Revenue Optimization in Tourism and Hotel Industry using Genetic Algorithm

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ABSTRACT

The paper provides a comprehensive review of the recent development of revenue management in different industries. We discuss research on different revenue management strategies including pricing, auctions, capacity control, overbooking and forecasting. Related issues such as economic concerns, customer perception, competition and consolidation, implementation, performance evaluation, and common techniques and approaches used for solving revenue management problems are also discussed. Finally, we give our suggestion on some important areas that warrant further research. Revenue management, or yield management, is concerned with creating and managing service packages to maximize revenue. By thoroughly understanding customers' value functions and behaviour, a firm can design service packages for different market segments using appropriate combinations of attributes such as price, amenities, purchase restrictions, and distribution channels. The research on revenue management can be traced back 51 years, when American Airlines implemented a computer reservations system (SABRE) in 1966, which had the capability of controlling reservations inventory. But the prevalence of revenue management came after the Airline Deregulation Act of 1978. This act loosened control of airline prices and led to a rapid change and a rash of innovation in the industry. Since then, airline revenue management systems have developed significantly from single-leg inventory control through segment control to origin-destination control. New information technologies play a critical role in the development of revenue management.

Keywords: Airline Revenue Optimization; Hotel Revenue optimization; entry deterrence; revenue management; yield management.

INTRODUCTION

It is our pleasure to welcome all of you to the inaugural issue of the International Journal of Revenue Management (IJRM). The IJRM is an interdisciplinary and refereed journal that provides authoritative sources of reference and an international forum in the field of revenue management. The objective of the journal is to establish an effective channel of communication among business decision-makers, policy makers, government agencies, academic and research institutions and persons concerned with the complex role of revenue management. Specifically, the IJRM aims to promote creative, innovative concepts, strategies, theories and methodologies in the area of revenue management. The IJRM publishes well-written and academically rigorous manuscripts. Though the IJRM is devoted to the main area of revenue management, it also expands its scope to broadly cover any issues overlapping or related to revenue management. The subject of coverage includes:

- Revenue or yield management
- Customer relationship management
- Knowledge management and value creation
- Cluster analysis
- Consumer behaviour
- Branding, segmentation and channel management
- E-commerce/e-business
- Strategy
- Supply chain and demand management
- Enterprise resource planning
- Production and operations management
- Business processes and management
- Forecasting
- Pricing/dynamic pricing/option pricing

- Database/data warehouse management
- Data mining and business intelligence
- Information technology/resource management and outsourcing
- Computerisation
- Decision support systems
- Software development
- Economics of revenue management
- Healthcare management
- Human resource management
- Strategic alliance
- Consulting business

LITERATURE REVIEW

Reference	Abstract
Weatherford and Bodily (1992)	This paper reviews over 40 articles, proposes a 14-element taxonomy for revenue management, and classifies the published work using this taxonomy.
McGill and van Ryzin (1999)	This paper reviews the history of research on transportation revenue management, especially airline revenue management, and the development in forecasting, overbooking, and seat inventory control. This paper also includes a glossary of revenue management terminology and a bibliography of over 190 references.
Pak and Piersma (2002)	This paper presents a review of the variety of OR techniques for airline revenue management problems from over 30 articles
Bitran and Caldentey (2003)	This paper reviews 88 papers that primarily focus on the research and results of dynamic pricing policies and their relation to revenue management.
Kimes (2003)	This paper reviews her research in revenue management, including 11 articles published in Cornell Hotel and Restaurant Administration Quarterly and discusses areas for future research
Boyd and Bilegan (2003)	This paper references over 110 articles to review the history of revenue management to illustrate a successful e-commerce model of dynamic, automated sales enabled by central reservation and revenue management systems.
Elmaghraby and Keskinocak (2003)	This paper reviews over 80 articles and current practices in dynamic pricing in the presence of inventory considerations.

REVENUE MANAGEMENT OVERVIEW

In addition, several books have been published in recent years that focus on the issue of revenue management. Revenue Management: Hard-core Tactics for Market Domination (1997) written by Robert G. Cross addresses fundamental questions about revenue management such as how revenue management can be applied to a range of businesses and what kind of techniques can be used in revenue management. Anthony Ingold, Una McMahon-Beattie and Ian Yeoman's Yield Management: Strategies for the Service Industries (2000) focuses on theoretical foundations, knowledge and applications of revenue management. Ian Yeoman and Una McMahon-Beattie's Revenue Management and Pricing: Case Studies and Applications (2004) is an extension of their previous Yield Management. This case study book views revenue management and pricing as a practical subject; it helps readers to understand what can be done by revenue management, how practitioners face the related issues, and how they work with problems. Kalyan Talluri and Garrett van Ryzin's The Theory and Practice of Revenue Management (2004b) provides a thorough introduction of concepts of revenue management. This book includes three primary sections: quantity-based revenue management, price-based revenue management and other related elements of revenue management. Robert Philips' Pricing and Revenue Optimization (2005) is another book that provides a comprehensive introduction of pricing and revenue management. This book covers basic price optimization, price differentiation, pricing with constrained supply, revenue management, capacity allocation, network management, overbooking, markdown management, customized pricing, and customer acceptance.

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 customer

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Frederick Harris is the John B. McKinnon Professor of Managerial Economics and Finance at the Babcock Graduate School of Management, Wake Forest University. He specialises in pricing tactics and capacity planning. From 1988 to 1993, he served on the Board of Associate Editors of the Journal of Industrial Economics. His management research benchmarks capacity-constrained pricing, order processing and capital planning of large companies against state-of-the-art techniques in revenue management. He is the co-author of Managerial Economics: Applications, Strategy, and Tactics, 10th edition. He earned a BA from Dartmouth College and a PhD from the University of Virginia in 1981.

CONCLUSION AND FUTURE RESEARCH OPPORTUNITIES

In this paper, we rigorously described a broadcasting company's problem of selecting orders and scheduling spots from accepted orders at the same time. Five heuristics for that problem have been proposed and tested. We developed a systematic procedure to generate test instances for the problem at hand based on the situation in Spain. Since this situation is similar to previous descriptions in the literature, it seems to be able to generate representative test problems. We restricted ourselves to heuristic solutions of the problem. Finding exact solutions to the problems, e.g. using branch-and-bound or branch-and-cut schemes will be a fruitful area of future research. Since all heuristics we presented in this paper (except Dive-and Fix) performed well with respect to gaps and running times, they can be used as the 'core' of a DSS to support the actual managerial decisions in practice. All the heuristics are easy to understand and implement, so the missing part to put our approach into practice is basically a user interface. We assumed that the set of orders O and the associated data like prices vo, etc. are known. This precisely describes the situation when orders are placed over time and the channel decides about acceptance or rejection at a fixed due date after which no orders are accepted. This assumption is also justified if the values and characteristics of future orders can be forecasted with sufficient accuracy. If the channel has to decide about orders shortly after they are placed and before knowing about potential future orders, a dynamic, stochastic model would be more appropriate. In such a model, however, given an

order with known characteristics, it has to be decided whether it can be feasibly scheduled and whether it is profitable to accept it. At least for the first question, a problem very similar to the one presented here has to be solved. In that respect, this paper is a cornerstone for future research on dynamic and stochastic approaches to the problem.

The results are also compared using different selection and crossover combinations. It is found that each behaves in a different manner depending on the problem. However, there are several limitations in the problem formulation that warrant further investigation and analysis.

1. In both the models, the demand is considered independent between classes. However, a passenger who was refused as eat in the lowest-fare class (say, $100) may opt for the next lowest-fare class (say, $200). This aspect was ignored in this article.

2. In case of network model, all itineraries(OD combinations)are given equal weight. However, the system manager may forgo a reservation for short itineraries (single legs), expecting a request for multiple legs in future. Hence, more weight should be given to passengers travelling over multiple legs.

3. The model presented for airline network is implemented only for linear network. To find the number of ODs and hence the implementation could be changed to make it for hub and spoke network.

4. Overbooking may also be applied to hotel and network model. If the actual arrivals exceed the hotel's capacity, the hotel should implement strategies to deal with this problem, such as compensating or transferring customers.

5. The analysis was based on rather simplified representation of the inventory control problem, with such factors as cancellations, no shows and customer upgrades not included. These can be taken into consideration for further research.

6. Real Coding was used for hotel optimization. Not much of the genetic operators are introduced for real value encoding. Further research should be done in this area also

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