Operations Management Summer Camp 2013

Date: **Wednesday, 7 August 2013**

Venue: **Singapore Management University**
Lee Kong Chian School of Business
Level 2, Seminar Room 2.1

Programme	
8.30am- 8.45am	**Registration**
8.45am- 9.00am	**Opening Speech by Professor Howard THOMAS, Dean of Lee Kong Chian School of Business, Singapore Management University**
9.00am- 10.00am	**Paper I** **Presenter: Buket AVCI** **Discussant: Yossi AVIV** **Title: Electric Vehicles with a Battery Switching Station: Adoption and Environmental Impact** Abstract: The transportation sector's carbon footprint and dependence on oil are of deep concern to policy makers in many countries. Use of all-electric drive-trains is arguably the most realistic medium-term solution to address these concerns. However, motorist anxiety induced by an electric vehicle's limited range and high battery cost have constrained consumer adoption. A novel switching-station-based solution is touted as a promising remedy. Vehicles use standardized batteries that, when depleted, can be switched for fully charged batteries at switching stations and motorists only pay for battery use. We build a model that highlights the key mechanisms driving adoption and use of electric vehicles in this new switching-station-based electric vehicle system and contrast it with conventional electric vehicles. Our model employs results from repairable item inventory theory to capture switching station operation; we embed this model in a behavioral model of motorist use and adoption. Switching-station systems effectively transfer range risk from motorists to the station

	operator, who, on account of statistical economies of scale, can better manage it. We find that this transfer of risk can lead to higher electric vehicle adoption than in a conventional system, but it also encourages more driving than a conventional system does. We calibrate our models with motorist behavior data, electric vehicle technology data, operation costs and emissions data to estimate the relative effectiveness of the two systems under the status quo and other plausible future scenarios. We find that the system that is more effective at reducing emissions is often less effective at reducing oil dependence, the misalignment between the two objectives is most severe when the energy mix is coal heavy and with advanced battery technology. Increases in gasoline prices (by imposition of taxes, for instance) are much more effective in reducing carbon emissions while battery-price reducing policy interventions are more effective for reducing oil dependence. Taken together, our results help a policy maker identify the superior system for achieving the desired objectives. They also highlight that policy makers should not conflate the dual objectives of oil dependence and emissions reductions as the preferred system and the policy interventions that further that system may be different for the two objectives.
10.00am- 10.15am	**Tea Break @ Catering area 2A/2B, near SR 2.8, Level 2**
10.15 am- 11.15am	**Paper II** **Presenter: Helen ZHOU Yangfang** **Discussant: Tava OLSEN** **Title: Combining Operations Management and Engineering Models to Effectively Manage Electricity Storage** Abstract: Electricity storage has the potential to play an important role in many aspects of the global economy, such as enabling the use of electric cars and balancing electricity supply and demand on the power grid. However, in the literature, when these storage facilities are valued or managed, their physical characteristics and operating dynamics are often ignored. A natural question is whether it is important to model these dynamics, specifically whether modeling them might materially change the prescribed operating policy and the resulting valuation of a storage facility. We answer this question using a representative setting, in which a battery is utilized to trade electricity in an energy arbitrage market. We model the problem of operating a battery in an electricity market as a finite-horizon Markov Decision Process. Using engineering models, we capture the dynamics of energy capacity degradation over time and efficiency variation at different charging/discharging rates, evaluating three types of batteries: lead acid, lithium-ion, and Aqueous Hybrid Ion—a new commercial battery technology. We calibrate the model for each battery to manufacturers' data, and evaluate each battery using an existing financial engineering price model

	calibrated to price data from New York Independent System Operator. Our analysis shows that: (a) it is quite suboptimal to operate each battery as if it did not degrade, particularly for lead acid and lithium-ion; (b) reducing degradation and efficiency variation have a complementary effect—the value of reducing both together is greater than the sum of the value of reducing one individually; and (c) decreasing degradation may better increase the value of a battery than keeping efficiency constant over time.
11.15am- 11.30am	**Tea Break @ Catering area 2A/2B, near SR 2.8, Level 2**
11.30am- 12.30pm	**Paper III** **Presenter: LIM Yun Fong** **Discussant: TEO Chung-Piaw** **Title: Optimal Storage and Retrieval Policies for Unit-Load Warehouses** Abstract: A major operating cost of a unit-load warehouse is the travel to store and retrieve pallets. It is crucial to properly determine where to store these pallets when they arrive, and where to retrieve them when demands arise. The problem is challenging especially if the warehouse faces time-varying arrivals of pallets and random demands over a multi-period planning horizon. We formulate this problem as a dynamic program and find the optimal storage and retrieval policies. We will discuss insights observed from these policies.
12.30pm- 2.00pm	**Lunch @ Catering area 2A/2B, near SR 2.8, Level 2**
2.00pm- 3.00pm	**Paper IV** **Presenter: Pascale CRAMA** **Discussant: Stelios KAVADIAS** **Title: Meeting Project Deadlines under Uncertainty - When (and How) to Encourage Help?** Abstract: Despite sophisticated project management methods, companies struggle with costly project delays. While cooperative behavior has been identified to be a critical factor for on-time project completion, it has not been explicitly embedded into project management (PM) systems. Inspired by an innovative real-life new product development management practice, we model a PM system that incorporates and shapes project managers' cooperative behavior. Help is at the core of this system in which project managers may mutually ask for and provide help, while top management formally facilitates the exchange of help. We find

	that the company should take a nuanced approach to the provision of help. In projects with a low cost of effort of executing one's own project, help is allowed to occur informally, that is, without top management's coordination. For higher costs of effort, the company benefits from shaping the compensation structure to reward help. Against all intuition, the company may prefer to avoid helping behavior in projects for which early completion benefits taper off sharply with completion time. Finally, it is striking that a natural order among projects emerges, even with symmetrical projects: cooperative behavior may lead the company to choose an asymmetric equilibrium in which identical projects receive a different level of effort.
3.00pm- 3.15pm	**Tea Break @ Catering area 2A/2B, near SR 2.8, Level 2**
3.15pm- 4.15pm	**Paper V** **Presenter: Onur BOYABATLI** **Discussant: Saif BENJAAFAR** **Title: Farm-Yield Management When Production Rate is Yield Dependent** Abstract: In agricultural industries, unfavorable weather conditions, pests and diseases lead to not only a lower farm-yield available for processing, but also a lower production rate in processing due to the inferior quality of the crop, a feature that is largely ignored by the academic literature. This paper studies the role of the yield-dependent production rate influencing the insights coming from traditional models that assume yield-invariant production rate. We consider a firm that reserves farm space for an agricultural input under the yield uncertainty, and processes the realized yield to sell through different sales contracts. The production rate from each input is yield dependent, and is non-decreasing in the realized yield. We show that, contrary to common intuition, the firm may benefit from increasing yield variability, specifically, when the probability of achieving a higher production rate is moderate. Furthermore, a lower farm-space dependence always better combats the increasing yield variability, whereas this response crucially depends on the size of the reserved farm space when the production rate is yield invariant. We show that the cost of ignoring the yield-dependent nature of the production rate in procurement planning can be substantial, and this cost is very sensitive to the sales contract used. Our results have important implications about the procurement strategy and the sales contract choice of processors in agricultural industries.
4.15pm- 4.30pm	**Concluding Remarks by Professor Brian RODRIGUES, Deputy Dean of Lee Kong Chian School of Business, Singapore Management University**

Discussants' Profile:

Yossi AVIV is the Dan Broida Professor of Operations and Manufacturing Management, and the Area Chair of Operations and Manufacturing Management at the Olin Business School of Washington University in St. Louis. Aviv develops and applies operations research models and methods to study problems related to supply chain management and revenue management. His research has focused on strategic inventory positioning in distribution networks, collaborative forecasting, and dynamic pricing. He holds several editorial positions, and serves as a Department Editor for Management Science. Aviv has consulted in the defense and electronics industries. At the Olin School of Business, he has been teaching courses on quantitative decision modeling, operations management, and supply chain management, at the undergraduate, MBA, EMBA, and Ph.D. levels.

Saif BENJAAFAR is Head of Engineering Systems and Design at Singapore University of Technology and Design. He is Distinguished McKnight University Professor at the University of Minnesota where he was Founding Director of Industrial & Systems Engineering, Director of the Center for Supply Chain Research, and a Faculty Scholar with the Center for Transportation Studies. He was a Distinguished Senior Visiting Scientist at Honeywell Laboratories and a Visiting Professor at universities in France, Belgium, Hong Kong, China and Singapore. He Holds PhD and MS degrees from Purdue University and a BS degree from the University of Texas at Austin. His research is in the areas of supply chain management, service and manufacturing operations, and production and inventory systems, with a current focus on sustainability and environmental modeling. He is on the editorial board of several journals including *MSOM*, *POM*, *NRL*, and *IIE*. His papers have been published in various journals including *Management Science*, *Operations Research*, and *MSOM*. His research has been funded by NSF, DOT, DHS, and DARPA and other agencies and industry. He has consulted widely with leading companies and organizations such as Honeywell, General Mills, 3M, and the World Bank, among many others. He is a Fellow of IIE.

Stelios KAVADIAS serves as the Director of Research for the Judge Business School and he holds (starting the Fall 2013) the Margaret Thatcher Chair in Innovation and Business Research Studies. He also serves as an Associate Editor for *Management Science*'s Entrepreneurship and Innovation department, and as the Department Editor for the R&D, New Product Development and Project Management department of *Production and Operations Management*. At the Judge Business School Executive Education center he contributes to the Advanced Leadership program, and directs the Making Your Organization Innovative program. Previously, at Georgia Tech's Huang Executive Education Center he was the Academic Director of the GE Energy PLMP program. He has authored several case studies through close collaboration with major firms across multiple industries. Professor Kavadias was the Steven A. Denning Professor of Technology & Management, as well as an Associate Professor of Operations Management, at the Scheller College of Business at Georgia Tech. He is also a Batten Fellow at the Batten Institute of Innovation and Entrepreneurship at the Darden School of Business, and a Visiting Professor at INSEAD.

Tava OLSEN holds the Ports of Auckland chair in Logistics and Supply Chain Management at the University of Auckland Business School. Prior to joining Auckland, she was Professor of Operations and Manufacturing Management in the Olin Business School at Washington University in St. Louis, which she joined after serving in the Department of Industrial and Operations Engineering at the University of Michigan, Ann Arbor.

Tava received her BSC (honours) from The University of Auckland and her PhD from Stanford University. Tava's research interests include supply-chain management, pricing and inventory control and stochastic modelling of manufacturing, service and healthcare systems. Tava is a Past President of the Manufacturing and Service Operations (MSOM) society.

TEO Chung-Piaw is currently a Professor, and Head of the Department of Decision Sciences in NUS Business School. He was the former Acting Deputy Dean and Vice Dean of Research in the Business School. He graduated from MIT with a PhD in Operations Research, and has taught in NUS and Sungkyunkwan University (Korea). He was a fellow with the Singapore-MIT Alliance Program, an Eschbach Scholar with Northwestern University (US), and a Distinguished Visiting Professor in YuanZe University (Taiwan). He is currently a department editor with Operations Research and an associate editor with Management Science. His research interest is in the interface of operations, analytics and optimization. In operations, he is looking at issues of flexibility and sustainability. In analytics and optimization, he is looking at choice inferences and predictive analytics using distributionally robust models.