Manufacturing & Service Operations Management

Publication details, including instructions for authors and subscription information:
http://pubsonline.informs.org

MSOM Society Student Paper Competition: Abstracts of 2009 Winners

To cite this article:
(2010) MSOM Society Student Paper Competition: Abstracts of 2009 Winners. Manufacturing & Service Operations Management 12(1):184-187. http://dx.doi.org/10.1287/msom.1090.0289

M&SOM MANUFACTURING & SERVICE OPERATIONS MANAGEMENT
Vol. 12, No. 1, Winter 2010, pp. 184–187
ISSN 1523-4614 | EISSN 1526-5498 | 10 | 1201 | 0184

informs

DOI 10.1287/msom.1090.0289

MSOM Society Student Paper Competition: Abstracts of 2009 Winners

The journal is pleased to publish the abstracts of the six finalists of the 2009 Manufacturing and Service Operations Management Society's student paper competition.

The 2009 prize committee was chaired by Hyun-Soo Ahn and Damian R. Beil (Stephen M. Ross School of Business, University of Michigan). The other committee members were: Elodie Adida, Mustafa Akan, Oğuzhan Alagöz, Gad Allon, Aydín Alptekinoğlu, Yossi Aviv, Achal Bassamboo, Fernando Bernstein, Felipe Caro, Xin Chen, Ying-Ju Chen, Soo-Haeng Cho, Jiří Chod, Leon Chu, William Cooper, Laurens Debo, Nicole DeHoratius, Sarang Deo, Vinayak Deshpande, Cheryl Druehl, Noah Gans, Manu Goyal, Itay Gurvitz, Dorothee Honhon, Xinxin Hu, Stylianos Kavadias, Eda Kemahlíğlu-Ziya, Seong-Hee Kim, Diego Klabjan, Gürhan Kök, Dimitris Kostamis, Harish Krishnan, Darma Kwon, Richard Lai, Serguei Netessine, Rodney Parker, Ali Parlaktürk, Ioana Popescu, Guillaume Roels, Edwin Romejin, Paat Rusmevichientong, Nicola Secomandi, Kevin Shang, Steven Shechter, Robert Shumsky, Enno Siemsen, Svenja Sommer, Greys Sošiç, Richard Steinberg, Xuanming Su, Ravi Subramanian, Peng Sun, Chung-Piaw Teo, Brian Tomlin, Tunay Tunca, Senthil Veeraraghavan, Gabriel Weintraub, Owen Wu, Xiaowei Xu, Fuqiang Zhang, Yao Zhao, and Shaohui Zheng.

The 2009 prize winners are as follows:

First Place
Denis Saure, Columbia University
"Optimal Dynamic Assortment Planning"

Second Place
Mehmet A. Begen, University of Western Ontario
"Appointment Scheduling with Discrete Random Durations"

Finalists
Polly Biyu He, Stanford University
"Staffing in Hospital Operating Rooms: Capturing Information on Workload Heterogeneity to Reduce Total Costs"

Onesun Steve Yoo, University of California, Los Angeles
"A Time-Management Framework for Entrepreneurial Process Improvement"

Ying Rong, Lehigh University
"Bullwhip and Reverse Bullwhip Effects Under the Rationing Game"

Ali Ekici, University of Houston
"Modeling Influenza Pandemic, Intervention Strategies, and Food Distribution"

Optimal Dynamic Assortment Planning

Denis Saure
Columbia University,
dsaure05@gsb.columbia.edu

Advisor: Assaf Zeevi, Columbia University

Product assortment selection is among the most critical decisions facing retailers. Inferring customer preferences and responding accordingly with updated product offerings plays a central role in a growing number of industries, in particular, when companies are capable of revisiting product assortment decisions during the selling season as demand information becomes available. In this paper, we study a family of stylized assortment planning problems, where arriving customers make purchase decisions among offered products based on maximizing their utility. Given limited display capacity and no a priori information on consumers' utility, the retailer must select which subset of products to offer. By offering different assortments and observing the resulting purchase behavior, the retailer learns about consumer preferences, but this experimentation should be balanced with the goal of maximizing revenues. We develop a family of dynamic policies that judiciously balance the aforementioned tradeoff between exploration and exploitation and prove that their performance cannot be improved upon in a precise mathematical sense. One salient feature of these policies is that they "quickly" recognize, and hence limit experimentation on, strictly suboptimal products. This and other features distinguish the dynamic assortment problem from similar problems of sequential decision making under model uncertainty.

Appointment Scheduling with Discrete Random Durations

Mehmet A. Begen
University of Western Ontario,
mbegen@ivey.uwo.ca

Advisor: Maurice Queyranne, University of British Columbia

We consider the problem of determining an optimal appointment schedule for a given sequence of jobs (e.g., surgeries, medical procedures) on a single processor (e.g., operating room, examination facility, physician). Jobs have random processing durations and are not available before their appointment times (i.e., planned start times). Random processing durations are given by a discrete joint probability distribution and the objective is to minimize the expected total underage (idle-time of the processor) and overage (waiting time of jobs and overtime of the processor) costs. Simple conditions on the cost rates imply that the objective function is submodular and L-convex. Then there exists an optimal appointment schedule which is integer and can be found in polynomial time. Our model can handle a given due date for the total processing (e.g., end of day for an operating room) after which overtime is incurred, and no-shows and some emergencies. Besides the applications in health care such as surgery scheduling and physician appointments, there are many applications of the appointment scheduling problem from other industries such as project scheduling, container vessel and terminal operations, and gate and runway scheduling of aircrafts in an airport. We believe that our framework is sufficiently generic so that it is portable and applicable to many appointment systems in health care as well as in other areas.

Staffing in Hospital Operating Rooms: Capturing Information on Workload Heterogeneity to Reduce Total Costs

Polly Biyu He
Stanford University,
bhe@stanford.edu

Advisor: Stefanos Zenios, Stanford University

We study the problem of setting nurse staffing levels in hospital operating rooms when there is uncertainty about the daily workload. We consider a system with multiple medical specialties, in which staffing is reserved for individual specialties based on forecasted workload of scheduled cases and emergency cases added on the day of surgery. Variable staffing costs consist of wages at a regular (scheduled) rate and at an overtime rate when the realized workload exceeds the scheduled time. We consider the problem of determining optimal staffing levels with

different information sets available at the time of decision: no information, information on number of cases, and information on number and types of cases. We develop empirical models to predict the daily workload distribution and study how its mean and variance changes with the information available. We use these models to derive optimal staffing rules based on historical data from a U.S. teaching hospital and prospectively test the performance of these rules. Our empirical results suggest that hospitals could potentially reduce their staffing costs by an average of 39%–49% (depending on the absence or presence of add-on cases) by deferring the staffing decision until procedure-type information is available. The improvements are robust to changes in the assumptions about newsvendor costs. Furthermore, the higher the uncertainty about the types of the scheduled procedures, the more substantial the cost saving from deferring staffing decisions until after that uncertainty is resolved. We also demonstrate a systematic approach of empirical modeling in newsvendor problems with heterogeneous sources of demand that can be used in other applications.

A Time-Management Framework for Entrepreneurial Process Improvement

Onesun Steve Yoo
University of California, Los Angeles,
onesun.yoo.2010@anderson.ucla.edu

Advisor: Charles Corbett, University of California, Los Angeles

For many entrepreneurs, the main bottleneck resource of their company is their own time, rather than cash. In this paper, we develop a dynamic time-management framework for entrepreneurial process improvement for contexts where time is more constrained than cash and provide clear guiding principles for time management. We classify an entrepreneur's daily activities into four categories: firefighting, process improvement, revenue enhancement, and revenue generation, and we analyze a stylized dynamic time allocation problem for maximizing long-term expected profits. We find that entrepreneurs should first invest time in process improvement until the process reliability reaches a certain threshold, then invest in revenue enhancement until the revenue rate reaches a certain threshold and only then spend time generating revenue. Also, entrepreneurs with lower initial revenue rates should invest more time in process improvement and in revenue enhancement, ultimately earning revenue at a higher rate than if they were endowed with a higher initial revenue rate. Our model formally links time with money and introduces a framework for evaluating the opportunity cost of an entrepreneur's time. We highlight the performance difference between the optimal policy and two commonly employed (well-intentioned) time management heuristics and show that working hard does not necessarily imply good time management.

Bullwhip and Reverse Bullwhip Effects Under the Rationing Game

Ying Rong
Lehigh University,
ying.rong@lehigh.edu

Advisors: Lawrence Snyder, Lehigh University;
Zuo-Jun Max Shen, University of California, Berkeley

When an unreliable supplier serves multiple retailers, the retailers may compete with each other by inflating their order quantities to obtain their desired allocation from the supplier, a behavior known as the rationing game. In this paper, we study the retailers' ordering behavior and find that no Nash Equilibrium (NE) of the retailers' order quantities exists for a certain class of supply processes when the supplier applies the well known proportional allocation rule. We also prove that if the retailers make a certain reasonable assumption about their competitors' behavior, the bullwhip effect (BWE) always occurs downstream under the rationing game when the mean demand changes over time. Moreover, we prove that the reverse bullwhip effect ([R]BWE) occurs upstream in the same setting, which is a consequence of the disruption caused by the supplier. We then introduce an additional model in which the retailers pay a reservation payment for each unit ordered. We prove that an NE exists in this setting, regardless of how small the reservation payment is, and we characterize the conditions under which the BWE and [R]BWE

occur. Finally, we find that capacity information sharing does not necessarily mitigate the [R]BWE and that, although information sharing benefits the supplier, it may reduce the profitability of the retailers and of the supply chain as a whole.

Modeling Influenza Pandemic, Intervention Strategies, and Food Distribution

Ali Ekici
University of Houston,
aekici@uh.edu

Advisors: Pinar Keskinocak and Julie Swann,
Georgia Institute of Technology

Based on the recent incidents of avian flu (H5N1), swine flu (H1N1), and the influenza pandemic cases in history (1918, 1957, and 1968) experts believe that a future influenza pandemic is inevitable and likely imminent. Evidence suggests that an efficient and rapid response will be crucial for mitigating morbidity, mortality, and costs to society. Hence, preparing for a potential influenza pandemic has received high priority from governments at all levels (local, state, federal), nongovernmental organizations (NGOs), and companies. In collaboration with the American Red Cross, we study the logistics side of the problem, specifically, food distribution logistics during an influenza pandemic. We develop a disease spread model to estimate the spread pattern of the disease geographically and over time, integrate it to a facility location and resource allocation network model for food distribution, and develop heuristics to find near-optimal solutions for large instances of the embedded facility location problem. We run our combined disease spread and facility location model for the state of Georgia and present the estimated number of infections and the number of meals needed in each census tract for a one-year period along with a design of the supply chain network. We analyze the impact of two intervention strategies, namely, school closure and voluntary quarantine; our results indicate that voluntary quarantine may be a better alternative by being more effective and less disruptive. Moreover, we investigate the impact of voluntary quarantine on the food requirement and food distribution network and show that its effect on the food distribution supply chain can be significant.