

price forecasting, each of which has its specific requirements. All forecasting tasks need

to address issues such as what to forecast, the type of forecasting method, the aggregation

level, the data to use and the accuracy of forecast. Forecasting can have different

aggregation levels, from full aggregated forecasting to semi-aggregated forecasting and

to fully disaggregated forecasting. The data used in forecasting can be based on historical

arrivals or bookings. In addition, forecasting must be adjusted according to special

An overview of research on revenue management 111 events, for example, holidays. Zaki (2000) gives a summary of forecasting for airline revenue management.

Weatherland et al. (2001) discuss different ways to forecast demand for hotel revenue

management systems and assess the effectiveness of aggregated approach and

desegregated forecast. Furthermore, Weatherford and Kimes (2003) use data from Choice

Hotels and Marriott Hotels to conduct a comparative test on a variety of forecasting

methods for hotel revenue management systems to find the most accurate method. Their

research suggests that exponential smoothing, pickup method and moving average

models provide the most robust forecasts.

Despite the mounting forecasting methods, human judgment is still indispensable in

forecasting demand. Schwartz and Cohen (2004) make a study on 57 experienced

revenue managers to evaluate the bias of this kind of subjective judgment. They find that

the nature of the user interface can influence the way the revenue managers adjust the

computers' forecasts, although the managers are given the same

predictions. The

managers with a deliberate computer and no chart made the smallest

volume of

adjustments to the computer's forecast, while the managers with a slow

computer and an interactive chart made the highest volume of adjustments.

How to develop revenue management

How to develop and implement revenue management systems is another

key issue.

Kimes (1999) and Kimes et al. (1999) present a 5-step approach for

implementing

restaurant revenue management and provide insights from the

implementation.

Secomandi et al. (2002) present a case of how PROS Revenue Management

Inc. worked

with three non-airline companies to determine the applicability of revenue

management,

and to design, develop, and implement Revenue Management systems.

Skugge (2002)

discusses issues that need to be considered when implementing a revenue

management

system. He presents risks associated with development and implementation and ways to

reduce these risks, and then proposes a two-step process to maximise the likelihood of a

successful project completed on time and within budget. Okumus's (2004) research

reveals the complexity and difficulty of developing and implementing a centralised

revenue management project. He argues that this is because revenue management

implementation is often viewed as a tactical activity, but this is not correct. He suggests

that researchers and practitioners should view the implementation from the perspectives

of strategic management, and they should change management fields.

Revenue managers play a crucial role in implementing revenue management. Skugge

(2004) finds that one of the reasons why some companies enjoy much greater success

with revenue management is they have more effective revenue managers and suggests

several methods to improve revenue management education and training

programs. Zeni

(2003) presents a study performed at US Airways to measure the value of

revenue

managers' contributions to a revenue management system and concludes

that analysts

can add up to 3 percent in incremental revenue. Parker (2003) presents that

airlines need

to establish and provide support for a ' community of practice', which is a

group of

revenue management related people who interact on an ongoing basis. This

group takes

responsibilities of establishing protocols and standard procedures with

respect to revenue

management. The implementation of revenue management requires

management to make a series of business decisions. Yeoman and Ingold

(2000) discuss the decision-making processes using examples from airlines

and hotels. All business decisions have risks, as do revenue management

decisions. Therefore, every company must evaluate the potential risks of

revenue management. Lancaster (2003) focuses on the risk incurred in the

revenue

management policies and analyses how risk management measurements and methods can

be applied to the revenue management practices.

In addition, companies want to make sure that their investment on revenue

management can achieve the expected return. Delain and O'Meara (2004) illustrate how

a company can build a business case to estimate the incremental revenues and costs

associated with developing or enhancing a revenue management programme

IT service and internet service

Revenue management also has application opportunities in subscription services, such as

on-demand information technology service and Internet service. Internet service is, in

fact, a special case of on-demand information technology service.

Nair and Bapna (2001) find that Internet Service Providers (ISP) have perishable

capacity for users to log on, a fixed number of units, and the possibility of segmenting

price-sensitive customers. These three characteristics are common with industries where

revenue management is traditionally applied. They also identify that revenue

management in Internet service is different than traditional applications. The Internet

service is continuous in state and time, the request and the service happen

simultaneously, and overbooking is impossible for ISP. Furthermore, they formulate the

revenue management problem for ISP as a continuous time Markov Decision Process to

maximize the discounted value while improving service levels for higher class customers.

Wynter et al. (2004) introduce a revenue management model for a specific information

technology service – on-demand computing service. Dube et al. (2005) make a further

analysis on the model of Wynter et al. (2004) both analytically and numerically, and

conclude that the application of revenue management can significantly increase revenue of on-demand computing service providers

Economic concerns

To better apply revenue management in the industry, practitioners must have a thorough

understanding of underlying economic theory, such as supply and demand, opportunity

cost, competition, consolidation, etc. Dana (1999) presents how revenue management

techniques, such as price dispersion, can shift demand even when the peak time is

unknown. Firms must compete with each other to get customers, so revenue management

decisions of one firm unavoidably affect the demand for other firms in the same industry.

The sudden reversal in the lodging industry's fortunes from 2008 to 2009 made the focus on customer rate resistance, contract renegotiations, competition, and price wars as top priorities for revenue managers. This contrasts with a 2008 study by Cornell university , where human resources and technology issues were ahead of economic concerns. The recent bad economic situation made it for revenue managers to maintain price positioning, because the drop in demand has shifted considerable pricing power to the customer. Although many hotels can compete effectively on price (and others may have little choice), revenue managers may also draw on numerous non-price competitive techniques, including adding value. One

pricing approach might be to create a set of targeted rate promotions that are protected by rate fences and designed to attract price-conscious guests. Another technique is to bundle services into packages that disguise room rates. Non-price techniques include competing on the basis of quality, creating strategic partnerships, taking advantage of your loyalty program, developing additional revenue sources, and developing additional market segments

Even as they agreed that customers have gained considerable negotiating power, a research by Cornell university see a larger role for RM as the economy recovers. In the meantime, revenue managers have a key responsibility to determine ways to offset the loss of business by creating special rates that are protected by rate fences to attract different market segments or to augment existing packages to retain current business

Looking ahead, revenue managers should be aware that customers will be strongly focused on price and less so on brand loyalty. The common thread in this view of hotels' future is that RM is a valuable tool for hotel marketers and managers as they consider tactical price setting and strategic price positioning. The managers are well aware that revenue management cannot help in all cases. Also revenue managers should broaden the perspective on revenue management to include as many customer touch points as is appropriate. In a sense, this represents a combination of marketing principles with revenue management tactics. As demand returns, application of RM approaches will be able to help hotels find the way back to rate integrity. Based on that idea, now is the time to set price strategies and be ready with revenue management tactics when the recovery comes.

Customer perception

According to Cornell University research many managers have been reluctant to adopt revenue management practices because of possible customer dissatisfaction. They may well find support for their fears in the fairness literature, which has shown that customers will refuse to patronize companies perceived as unfair.

Customers from different cultures and nationalities often have different service expectations (Donthu and Yoo 1998). For example, Lee and Ulgado (1997) found that American fast-food customers considered low prices to be of paramount importance when evaluating satisfaction, whereas Korean consumers were more concerned about service dimensions such as reliability and empathy. Also, Asians often see eating out as more of a social or family activity than do Americans or Europeans (Hall 1966)