

MSOM Service Management SIG 2009 Conference

Session 1: Queueing, Customer Behavior & Competition	
8:00 – 8:45	Strategic Behavior and Social Optimization in Markovian Vacation Queues <i>Pengfei Guo (Hong Kong Polytechnic University), Refael Hassin (Tel Aviv University)</i> Discussant: Gabriel Weintraub (Columbia University)
8:45 – 9:30	Quality Differentiation in Time Competition <i>Weixin Shang (Fudan University), Liming Liu (Hong Kong Polytechnic University)</i> Discussant: Robert Shumsky (Dartmouth College)
Session 2: Movie & Hotel Rentals	
10:00 – 10:45	Now Playing: DVD Allocation for a Multiple-Location Rental Firm <i>Opher Baron, Iman Hajizadeh, Joseph Milner (University of Toronto)</i> Discussant: Fuqiang Zhang (Washington University)
10:45 – 11:30	Dynamic Pricing for Hotels Considering Multiple-Day Stays <i>Qing Ding, Yun Fong Lim, Kum Khiong Yang (Singapore Management University)</i> Discussant: Julie Swann (Georgia Institute of Technology)
Session 3: Collaborative & Labor-Intensive Services	
13:00 – 13:45	Contracting for Collaborative Services <i>Guillaume Roels, Uday Karmarkar, Scott Carr (UCLA)</i> Discussant: Martin Lariviere (Northwestern University)
13:45 – 14:30	Quality-Speed Conundrum: Tradeoffs in Labor-Intensive Services <i>Krishnan Anand, Fazıl Paç, Senthil Veeraraghavan (University of Pennsylvania)</i> Discussant: Francis de Véricourt (European School of Management and Technology)
Session 4: Congestion in Ports & Hospitals	
15:00 – 15:45	Estimating the Operational Impact of Container Inspections at International Ports <i>Nitin Bakshi (London Business School), Stephen Flynn (Council on Foreign Relations), Noah Gans (University of Pennsylvania)</i> Discussant: Edieal Pinker (University of Rochester)
15:45 – 16:30	Impact of Hospital Size & Occupancy on Ambulance Diversion: Theory & Evidence <i>Gad Allon, Sarang Deo, Wuqin Lin (Northwestern University)</i> Discussant: Tava Olsen (Washington University)

Conference Chair: Philipp Afèche afeche@rotman.utoronto.ca

Registration etc.: mitsloan.mit.edu/omg/msom2009

8:00–8:45 am (talk 1 of 8)

Strategic Behavior and Social Optimization in Markovian Vacation Queues

Pengfei Guo (Hong Kong Polytechnic University), Refael Hassin (Tel Aviv University)

Discussant: Gabriel Weintraub (Columbia University)

We consider a single server queueing system in which service shuts down when no customers are present, and is resumed only when the queue length reaches a given critical length. We analyze customers' strategic response to this mechanism and compare it to the overall optimal behavior, with and without information on delay. The results are significantly different from those obtained when the server is continuously available. We show that there may exist multiple equilibria in such a system and that the optimal arrival rate may be larger or smaller than the decentralized equilibrium one. Finally, we consider this critical length to be a decision variable and discuss the optimal operations policy with strategic customers.

8:45–9:30 am (talk 2 of 8)

Quality Differentiation in Time Competition

Weixin Shang (Fudan University), Liming Liu (Hong Kong Polytechnic University)

Discussant: Robert Shumsky (Dartmouth College)

We investigate competitive firm behaviors in service industries where customers are sensitive to both promised delivery/waiting time (PDT) and quality of service (QoS) measured by on-time delivery rate. To study the competition in PDT and QoS at the marketing level with inflexible capacities, we construct an oligopoly game with an external QoS constraint.

We show that there exists a unique Nash equilibrium, which can be computed using an efficient algorithm. The equilibrium QoS exhibits a switching surface structure with respect to capacities that determines firms' quality differentiation strategies. We find that the market status quo is usually disrupted when time competition is introduced, and the firms with a larger residual capacity (without time competition) will gain market share. To study the competition in capacity at the strategic level, we construct a two-stage game in which the firms compete in capacity in the first stage and in PDT and QoS in the second stage. We show that besides interior equilibria commonly considered in literature, we may have boundary equilibria. We find that the efficiency indicator, defined as the ratio of revenue rate to capacity cost rate, plays a key role here. Interior equilibria exist only if all firms are efficient, and the more efficient firm will gain market share from time competition. Boundary equilibria exist if and only if the firms are mostly inefficient (or capacity investment is expensive in general in this market). Under a boundary equilibrium, the firm that gains market share from time competition may not be the more efficient firm, and quality differentiation may be used by the firm to protect her market advantage by setting a higher barrier to the change of status quo for the competitors.

The dual-role of quality differentiation, i.e., either helping a more efficient firm to compete more effectively or helping a (possibly less efficient) firm to threaten competitors and protect the market advantage, highlights the importance of a clear understanding of time competition and the strategic actions that should be taken by senior corporate management.

10:00–10:45 am (talk 3 of 8)

Now Playing: DVD Allocation for a Multiple-Location Rental Firm

Opher Baron, Iman Hajizadeh, Joseph Milner (University of Toronto)

Discussant: Fuqiang Zhang (Washington University)

This paper studies the problem of purchasing and allocating copies of films to multiple stores of a movie rental chain. A unique characteristic of this problem is the return process of rented movies. We formulate this problem for new movies as a newsvendor-like problem with multiple rental opportunities for each copy. We provide demand and return forecasts at the store-day level based on comparable films. We estimate the parameters of various demand and return models using an iterative maximum likelihood estimation and Bayesian estimation via Markov chain Monte Carlo simulation. Test results on data from a large movie rental firm reveal systematic under-buying of movies purchased through revenue sharing contracts and over-buying of movies purchased through standard (non-revenue sharing) ones. For the movies considered, our model estimates an increase in the average profit per title for new movies by 18% and 2% for revenue sharing and standard titles, respectively. We discuss the implications of revenue sharing on the profitability of both the rental firm and the studio.

10:45–11:30 am (talk 4 of 8)

Dynamic Pricing for Hotels Considering Multiple-Day Stays

Qing Ding, Yun Fong Lim, Kum Khiong Yang (Singapore Management University)

Discussant: Julie Swann (Georgia Institute of Technology)

We study the pricing policy that maximizes the expected revenue for hotels with stochastic and non-stationary arrivals of requests for a single room type. We consider the capacity requirement of multiple-day stays if customers make such reservations. We formulate this problem as a stochastic dynamic program. Our results suggest that we should substantially raise the rental rates for high-demand days and simultaneously lower the rental rates for their neighboring, low-demand days so that we remain attractive to customers staying for multiple days while we exploit the high-demand days. For large-size problems we develop two heuristics that determine the rental rates almost instantly when a customer makes a request.

1:00–1:45 pm (talk 5 of 8)

Contracting for Collaborative Services

Guillaume Roels, Uday Karmarkar, Scott Carr (UCLA)

Discussant: Martin Lariviere (Northwestern University)

In this paper, we analyze the contracting issues that arise in collaborative services, such as consulting, financial planning, and IT outsourcing. In particular, we investigate how the choice of contract type, among fixed-fee, time-and-materials, and performance-based contracts, is driven by the service environment characteristics. We first present a framework that relates the types of contract to the sensitivity of the service output to the buyer's and the vendor's inputs. In particular, we find that fixed-fee contracts contingent on performance are preferred when the output is not sensitive to the buyer's effort, that time-and-materials contracts are optimal when the output is not sensitive to the vendor's effort, and that performance-based contracts dominate when the output is sensitive to both inputs. We then discuss how the performance of these contracts is affected with output complexity, process improvement opportunities, and the involvement of multiple buyers and vendors in the joint-production process.

1:45–2:30 pm (talk 6 of 8)

Quality-Speed Conundrum: Tradeoffs in Labor-Intensive Services

Krishnan Anand, Fazil Paç, Senthil Veeraraghavan (University of Pennsylvania)

Discussant: Francis de Véricourt (European School of Management and Technology)

In labor-intensive services such as primary health care, hospitality and education, the quality or value provided by the service increases with the time spent with the customer (with diminishing returns). However, longer service times (i.e., slower speed of service) also result in longer waits for customers. Thus, labor-intensive services need to make the tradeoff between service quality and service speed. By treating quality and speed as independent performance metrics, the extant academic research has not addressed the consequences of their interactions; whereas, their interaction is critical for labor-intensive services. In a queueing framework, we parameterize the degree of labor-intensity of the service. The service speed chosen by the service-provider affects the quality of the service through its labor-intensity. Customers queue for the service based on the quality of the service, delay costs and price. We study how a service provider can make the optimal "quality-speed tradeoff" in the face of such self-interested, rational customers. Our results demonstrate that the labor-intensity of the service is a critical driver of equilibrium price, service speed, demand, congestion in the queue and service provider revenues. We also model service rate competition among multiple servers, whose effects, we find, are very different from price competition. For instance, as the number of servers increases, the price increases and the servers become slower.

3:00–3:45 pm (talk 7 of 8)

Estimating the Operational Impact of Container Inspections at International Ports
Nitin Bakshi (London Business School), Stephen Flynn (Council on Foreign Relations), Noah Gans (University of Pennsylvania)

Discussant: Edieal Pinker (University of Rochester)

A US law mandating non-intrusive imaging and radiation detection by 2012 for 100% of US-bound containers at international ports has provoked widespread concern that the resulting congestion would hinder trade significantly. Using detailed data on container movements, gathered from two large international terminals, we simulate the impact of various inspection policies being considered. We find that the current inspection regime being advanced by the US Department of Homeland Security and widely supported by the international community can only handle a small percentage of the total load. An alternate inspection protocol which emphasizes screening – a rapid primary scan of all containers, followed by a more careful secondary scan of only a few containers that fail the primary test – holds promise as a feasible solution for meeting the 100% scanning requirement.

3:45–4:30 pm (talk 8 of 8)

Impact of Hospital Size & Occupancy on Ambulance Diversion: Theory & Evidence
Gad Allon, Sarang Deo, Wuqin Lin (Northwestern University)

Discussant: Tava Olsen (Washington University)

In recent years, growth in the demand for emergency medical services along with decline in the number of hospitals with emergency departments (EDs) has raised concerns about the ability of the EDs to provide adequate service. Many EDs frequently report periods of overcrowding during which they are forced to divert incoming ambulances to neighboring hospitals, a phenomenon known as “ambulance diversion”. This paper aims to study the impact of key structural characteristics of the hospitals such as the number of ED beds, the number of inpatient beds, and the utilization of inpatient beds on the extent to which hospitals go on ambulance diversion. We first develop a simple queueing network model to describe the patient flow between the ED and the inpatient department and analyze this model using heavy traffic approximation. We show that, for a pre-specified delay probability, the fraction of time that the ED goes on diversion is decreasing in the spare capacity of the inpatient department and in the size of the ED, where both are appropriately normalized for the size of the inpatient department. We then test these findings by estimating a selection model using publicly available cross-sectional data on California hospitals and find moderate support for our theoretical findings. We also find evidence that certain hospitals, owing to their location and ownership structure, are more likely to choose ambulance diversion to mitigate overcrowding than others.