General Information:

1. The goal of this seminar is to introduce participants to conducting scientific research. It thereby prepares students for writing their M.Sc./diploma thesis. The seminar is geared towards students intending to write their thesis at the Chair of Service Operations Management.

2. Each participant will explore one of the research papers listed below. The task is to review and critically assess the assigned research paper and to relate it to the corresponding stream of scientific literature. Each participant presents his/her findings in a written report (about 20 pages) as well as in an in-class presentation (20 min + 20 min discussion).

3. Each participant also acts as a discussant for one of the other presentations. The discussant is responsible for critically assessing the presented work and for opening the ensuing discussion.

4. A kick-off meeting for all participants will be held on September 5th (exact time and location tba). During this meeting, general guidelines for conducting a scientific literature review will be discussed.

5. The written reports have to be submitted electronically and as a hard copy in two-fold by November 22nd.

6. Student presentations will be held as a blocked session on December 5th and 6th (exact times and room to be announced shortly). Attendance of the presentations is mandatory.

7. The final grade for the seminar is composed of the following components: Written report (60%), presentation (30%), contribution to discussion (10%).

8. The report and the presentations can be delivered either in English or in German.

9. The application procedure for this seminar is combined with those for the seminars of the Chair of Production Management (OPM 761) and the Chair of Logistics (OPM 701). Students can apply for topics from all chairs by completing the following online form (click here). Topics labeled with “L” refer to the Chair of Logistics (OPM 701), topics labeled with “P” refer to the Chair of Production Management (OPM 761), and topics labeled with “S” refer to the Chair of Service Operations Management (OPM 781). Applicants for OPM 781 must in addition send a CV and official grades overview by e-mail to info@serviceoperations.net with subject “OPM 781 Seminar Application”.

10. Applications will be accepted until May 23rd. Admission to the seminar is binding and will be confirmed by e-mail by May 27th.
11. For questions concerning the seminar contact Prof. Cornelia Schön by email at info@serviceoperations.net or during a special office hour (date tba shortly on the chair’s webpage).
Seminar topics

Each participant will be assigned one of the topics listed below. The task then is to identify the main issues addressed by the paper, explain its methodology, including potential quantitative models, position it in the corresponding stream of scientific literature, and critically assesses the paper’s contribution to the literature as well as to practice.


Customer choice behavior, such as buy-up and buy-down, is an important phenomenon in a wide range of revenue management contexts. Yet most revenue management methodologies ignore this phenomenon—or at best approximate it in a heuristic way. In this paper, we provide an exact and quite general analysis of this problem. Specifically, we analyze a single-leg reserve management problem in which the buyers' choice behavior is modeled explicitly. The choice model is very general, simply specifying the probability of purchase for each fare product as a function of the set of fare products offered. The control problem is to decide which subset of fare products to offer at each point in time. We show that the optimal policy for this problem has a quite simple form. Moreover, we give a characterization of when nesting by fare order is optimal. We also develop an estimation procedure for this setting based on the expectation-maximization (EM) method that jointly estimates arrival rates and choice model parameters when no-purchase outcomes are unobservable. Numerical results are given to illustrate both the model and estimation procedure.


We introduce the terms dynamic and static, respectively, to identify the prevailing approaches to the single-leg airline yield-management problem: those allowing customers of different fare classes to book concomitantly (dynamic), and those assuming that the demands for the different fare classes arrive separately in a predetermined order (static). We present a coherent framework linking these seemingly disparate models through the underlying dynamic program common to both. We develop a discrete-time Markov decision process formulation mirroring that of Janakiram et al. *Transp. Sci.* 33, 147–167 (1999) to solve the single-leg problem without cancellations, overbooking, or discounting. Borrowing a result from the queuing-control literature, we prove the concavity of the associated optimal value functions and, subsequently, the optimality of a booking limit policy. We then apply this same technique to the more influential papers from the single-leg literature, at once unifying the static and dynamic models and establishing the connection between the yield-management and queuing-control problems. Finally, we propose an omnibus formulation that yields the static and dynamic models as special cases.

In this paper, we examine the research and results of dynamic pricing policies and their relation to revenue management. The survey is based on a generic revenue management problem in which a perishable and nonrenewable set of resources satisfy stochastic price sensitive demand processes over a finite period of time. In this class of problems, the owner (or the seller) of these resources uses them to produce and offer a menu of final products to the end customers. Within this context, we formulate the stochastic control problem of capacity that the seller faces: How to dynamically set the menu and the quantity of products and their corresponding prices to maximize the total revenue over the selling horizon.


Constructing a profitable schedule is of utmost importance to an airline because its profitability is critically influenced by its flight offerings. We focus our attention on the steps of the airline schedule planning process involving schedule design and fleet assignment. Airline schedule design involves determining when and where to offer flights such that profits are maximized, and fleet assignment involves assigning aircraft types to flight legs to maximize revenue and minimize operating cost. We present integrated models and solution algorithms that simultaneously optimize the selection of flight legs for and the assignment of aircraft types to the selected flight legs. Preliminary results, based on data from a major U.S. airline, suggest that significant benefits can be achieved.


Plagued by high labor costs, low profitability margins, airspace and airport congestion, high capital and operating costs, security and safety concerns, and complex and large-scale management and operations decisions, the airline industry has armed its planners with sophisticated optimization tools to improve decision making and increase airline profits. In this paper, we describe optimization approaches for airline schedule planning, demonstrating how optimization can facilitate the management of a diverse and finite set of expensive, highly constrained resources. We focus on the art and science of modeling and solving these problems, providing illustrative examples of the associated impacts and challenges, and highlighting effective techniques that might be applicable to problems arising in other industries.


The fleet assignment problem (FAP) deals with assigning aircraft types, each having a different capacity, to the scheduled flights, based on equipment capabilities and availabilities, operational costs, and potential revenues. An airline’s fleeting decision highly impacts its revenues, and thus, constitutes an essential component of its overall scheduling process. However, due to the large number of flights sched-
uled each day, and the dependency of the FAP on other airline processes, solving the FAP has always been a challenging task for the airlines. In this paper, we present a tutorial on the basic and enhanced models and approaches that have been developed for the FAP, including: (1) integrating the FAP with other airline decision processes such as schedule design, aircraft maintenance routing, and crew scheduling; (2) proposing solution techniques that include additional considerations into the traditional fleeting models, such as considering itinerary-based demand forecasts and the recapture effect, as well as investigating the effectiveness of alternative approaches such as randomized search procedures; and (3) studying dynamic fleeting mechanisms that update the initial fleeting solution as departures approach and more information on demand patterns is gathered, thus providing a more effective way to match the airline’s supply with demand. We also discuss future research directions in the fleet assignment arena.


Product line selection and pricing decisions are critical to the profitability of many firms, particularly in today’s competitive business environment in which providers of goods and services are offering a broad array of products to satisfy customer needs.

We address the problem of selecting a set of products to offer and their prices when customers select among the offered products according to a share-of-surplus choice model. A customer’s surplus is defined as the difference between his utility (willingness to pay) and the price of the product. Under the share-of-surplus model, the fraction of a customer segment that selects a product is defined as the ratio of the segment’s surplus from this particular product to the segment’s total surplus across all offered products with positive surplus for that segment.

We develop a heuristic procedure for this non-concave, mixed-integer optimization problem. The procedure utilizes simulated annealing to handle the binary product selection variables, and a steepest-ascent-style procedure that relies on certain structural properties of the objective function to handle the non-concave, continuous portion of the problem involving the prices. We also develop a variant of our procedure to handle uncertainty in customer utilities. In computational studies, our basic procedures perform extremely well, producing solutions whose objective values are within about 5% of those obtained via enumerative methods. Our procedure to handle uncertain utilities also performs well, producing solutions with expected profit values that are roughly 10% higher than the corresponding expected profits from solutions obtained under the assumption of deterministic utilities.


We take advantage of recent advances in optimization methods and computer hardware to identify globally optimal solutions of product line design problems that are too large for complete enumeration. We then use this guarantee of global optimality to benchmark the performance of more practical heu-
rastic methods. We use two sources of data: (1) a conjoint study previously conducted for a real product line design problem, and (2) simulated problems of various sizes. For both data sources, several of the heuristic methods consistently find optimal or near-optimal solutions, including simulated annealing, divide-and-conquer, product-swapping, and genetic algorithms.


Selecting and pricing product lines is an essential activity in many businesses. In recent years, quantitative approaches for such tasks have been gaining in popularity. One often-employed method is to use data from traditional rankings/ratings-based conjoint analysis and attack the product line selection problem with enumeration or heuristics. In this note, we employ a relatively new methodology known as choice-based conjoint analysis (to model customer preferences) and investigate its mathematical properties when used to model the product line selection problem. Despite some inherent limitations resulting from its aggregated formulation, we show that this more parsimonious conjoint approach has some special mathematical properties that lead to an efficient optimal algorithm to tackle the product line/price selection problem. As a result, problems of realistic size can be solved efficiently using standard, commercially available mathematical programming codes.


Researchers in several academic disciplines have investigated the effect of the sequence of pleasure and pain on the customer in service, experience, or healthcare-related interactions. Specifically, past research from psychology, behavioral economics, and other related fields suggests that the sequence effect can significantly impact a customer's overall impression of a service interaction. In this article, we test the influence that the sequence of discrete events separated by several days or weeks plays on customers’ assessment of service bundles. If the relative importance of the sequence effect for discrete bundles is known, then a service designer and event scheduler can optimize and develop a better sequence of interactions for the customers, leading to higher satisfaction, loyalty, and repurchase. Using an extensive multi-year ticket purchase database from a world-renowned performing arts venue, we develop and test econometric models to predict season ticket subscription repurchase. The estimated models show that sequence effects do indeed play a significant role in determining customer repurchase of subscriptions. These results have important implications for effective service design and capacity planning for a wide range of service industries. This article suggests both managerial implications and future research opportunities related to sequence effects in service operations.

A service encounter is an experience that extends over time. Therefore, its effective management must include the control of the timing of the delivery of each of the service's elements and the enhancement of the customer's experience between and during the delivery of the various elements. This paper provides a conceptual framework that links the duration of a service encounter to behaviors that have been shown to affect profitability. Analysis of the framework reveals a wide gap between the behavioral assumptions typically made in operations research (OR) and operations management (OM) models and the state of the art in the marketing and psychology literature. The central motivations behind this paper are (1) to help the OR and OM community bridge this gap by bringing to its attention recent findings from the behavioral literature that have implications for the design of queueing systems for service firms and (2) to identify opportunities for further research.


This paper presents an overview of the new issues and research opportunities related to four service operations design topics—the design of retail and e-tail service processes, design of service processes involving waiting lines and workforce staffing, service design for manufacturing, and re-engineering service processes. All four topics are motivated by new technologies (particularly web-based technologies) and require a multi-disciplinary approach to research. For each topic, the paper presents an overview of the topic, the relevant frameworks, and a discussion of the research opportunities.